Paidéia
2024, Vol. 34, e3415.doi:https://doi.org/10.1590/1982-4327e3415
ISSN 1982-4327 (online version)

Developmental Psychology

Unidirectional Speaker Naming in Toddlers: Effects of Multiple Exemplar Instruction Teaching

Giulia Gomes da Silva [1]
Carlos Barbosa Alves de Souza[2]
Maria Stella Coutinho de Alcantara Gil[1]

Abstract: Toddlers (children aged 1 to 3 years) may have difficulties responding as a speaker to objects/events for which they have been taught to respond as a listener. This study aimed to perform a methodologically robust evaluation of the effectiveness of a Multiple Exemplar Instruction teaching (MEI) consisting only of listener (auditory-visual matching-to-sample) and speaker tasks (intraverbal tact), in inducing Unidirectional Speaker Naming in toddlers with typical development. Thus, three toddlers aged between 28 and 29 months were exposed to: listener and speaker pre-tests with auditory stimuli and two-dimensional visual stimuli; listener teaching; listener and speaker post-test 1; MEI; and listener and speaker post-test 2. In post-test 2, one toddler showed emergence of Unidirectional Speaker Naming. The findings of this study may help to refine language teaching procedures for toddlers.

Keywords: language, toddlers, intraverbal-tact, multiple exemplar instruction, naming

Nomeação Unidirecional de Falante em Crianças Bem Pequenas: Efeitos do Ensino por Múltiplos Exemplares

Resumo: Crianças bem pequenas (1 a 3 anos de idade) podem apresentar dificuldades em responder como falante para objetos/eventos para os quais foram ensinadas a responder como ouvinte. Este estudo objetivou realizar uma avaliação metodologicamente robusta da eficácia de um Ensino por Múltiplos Exemplares (MEI, no acrônimo em inglês), constituído apenas por tarefas de ouvinte (emparelhamento ao modelo auditivo-visual) e de falante (tato intraverbal), na indução de Nomeação Unidirecional de Falante em crianças bem pequenas com desenvolvimento típico. Assim, três crianças com idades entre 28 e 29 meses foram expostas a: pré-testes de ouvinte e falante com estímulos auditivos e estímulos visuais bidimensionais; ensino de ouvinte; pós-teste 1 de ouvinte e falante; MEI; pós-teste 2 de ouvinte e falante. No pós-teste 2 uma criança apresentou emergência de Nomeação Unidirecional de Falante. Os achados deste estudo poderão contribuir para o refinamento de procedimentos de ensino de linguagem para crianças bem pequenas.

Palavras-chave: linguagem, crianças bem pequenas, tato intraverbal, ensino por múltiplos exemplares, nomeação

Nombramiento Unidireccional de Hablante en Niños Muy Pequeños: Efectos de la Enseñanza por Múltiples Ejemplares

Resumen: Los niños muy pequeños (1 a 3 años) pueden tener dificultades para responder como hablantes a objetos/eventos a los que se les ha enseñado a responder como oyentes. Este estudio buscó llevar a cabo una evaluación metodológicamente robusta de la eficacia de una Enseñanza por Múltiples Ejemplares (MEI, del acrónimo en inglés), consistente únicamente en tareas de oyente (igualación a la muestra auditivo-visual) y hablante (tacto intraverbal), para inducir el Nombramiento Unidireccional de Hablante en niños muy pequeños con desarrollo típico. Así, tres niños de entre 28 y 29 meses fueron expuestos a: prepruebas de oyente y hablante con estímulos auditivos y estímulos visuales bidimensionales; enseñanza de oyente; posprueba 1 de oyente y hablante 1; MEI; posprueba 2 de oyente y hablante. En la posprueba 2, un niño mostró la aparición de la denominación unidireccional del hablante. Los hallazgos de este estudio podrían contribuir a perfeccionar los procedimientos de enseñanza del lenguaje para niños muy pequeños.

Palabras clave: lenguaje, niños muy pequeños, tacto intraverbal, instrucción por múltiples ejemplares, nombramiento

One of the challenges found in Skinner's proposal for explaining Verbal Behavior (Skinner, 1957) is to understand how behaviors that are not directly taught (i.e., emergent) can integrate the repertoire of toddlers (i.e., children aged between 19 months and 47 months, according to the parameters of the National Common Core Curriculum - Ministry of Education of Brazil, 2018). For example, how can children in this age group learn to say the names of new stimuli (objects/events), i.e., emit tacts (Skinner, 1957), without direct and planned exposure to contingencies for teaching this repertoire?

One explanation has been proposed by the naming theory (Horne & Lowe, 1996), in which shared stimulus control

[1]*Universidade Federal de São Carlos, São Carlos-SP, Brazil*

[2]*Universidade Federal do Pará, Belém-PA, Brazil*

Article derived from the master's thesis of the first author under the supervision of the third author, defended in 2020, in the Postgraduate Program in Special Education at the Universidade Federal de São Carlos. Support: The research was conducted as part of the National Institute of Science and Technology for Behavior, Cognition and Teaching (INCT ECCE) scientifc program, supported by the São Paulo Research Support Foundation (FAPESP; grant # 2014/50909-8), by the National Council for Scientifc and Technological Development (CNPq; grant # 465686/2014-1), and by CAPES (grant # 88887136407/2017-00).

Correspondence address: Giulia Gomes da Silva. Universidade Federal de São Carlos, Rodovia Washington Luiz, Km 235, São Carlos-SP, Brazil. CEP 13.565-905. E-mail: giuliagomes@estudante.ufscar.br

makes previously independent directly reinforced operant repertoires interdependent: listener, echoic, and tact response (Skinner, 1957). The integration of these repertoires leads to the establishment of a bidirectional relation between listener and speaker responses (naming), in the sense that the direct teaching of one repertoire (listener or speaker) implies the emergence of the other. Naming, by becoming a generalized operant in a child's repertoire (full name relation), would allow mere exposure to pairings between stimuli (without reinforcement of listener or speaker responses) to make them able to respond as listeners and speakers to new objects/words (Horne & Lowe, 1996).

Subsequently, Hawkins et al. (2018) advanced in the analysis of the possible characteristics of naming and suggested six subtypes, anchored in the justification that studies in the area adopted the same description for different behavioral repertoires (Santos & Souza, 2020): (i) Unidirectional Listener Naming, characterized by the direct teaching of speaker behavior and the emergence of listener behavior for the same stimulus; (ii) Unidirectional Speaker Naming, characterized by the direct teaching of listener behavior and the emergence of speaker behavior for the same stimulus; (iii) Bidirectional Naming, characterized by the direct teaching of listener and speaker for different stimuli and the emergence of listener for the stimuli that were taught by the speaker and vice versa; (iv) Incidental Unidirectional Listener Naming, characterized by the emergence of listener behavior from simple exposure to stimulus pairings; (v) Incidental Unidirectional Speaker Naming, characterized by the emergence of speaker behavior from stimulus pairing; and (vi) Incidental Bidirectional Naming, characterized by the emergence of both listener and speaker behavior from incidental exposure to stimuli (i. e., without direct reinforcement).

In the subtypes of naming proposed by Hawkins et al. (2018), it is possible to suppose a hierarchy in the organization of the environment for the emergence of naming. Exposure to direct teaching or stimulus pairing would correspond, in this order, to joint unidirectional/bidirectional naming and incidental naming. The transition from (uni/bi) directional naming to incidental naming would presuppose that the environmental arrangements would be simplified to achieve the emergence of Incidental Bidirectional Naming the most sophisticated type of acquisition. For this last subtype, exposure to paired stimuli present in the environment would be enough for the naming of interdependent listener and speaker to emerge. Robust acquisition of the first three types of naming would prepare the organism for the effects of incidental exposure to stimuli that result in Incidental Bidirectional Naming.

Despite this conceptual systematization (Hawkins et al., 2018), empirical research on the integration of listener and speaker repertoires has presented divergent results. Some studies have suggested that teaching the listener repertoire is not sufficient to induce tact-derived relations (e.g., Hranchuk et al., 2019; Ribeiro de Souza & Gil, 2018). Other studies have reported success in inducing bidirectional naming and/or incidental naming in different populations (e.g., Cao & Greer, 2018; Carnerero et al., 2019; Petursdottir et al., 2020; Sivaraman et al., 2021; Yoon et al., 2023).

However, as Lima and Souza (2022) and Santos and Souza (2020) have pointed out, a general difficulty in studies that have sought to investigate the integration of listener and speaker repertoires lies in the inadequacy of the pre-intervention assessment (i.e., in baselines, pre-tests etc.) of the naming subtypes that the studies intend to investigate (Cao & Greer, 2018; Carnerero et al., 2019; Yoon et al., 2023) or the lack of pre-intervention assessment of the presence of the naming subtypes in the behavioral repertoire of the study participants (Hranchuk et al., 2019; Ribeiro de Souza & Gil, 2018). Therefore, the studies have not enabled an adequate investigation of the procedures that can favor the integration of listener and speaker repertoires and the possible relations that may exist in the acquisition of the different subtypes of naming.

For example, the Multiple Exemplar Instruction (MEI) procedure has been shown to promote incidental bidirectional naming (Fiorile & Greer, 2007; Gilic & Greer, 2011; Greer et al., 2005, 2007). In this procedure, listener and speaker responses are taught with a rapid rotation between the repertoires, i.e., the experimenter presents a stimulus asking for a certain response (for example, in front of a picture of a cap, the experimenter says "What is that?"), and after the participant has given a response, in the next trial, the experimenter presents another stimulus and asks for another type of response (for example, in front of three pictures, the experimenter says "Select/point to the fork").

The procedure carried out with these requirements can establish the joint function of the stimuli, favoring listener-speaker integration (LaFrance & Tarbox, 2020). However, as Lima and Souza (2022) and Santos and Souza (2020) pointed out, in studies that evaluated the role of MEI in inducing incidental bidirectional naming (e.g., Gilic & Greer, 2011; Greer et al., 2005, 2007, 2011; Pereira et al., 2018), the pre- and post-tests were carried out using an identity matching-to-sample (IDMTS) task in which the experimenter said the name of the sample stimulus (auditory-visual matching-to-sample, AVMTS), which made the task a matching-to-sample with compound sample stimulus (IDMST+AVMTS), with the listener repertoire being reinforced/taught. This makes it possible to assess only the unidirectional speaker naming.

Moreover, these studies have been carried out almost exclusively with children with atypical development, aged over 3 years old, without pre-tests (baseline) of the listener and speaker repertoires with repeated measures, and employing a variety of tasks in the composition of the MEI, such as IDMTS+AVMTS, AVMST, tact and intraverbal tact (verbal response controlled by verbal and non-verbal stimuli - e.g. saying the name of an object/event, when someone in front of the object/event asks "What's that/What's the name of that?", degli Espinosa et al., 2021). Intraverbal tact comprises verbal responses under the multiple control of verbal and non-verbal stimuli (Michael et al., 2011). In this case, the non-verbal stimulus corresponds to an object or event,

and the verbal stimulus corresponds to the instruction given together. In natural situations of social interaction, parents teach their children not only pure tact, controlled solely by non-verbal stimuli, but also responses that are the product of verbal and non-verbal sources of control (degli Espinosa et al., 2021), such as intraverbal tact. Therefore, this study aimed to carry out a methodologically robust evaluation of the effectiveness of Multiple Exemplar Instruction teaching (MEI), consisting only of listener (AVMTS) and speaker (intraverbal tact) tasks, in inducing Unidirectional Speaker Naming in toddlers with typical development.

Method

This study used a single-subject design with repeated measures of pre-tests (baseline) and post-tests (probes). The independent variable was the implementation of MEI consisting of listener (AVMTS) and speaker (intraverbal tact) tasks and the dependent variable was the percentage of correct/incorrect responses in the AVMTS and intraverbal tact tasks in the experimental stages of the procedure.

Participants

Two boys, Joca and Pipo, and one girl, Manu (fictitious names), aged between 28 and 29 months at the start of data collection, took part in the study. Manu and Joca were born at term (> 37 weeks), and Pipo was born prematurely (< 37 weeks, corrected age of 28 months). Participants were recruited from a public preschool in a small town (eight thousand inhabitants) in the inner state of São Paulo, Brazil. Table 1 summarizes information about the participants.

Table 1

Characterization of Participants: Fictitious name, Gender, Chronological Age, Denver II Screening Test and Operationalized Portage Inventory (OPI)

Fictitious names	Gestation time (weeks)	Gender	Chronological/corrected age (months)	Denver II
Manu	> 37	Female	28	Normal
Joca	> 37	Male	29	Normal
Pipo	< 37	Male	28	Normal
		OPI		
Participant/ OPI area	Language (%)	Cognition (%)	Socialization (%)	Self-care (%)	Motor (%)
Manu	92.0	68.3	96.0	65.6	96.0
Joca	92.0	75.0	96.0	80.5	96.0
Pipo	83.3	72.5	86.6	65.6	92.0

Instruments

The *Denver II Developmental Screening Test* (Denver II) (Sabatés, 2017) and the Operationalized Portage Inventory (OPI) (Williams & Aiello, 2018) were used to assess the participant's development conditions (see Table 1). Additionally, the following instruments were utilized: a protocol for recording the accuracy and errors of the participants' selection responses (pointing, touching, or grabbing) and tact responses during data collection; a pen for note-taking; toys of interest provided by the teachers for free play; containers (buckets) for storing the cards; a Canon® VIXIA HF R800 video camera for recording the children's performances and the experimenter's actions; and a Dell computer Dell® i15-5567-A30C for information storage and analysis.

Nine discriminative stimuli were used to carry out the listener and speaker tasks, organized into three sets (see Figure 1). Each stimulus consisted of a colored drawing printed on a paper card measuring 10x10 cm, which was given a conventional, two-syllable name in Portuguese (*siri*, *tatu*, *figo*, *cajú*, *mola,* and *ioiô,* which mean, respectively, crab, armadillo, fig, cashew, spring, and yo-yo) or a name created for the experiment (*nito*, *momo,* and *tabi,* which are just two-syllable names with no special meaning).

Figure 1

Auditory and visual stimuli grouped into sets

	Set 1			Set 2			Set 3		
Name	*siri*	*tatu*	*nito*	*figo*	*caju*	*momo*	*mola*	*ioiô*	*tabi*
Figure									

Procedure

Data collection. The research was carried out in a public nursery school in a city in the inner state of São Paulo, Brazil. The data collection environments varied according to the disposition of the participants. Initially, there was a two-week pre-experimental period in which the researcher interacted with the children during classroom activities in order to familiarize herself with them. After this period, experimental sessions were held with each participant (which were videotaped). Each session lasted approximately 5 min, with 3 min for the experimental tasks and 2 min for free play between the experimenter and the child at the end of the tasks, with toys from the daycare center itself. Five experimental stages were carried out:

(1) Pre-tests (Baselines - BL) - Five Baseline measures verified the accuracy of listener (AVMTS) and speaker (intraverbal tact) behaviors for the nine stimuli. Each measure consisted of one listener trial and one speaker trial for each stimulus. The trials did not include a programmed differential consequence.

AVMTS task - The sample stimulus was the vocalization of the names of the nine stimuli that made up the three sets. The spoken names were inserted into a vocal instruction issued by the experimenter: e.g., "Touch the (stimulus name)". After the presentation of the sample stimulus, three comparison stimuli were placed in front of the participant. The expected response was to touch/select the correct comparison stimulus. The relative position of the comparison stimuli was balanced with each trial.

Intraverbal tact task - The procedure for checking intraverbal tact began with the presentation of the instruction given by the experimenter: e.g., "Who is that?". At the same time as the instruction, a card with a printed figure was presented to the child. The correct response was to utter the names corresponding to the figures.

(2) Teaching AVMTS for set 1- The aim was to teach listening behavior for the three figures in set 1, in blocks of 9 AVMTS trials, with a gradual increase in the number of comparison stimuli per block. There was a differential consequence for successes and errors and the learning criterion was 100% correct responses in a block. Teaching began with blocks of AVMTS trials with only one correct comparison stimulus (figure S+), progressed to blocks with two comparison stimuli (S+ and S-) and ended with blocks with three comparison stimuli (one S+ and two S-). Correct answers were reinforced with praise in a continuous reinforcement schedule and incorrect answers led to the trial being resubmitted (if the child made a mistake again, a new trial was made with another stimulus).

(3) Post-tests 1 (Probes) of AVMTS and intraverbal tact - were identical to the pre-tests (Stage 1).

(4) MEI with AVMTS and intraverbal tact tasks for stimuli from set 2. Each teaching block consisted of 12 trials, with two trials per stimulus, distributed in six AVMTS trials (with three comparison stimuli) and six randomized intraverbal tact trials. Additionally, no stimuli appeared sequentially on AVMTS or intraverbal tact trials. The learning criteria and consequences of correct and incorrect responses were identical to those in stage 2.

(5) Post-tests 2 (Probes) of AVMTS and intraverbal tact - were identical to the pre-tests (Stage 1).

Data analysis. For each experimental session of all stages of the Procedure, the percentage of correct/incorrect responses in the AVMTS and intraverbal tact tasks was calculated. Thirty percent of the records from all stages were classified by a second observer to establish the Interobserver Agreement (IOA) and Procedural Integrity (PI). The average percentage of IOA for recording the participants' responses was 93.5% and for the PI was 91.4%.

Ethical Considerations

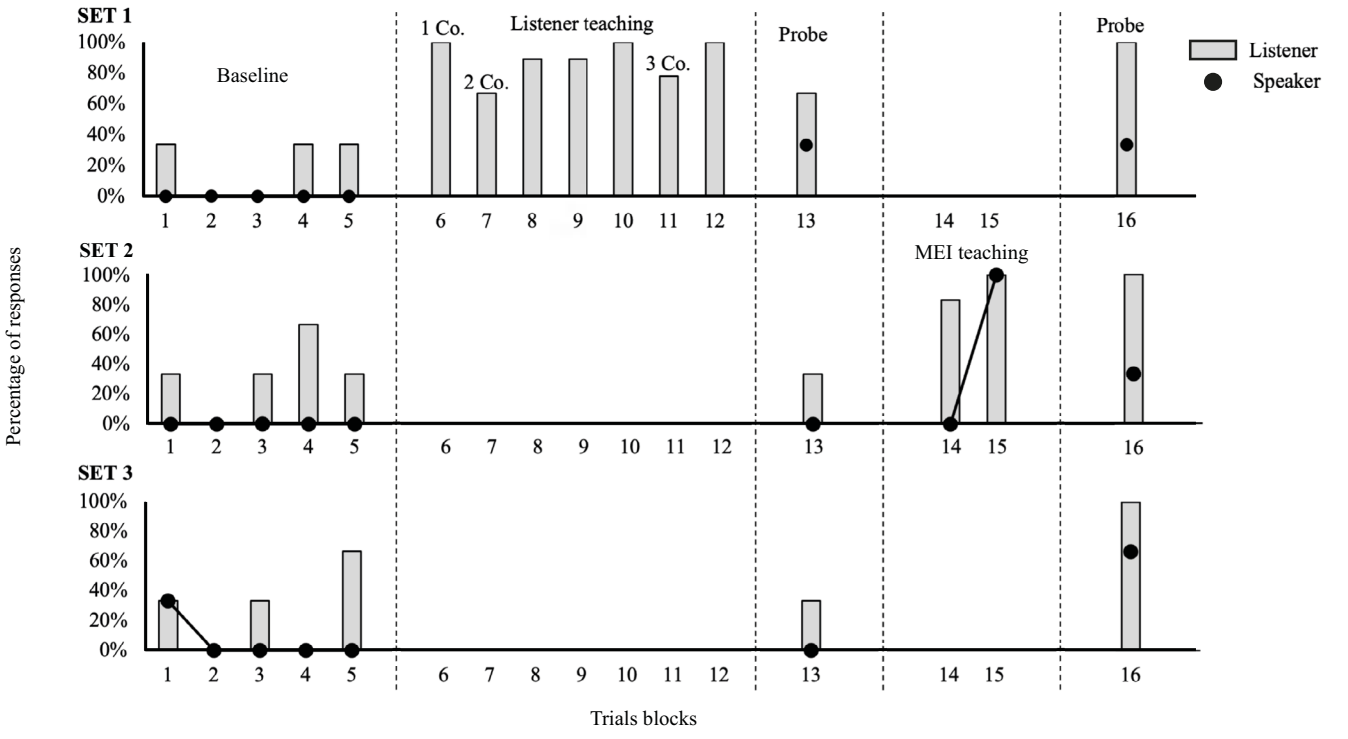
The study was approved by the Ethics Committee of Universidade Federal de São Carlos (CAAE No. 18022219.0.0000.5504). The participants' legal guardians signed the Free and Informed Consent Form authorizing participation in the study.

Results

There was a substantial increase in intraverbal tact responses for the three participants from the pre-tests (Baseline, BL) to the post-tests. Pipo had an increase from 11.1% in post-test 1 to 44.4% of correct intraverbal tact responses in post-test 2. Participant Joca had an increase of 11.1% in post-test 1, to 66.6% of correct intraverbal tact responses in post-test 2. Participant Manu had an increase of 22.22%, in post-test 1, to 88.8% correct intraverbal tact responses in the post-test 2. From the procedure, there was the possibility of responding emergently to 66.66% of the stimuli (sets 1 and 3). The emerging intraverbal tact responses to the set 1 stimuli indicated the possibility of inducing Unidirectional Speaker Naming. The performance in the experimental stages of participants Pipo, Joca, and Manu can be seen in Figures 2, 3, and 4, respectively. Next, the results of the experimental steps for each child are described.

Figure 2

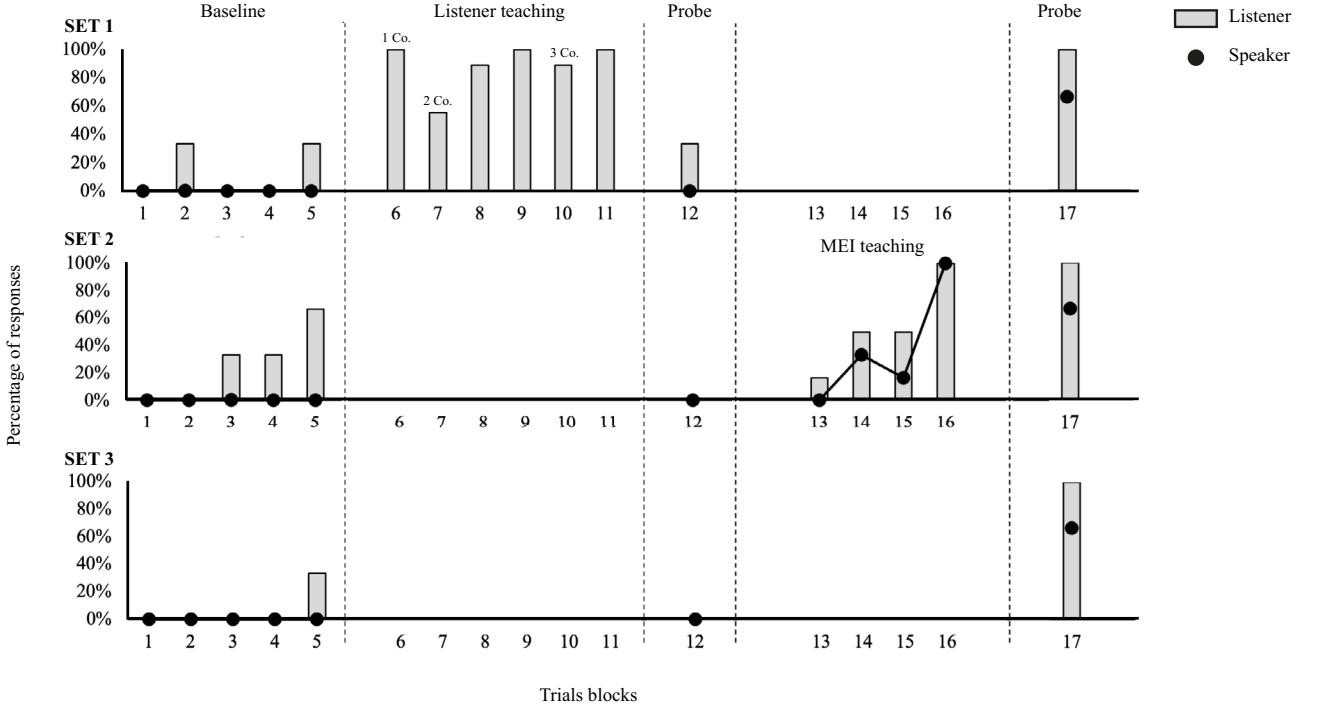
Participant Pipo's performance in the experimental stages of the study



Note. 1 Co = 1 comparison stimulus; 2 Co= 2 comparison stimuli; 3 Co= 3 comparison stimuli.

Figure 3

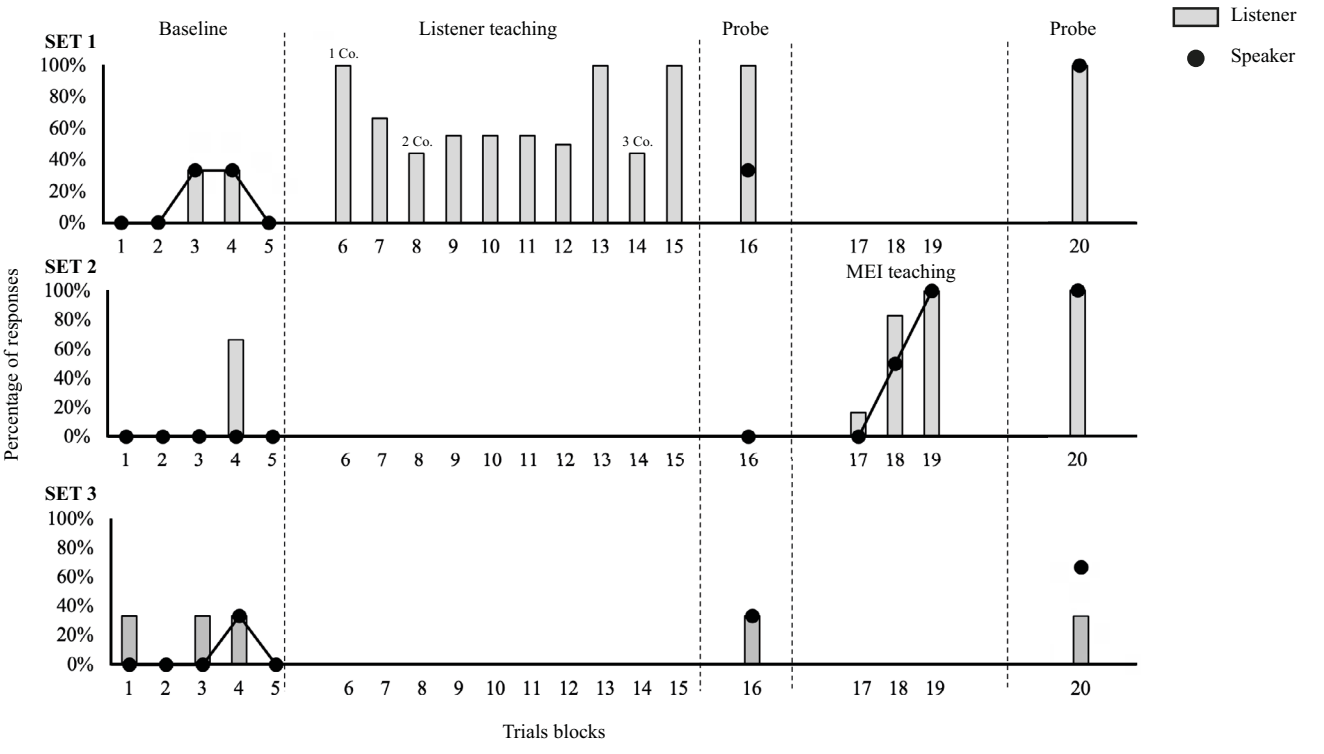
Participant Joca's performance in the experimental stages of the study



Note. 1 Co = 1 comparison stimulus; 2 Co= 2 comparison stimuli; 3 Co= 3 comparison stimuli.

Figure 4

Participant Manu's performance in the experimental stages of the study



Note. 1 Co = 1 comparison stimulus; 2 Co = 2 comparison stimuli; 3 Co = 3 comparison stimuli.

Pipo was exposed to five Baseline blocks in step one. Of the total trials of the AVMTS tasks, Pipo obtained 35.5% correct answers, correctly selecting four times the *mola* (spring) and *figo* (fig) stimuli; three times the *momo* stimulus; twice the tact stimulus; and once the *siri* (crab), *cajú* (cashew), and *tabi* stimuli. Regarding the intraverbal tact tasks, Pipo responded correctly for 4.5% of the trials, touching the *mola* (spring) stimulus once, with total correspondence (100% correspondence). In stage two, teaching AVTMTS tasks for stimuli from set 1, Pipo reached the criterion of 100% correct answers in nine consecutive trials in the first block of AVMTS teaching with a comparison stimulus. Four teaching blocks were carried out for Pipo to obtain the criterion of 100% correct answers in nine consecutive trials with two comparison stimuli. In trials with three comparison stimuli, Pipo needed to be exposed to two teaching blocks to reach the criterion of 100% correct answers in nine consecutive trials. In step three, post-test, for the AVMTS tasks, Pipo responded correctly to 44.4% of the trials, two stimuli from set 1 (*tatu* (armadillo) and *siri* (crab)), one stimulus from set 2 (*momo*) and one stimulus from set 3 (*mola* (spring)). In the intraverbal tact tasks, Pipo responded correctly for 11.1% of the trials, vocalizing a stimulus from set 1 (*tatu* (armadillo)) with full correspondence. In stage four, implementation of the MEI, Pipo needed two teaching blocks to reach the criterion of 100% correct answers in 12 consecutive trials, six of which were AVMTS and six were intraverbal tact. In the MEI intraverbal tact tasks, Pipo echoed the names of the fruits when the researcher corrected the answers. In step five, post-test 2, Pipo responded correctly to 100% of the taught and emerging AVMTS tasks: *tatu* (armadillo), *siri* (crab), *nito*, *figo* (fig), *cajú* (cashew), *momo*, *mola* (spring), *tabi* and *ioiô* (yo-yo). In the intraverbal tact tasks, Pipo vocalized with total correspondence to 44.4% of the stimuli, two directly taught stimuli and two emerging stimuli, namely: *tatu* (armadillo), *momo*, *mola* (spring) and *tabi*. Pipo vocalized *siri* (crab) and *figo* (fig), with 75% correspondence.

Joca was exposed to five blocks of BL in stage one. In the AVMTS tasks, he responded correctly to 26.6% of the total trials, i.e., he correctly selected the *nito*, *momo*, *mola* (spring) and *tabi* stimuli once; the *cajú* (cashew) stimulus twice; and the *siri* (crab) and *figo* (fig) stimuli three times. Regarding the intraverbal tact tasks, Joca vocalized in front of all the stimuli, but no vocalization with total correspondence. In stage two, the teaching of AVMTS for set 1, Joca reached the criterion of 100% correct answers in nine consecutive trials in a teaching block with one comparison stimulus. When teaching AVMTS with two comparison stimuli, Joca was exposed to three teaching blocks to reach the criterion of 100% correct answers in nine consecutive trials. When teaching AVMTS with three comparison stimuli, Joca was exposed to two teaching blocks to reach the criterion of 100%

correct answers in nine consecutive trials. In stage three, post-test 1, for the AVMTS tasks, Joca answered correctly for 11.11% of the trials, with one stimulus from set 1 *tatu* (armadillo). In the intraverbal tact tasks, Joca only voiced one syllable, i.e., 50% correspondence for the *siri* (crab) and *tatu* (armadillo) stimuli, "*si*" and "*ta*". In stage four, implementation of the MEI, Joca needed to be exposed to four teaching blocks in to reach the criterion of 100% correct answers in twelve consecutive trials, including six AVMTS trials and six intraverbal tact trials. When correcting the intraverbal tact tasks, Joca echoed the names of the stimuli presented by the researcher. In stage five, post-test 2, Joca responded correctly to 100% of the stimuli in the taught and emergent AVMTS tasks: *tatu* (armadillo), *siri* (crab), *nito*, *figo* (fig), *cajú* (cashew), *momo*, *mola* (spring), *tabi* and *ioiô* (yo-yo). In the intraverbal tact tasks, Joca emitted tact for 66.66% of the stimuli with total correspondence, of which two stimuli were taught and four were emerging stimuli (*tatu* (armadillo), *siri* (crab), *figo* (fig), *cajú* (cashew), *ioiô* (yo-yo), and *tabi*).

Manu was exposed to five blocks of BL in stage one. Of the trials at AVMTS tasks, Manu responded correctly to 20%, i.e. she correctly selected the *nito* stimulus twice, the *cajú* (cashew) stimulus once and the *mola* (spring) stimulus four times. In the BL intraverbal tact tasks, Manu vocalized for all the stimuli. Of the vocalizations, 6.66% were complete matches, twice for the *tatu* (armadillo) stimulus and once for the *mola* (spring) stimulus. In stage two, teaching AVMTS for the stimuli in set 1, Manu reached the criterion of 100% correct answers in nine consecutive trials in the first teaching block with a comparison stimulus. To teach AVMTS with two comparison stimuli, Manu was exposed to seven teaching blocks to reach the criterion of 100% correct answers in nine consecutive trials. For the teaching of AVMTS with three comparison stimuli, Manu reached the criterion of 100% correct answers in nine consecutive trials with two teaching blocks. In stage three, post-test 1, the participant responded correctly in the AVMTS tasks to 44.4% of the trials, i.e. to four stimuli, three stimuli from set 1 (*tatu* (armadillo), *siri* (crab) and *nito*) and one stimulus (*mola* (spring)) from set 3. In the intraverbal tact tasks, Manu vocalized with full correspondence in 22.2% of the trials, i.e., she vocalized the *tatu* (armadillo) and *mola* (spring) stimuli correctly. In stage four, Manu was exposed to three blocks of MEI to reach the criterion of 100% correct responses in twelve consecutive trials, six in AVMTS tasks and six in intraverbal tact tasks. When correcting the intraverbal tact tasks, the participant echoed the names of the stimuli in set 2 (fruits). In stage five, post-test 2, in the AVMTS tasks, Manu responded correctly to 77.7% of the stimuli (*tatu* (armadillo), *siri* (crab), *nito*, *figo* (fig), *cajú* (cashew), *momo* and *mola* (spring)). In the intraverbal tact tasks, Manu emitted tact for 88.8% of the stimuli with total correspondence, three of which were directly taught and five emergent stimuli (*nito*, *tatu* (armadillo), *siri* (crab), *figo* (fig), *momo*, *cajú* (cashew), *mola* (spring), and *ioiô* (yo-yo)).

Discussion

After exposure to a MEI procedure consisting of AVMTS and intraverbal tact tasks, participant Manu emitted tact for 100% of the target stimuli (belonging to set 1), showing a repertoire of Unidirectional Speaker Naming. Participant Pipo emitted tact for 33.3% of the target stimuli (belonging to set 1). The third participant, Joca, emitted tact for 66.6% of the target stimuli (belonging to set 1). The results of the emergence of speaking behavior after MEI corroborate the results of previous studies with populations affected by Autism Spectrum Disorder and language delay (Fiorile & Greer, 2007; Greer et al., 2005, 2007) and neurotypical populations (Gilic & Greer, 2011).

It is worth noting that Manu and Pipo emitted tacts for stimuli at baseline. Manu emitted tact for a stimulus from set 1 and a stimulus from set 2. Pipo emitted tact for a stimulus from set 3. Although Pipo and Manu emitted tact for these stimuli in the Baseline measure, there was no consistency, i.e., correct responses in the five Baseline measures; for this reason, the stimuli were used in the experiment. In probe 3, after teaching AVMTS (step 2), participant Manu emitted tact for the same stimuli to which she had responded as a speaker in the Baseline. Therefore, for this participant it is not possible to say that it was MEI alone that was responsible for the acquisition of Unidirectional Speaker Naming. On the other hand, participant Joca did not show correct responses to any stimuli in the Baseline and probes after AVMTS teaching, but showed the emergence of speaker behavior after MEI, which suggests a facilitating function of MEI in the induction of Unidirectional Speaker Naming.

As was seen in stage three (Post-test 1 of AVMTS and intraverbal tact), the direct teaching of AVMTS to set 1 did not produce the emergence of intraverbal tact. This data corroborates those studies that have pointed out the difficulty in producing emergent speaker responses only with direct listener teaching contingencies (e.g., Ribeiro de Souza & Gil, 2018). Based on this data, it can be concluded that the research participants did not have Unidirectional Speaker Naming in their repertoires.

All participants showed correct responses in the AVMTS and intraverbal tact tasks for set 3. It is worth noting that the stimuli in set 3 were not exposed to direct teaching contingencies in the AVMST and intraverbal tact tasks. The procedure outlined for this study did not provide for additional incidental exposure to pairings between the vocal emission of the stimulus name and the presentation of its image. The only possible pairings to which the participants were exposed occurred in the AVMTS tasks in the Baseline and Probe trials. However, in these trials, the auditory stimulus was paired with three visual stimuli. Therefore, the data indicates that, possibly, the emergence of correct responses in the AVMT and intraverbal tact tasks for the stimuli in set 3 were the result of re-exposure to the baseline and probe measures.

Regarding the properties of the stimuli that could have affected the performance of the study participants, it should

be noted that after the MEI, all the participants emitted tact for *tatu* (armadillo) (it is worth noting that Manu had already vocalized the *tatu* (armadillo) stimulus before the MEI was implemented). Therefore, of the nine experimental stimuli, only the learning of the intraverbal tact for the *tatu* (armadillo) stimulus was common to all three participants. In general, in the teaching and testing stages, the stimuli with the best performances were different among the participants, so it was not possible to establish a relation between the properties of the stimuli and the participants' performances.

Analyzing the characteristics of the teaching and testing procedures adopted in the study, although the AVMTS teaching procedure (stage 2) was long, all the participants reached the learning criterion with three comparison stimuli. This was very promising for toddlers, given how difficult the task can be for children in this age group. For example, Sousa et al. (2014) pointed out that in sessions with two comparison stimuli, they chose the stimulus incorrectly or did not produce the selection behavior.

In the implementation of MEI with AVMTS and intraverbal tact tasks, Joca, Pipo, and Manu echoed the correction given by the experimenter in all the tact emission tasks. Returning to Horne and Lowe's (1996), propositions on the theory of naming, it is worth remembering that according to these authors, echoing is one of the repertoires that constitute the establishment of listener-speaker integration as a generalized operant. Thus, future studies should seek to evaluate the role of echoic responses in investigating the effectiveness of MEI in inducing naming subtypes.

Still on the characteristics of the procedures used in the present study, another aspect was the suppression of the matching-to-sample with compound sample stimulus (IDMTS+AVMTS) as part of the MEI, commonly used in studies that aimed to induce Incidental Bidirectional Naming through the implementation of the MEI (e.g., Fiorile & Greer, 2007; Greer et al., 2005, 2007; Santos & Souza, 2020). When planning this study, the authors considered the participants as a challenging population (Souza & de Rose, 2017). Thus, the IDMTS+AVMTS task was not used, as adding another task to the MEI would expose them to more learning contingencies and could result in a decrease in the children's engagement in the study activities.

In general, the emergence of intraverbal tacts for the three participants in this study suggests that a MEI procedure consisting of AVMTS and intraverbal tact tasks can be used to favor the induction of Unidirectional Speaker Naming in toddlers. This assumption, reinforced by the verification of the emergence of Unidirectional Speaker Naming for one of the participants, should be supported by the replication of this data in new studies with larger samples of participants. Moreover, questions remain to be investigated regarding the relations between the subtypes of naming in the establishment of listener-speaker integration as a generalized operant, such as: do Unidirectional Naming types take hold earlier than Bidirectional Naming? Do Unidirectional Naming and Bidirectional Naming take hold before Incidental Naming? Future studies should seek to address these questions, investigating how the echoic repertoire, the MEI procedure, incidental pairings between stimuli, among other aspects, relate to them.

References

Cao, Y., & Greer, R. D. (2018). Mastery of echoics in Chinese establishes bidirectional naming in Chinese for preschoolers with naming in English. *The Analysis of Verbal Behavior, 34*(1-2), 79-99. https://doi.org/10.1007/s40616-018-0106-1

Carnerero, J. J., Pérez-González, L. A., & Osuna, G. (2019). Emergence of naming relations and intraverbals after auditory stimulus pairing: Effects of probing the listening skill first. *Psychological Record, 69*(2), 239-252. https://doi.org/10.1007/s40732-019-00336-7

degli Espinosa, F., Wolff, K., & Hewett, S. (2021). A comparison of two teaching procedures to establish generalized intraverbal-tacting in children with autism. *Journal of Applied Behavior Analysis, 54*(1), 1-20. https://doi.org/10.1002/jaba.869

Fiorile, C. A., & Greer, R. D. (2007). The induction of naming in children with no prior tact responses as a function of multiple exemplar histories of instruction. *The Analysis of Verbal Behavior, 23*(1), 71-87. https://doi.org/10.1007/BF03393048

Gilic, L., & Greer, R. D. (2011). Establishing naming in typically developing two-year-old children as a function of multiple exemplar speaker and listener experiences. *The Analysis of Verbal Behavior, 27*, 157-177. https://doi.org/10.1007/BF03393099

Greer, R. D., Corwin, A., & Buttigieg, S. (2011). The effects of verbal developmental capability of naming on how children can be taught. *Acta de Investigación Psicológica, 1*(1), 23-54. https://doi.org/10.22201/fpsi.20074719e.2011.1.214

Greer, R. D., Stolfi, L., Chavez-Brown, M., & Rivera-Valdes, C. (2005). The emergence of the listener to speaker component of naming in children as a function of Multiple Exemplar Instruction. *The Analysis of Verbal Behavior, 21*(1), 123-134. https://doi.org/10.1007/BF03393014

Greer, R. D., Stolfi, L., & Pistoljevic, N. (2007). Emergence of naming in preschoolers: A comparison of Multiple and Single Exemplar Instruction. *European Journal of Behavior Analysis, 8*(2), 109-131. https://doi.org/10.1080/15021149.2007.11434278

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

Hranchuk, K., Greer, R. D., & Longano, J. (2019). Instructional demonstrations are more efficient than consequences alone for children with naming. *The Analysis of Verbal Behavior, 35*(1), 1-20. https://doi.org/10.1007/s40616-018-0095-0

Horne, P. J., & Lowe, C. 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

LaFrance, D. L., & Tarbox, J. (2020). The importance of multiple exemplar instruction in the establishment of novel verbal behavior. *Journal of Applied Behavior Analysis, 53*(1), 10-24. https://doi.org/10.1002/jaba.611

Lima, L. C. A., & Souza, C. B. A. (2022). Ensino por múltiplos exemplares: Revisão sistemática de estudos experimentais [Multiple exemplar instruction: Systematic review of experimental studies]. *Revista Brasileira de Terapia Comportamental e Cognitiva, 24*(1)*,* 1-22. https://doi.org/10.31505/rbtcc.v24i1.1507

Michael, J., Palmer, D. C., & Sundberg, M. L. (2011). The multiple control of verbal behavior. *The Analysis of Verbal Behavior, 27*(1), 3-22. https://doi.org/10. 1007/BF03393089

Ministério da Educação. (2018). *Base Nacional Comum Curricular (BNCC)* [National Common Curricular Base (NCCB)]. http://portal.mec.gov.br/conselho-nacional-de-educacao/base-nacional-comum-curricular-bncc

Pereira, F. S., Assis, G. J. A., Palheta Neto, F. X., & Verdu, A. C. M. A. (2018). Emergência de nomeação bidirecional em criança com implante coclear via Instrução com Múltiplos Exemplares (MEI) [Bidirectional naming emergency in children with cochlear implant via Multiple Exemplar Instruction]. *Revista Brasileira de Terapia Comportamental e Cognitiva, 20*(2), 23-36. https://doi.org/10.31505/rbtcc.v20i2.1178

Petursdottir, A. I., Neaves, S. M., & Thomas, O. N. (2020). Emergent tact control following stimulus pairing: Comparison of procedural variations. *The Analysis of Verbal Behavior, 36*(2), 193-214. https://doi.org/10.1007/s40616-020-00132-3

Ribeiro de Souza, L. M., & Gil, M. S. C. A. (2018). Estabelecimento de relações emergentes nome-objeto por bebês de 18 a 22 meses [Toddlers between 18 and 22 months-old establish name-object emergent relations]. *Acta Comportamentalia, 26*(2), 199-215. https://revistas.unam.mx/index.php/acom/article/view/65037

Sabatés, A. L. (2017). *Denver II: Teste de triagem do desenvolvimento: Manual de treinamento* [Denver II: Developmental screening test: Training manual]. Hogrefe.

Santos, E. L. N., & Souza, C. B. A. (2020). Uma revisão sistemática de estudos experimentais sobre nomeação bidirecional [A systematic review of experimental studies on bidirectional naming]. *Revista Brasileira de Análise do Comportamento, 16*(2), 113-133. http://dx.doi.org/10.18542/rebac.v16i2.9605

Sivaraman, M., Barnes-Holmes, D., & Roeyers, H. (2021). Nonsimultaneous stimulus presentations and their role in listener naming. *Journal of the Experimental Analysis of Behavior, 116*(3), 300-313. https://doi.org/10.1002/jeab.715

Skinner, B. F. (1957). *Verbal behavior*. Appleton-Century-Crofts.

Sousa, N. M., Lohr, T., Almeida, C. G. M., Oliveira, T. P., & Gil, M. S. C. A. (2014). Estabilidade da aprendizagem em bebês: Como medir? [Stability of learning in toddlers: How to measure?]. In C. Vichi, E. Huziwara, H. Sadi, L. Postalli (Orgs.), *Comportamento em foco* (Vol. 3, pp. 245-263). Associação Brasileira de Psicologia e Medicina Comportamental.

Souza, D. G., & de Rose, J. C. (2017). *National Institute of Science and Technology on Behavior, Cognition, and Teaching. Final Report: 2009-2016*. Cubo.

Williams, L. C. A., & Aiello, A. L. R. (2018). *O Inventário Portage Operacionalizado: Intervenção com famílias* [The Operationalized Portage Inventory: Intervention with Families]. Juruá.

Yoon, J. S., Greer, R. D., Virk, M., & Fienup, D. M. (2023). The establishment of incidental bidirectional naming through multiple exemplar instruction: A systematic replication. *The Analysis of Verbal Behavior, 39*(1), 86-98. https://doi.org/10.1007/s40616-023-00181-4

Giulia Gomes da Silva is a candidate for the doctoral Master´s degree in the Postgraduate Program in Special Education at the Universidade Federal de São Carlos, São Carlos-SP, Brazil.

Carlos Barbosa Alves de Souza is a professor at the Universidade Federal do Pará, Belém-PA, Brazil.

Maria Stella Coutinho de Alcantara Gil is a professor at the Universidade Federal de São Carlos, São Carlos-SP, Brazil.

Authors' Contribution:

The first author was responsible for the research planning, data collection and analysis, as well as writing the manuscript. The second author contributed to data analysis and writing the manuscript; and the third author was responsible for the research planning, data analysis, and writing the manuscript.

All authors made substantial contributions reviewing the manuscript and approving the final version. All the authors assume public responsibility for the manuscript's content.

Associate editor:
Vanessa Barbosa Romera Leme

Received: Nov. 29, 2023
1st Revision: Feb. 28, 2024
2nd Revision: Mar. 25, 2024
Approved: Mar. 26, 2024

How to cite this article:
Gomes-Silva, G., Souza, C. B. A. & Gil, M. S. C. A. (2024). Unidirectional speaker naming in toddlers: Effects of multiple exemplar instruction teaching. *Paidéia (Ribeirão Preto), 34,* e3415. doi:https://doi.org/10.1590/1982-4327e3415