

Implementing intensive tact instruction to increase frequency of spontaneous mands and tacts in typically developing children

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ABSTRACT

The present study explored the effects of a modified, intensive tact instruction intervention on the emission of spontaneous, or unprompted, mands and tacts during play in two typically developing, preschool siblings. Intensive tact instruction involved presenting each participant 100 opportunities per session to tact stimuli prior to engaging in play. Picture cards were used as the tacting stimuli, which varied across five categories and five sets. Participants were reinforced for correct tacting responses or were conversely corrected for inaccurate or omitted responses. When compared to baseline, both participants exhibited increase in spontaneous tacts following such instruction. Mands only increased slightly for one participant. This study adds to the research on the positive effect of using intensive tact instruction to help typically developing yet linguistically diverse children communicate.

KEYWORDS: non-English speakers, language, mands, tacts, intensive tact instruction

OVERVIEW OF VERBAL BEHAVIOR

Language delays can be a common occurrence in the preschool years (Ward, 1999). These delays can be linked to repercussions in both language and learning later in adulthood. Nevertheless, when young children present delays in verbal development, such as a limited tact repertoire, basic verbal operants can be established via interventions in order to facilitate more complex verbal abilities (Delgado & Oblak, 2007). A plethora of effective interventions have in turn been developed to target such delays (Turan, 2012). Many of these interventions have been applied to individuals with developmental delays, behavioral disorders, or specific language impairments (e.g., Pistolejvic & Greer, 2006). The present study sought to explore the effects of an intervention for increasing basic and fundamental verbal operants (i.e., mands and tacts) specifically with typically developing yet linguistically diverse children.

Similar to many behavioral repertoires, verbal behavior can be considered within a developmental context (Greer & Keohane, 2006). Individuals transition from being listeners and speakers to readers, writers, and ultimately verbal mediators (Greer & Keohane, 2006). Verbal development was defined by Greer and Speckman (2009) as the acquisition of capabilities that allows an individual to learn new relationships and multiple responses, to learn at a faster rate, and to learn in novel ways not possible before the acquisition of certain verbal capabilities. Skinner identified several fundamental verbal operants that facilitate such development:

echoics, autoclitics, intraverbals, textual responses, mands, and tacts (as cited in Pistolejvic & Greer, 2006). In an unpublished manuscript preceding the publication of *Verbal Behavior* (1957), Skinner (1948) further postulated that these acquisitions arise in part from generalized secondary reinforcers, as when a child is smiled at for cooing or receives verbal praise for correctly naming objects or colors.

Through typical development, a child acquires increasingly complex behaviors. As a speaker, for example, a child progresses from uttering basic vocalizations and echoics to emitting mands and tacts, and finally engaging in conversational units, which involve a full exchange between a listener and a speaker. These increasingly complex repertoires are achieved through behavioral cusps. As defined by Rosales-Ruiz and Baer (1997), a cusp is a change in behavior that has implications for the individual beyond those of the change. These implications promote development and the acquisition of new cusps (Hixon, 2004). For example, imitation is a behavioral cusp that facilitates the learning of new behaviors. In turn, echoics, a type of verbal imitation, facilitates the acquisition of tacts. As stated by Commons (2014, May), tacting is a fundamental step towards human language development.

In particular, mands and tacts are two forms of somewhat complex verbal functions that are pivotal to early language development as they form the basis for more complex verbal responses like conversational units (as cited in Casarini, Cattivelli, & Cavallini, 2011). Tacts are verbal operants controlled by a nonverbal stimulus or antecedent, such as an event or object that is reinforced through

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generalized or social reinforcers (Lamarre & Holland, 1985). For instance, if a child is shown a cookie as a nonverbal antecedent he or she may tact “cookie” without necessarily wanting the edible and may be reinforced with a parent’s nod or verbal praise. Mands are verbal operants for which a response is reinforced by a consequence specific to the response (Lamarre & Holland, 1985). For example, if a child is hungry he or she may mand “cookie” which is in turn reinforced by access to the cookie. Skinner (1948) noted that mands are not elicited by an antecedent stimulus but rather by drives (e.g., child is hungry). Mands and tacts can be communicated via gestures, emotional displays, vocalizations, manual sign language, speech generating devices, or a picture exchange communication system (PECS) (Albert, Carbone, Murray, Hagerty & Kerwin, 2012).

Mand and tact training

A review of the literature indicates that training of verbal repertoires, in particular of mands and tacts, has been a widely researched area across participants, behaviors, and contexts. Greer and Keohane (2006) reported over 100 studies that assessed various aspects of verbal behavior. For example, tact and mand training has been effectively implemented with some children with Autism Spectrum Disorder who exhibit most palilalia (Karmali, Greer, Nuzzolo-Gomez, Ross, & Rivera-Valdes, 2005); with traumatically brain injured adults with aphasia (Sundberg, San Juan, Dawdy, & Argüelles, 1990); and with individuals with intellectual disabilities (Ribeiro, Elias, Goyos, & Miguel, 2010). Tact and mand training has also been shown to increase emission of untrained verbal operants. Because mands and tacts are behavioral cusps, once acquired, these verbal operants allow for rapid development of other verbal repertoires without direct training of these repertoires. Finn, Miguel, and Ahearn (2012), for instance, provided participants with autism spectrum disorder either tact or mand training; yet three of the four participants displayed transference of training to the untrained verbal operant. Similarly, Albert, Carbone, Murray, Hagerty, and Sweeney-Kerwin (2012) found that using mand training to increase unprompted or pure mands of missing items also increased unprompted, related tacts.

Intensive tact training

Similarly, increased emissions of spontaneous and unprompted mands and tacts, known as pure mands and tacts, have been achieved via intensive tact instruction. Such instruction has been explored with other verbal components like conversational units and intraverbals as well as with participants exhibiting language delays and emotional and behavioral disorders. As cited in Pistolejvic and Greer (2006), establishing a tacting repertoire is fundamental to developing other verbal operants, including more complex ones like naming concepts, conversational units, and reading. Specifically, in intensive tact instruction, a child is presented with 100 daily opportunities to tact stimuli (e.g., a card with a two dimensional picture) under the paradigm of a “learn unit” (Pistolejvic & Greer, 2006). Learn units explicitly outline student-teacher interactions and define the antecedent of a behavior, the desired response, and the consequence of such a response or lack thereof (Greer & McDonough, 1999). For example, in the context of verbal behavior,

a learn unit exists when a teacher asks the child “Do you want a cookie?” (i.e., antecedent); the child responds with a mand (i.e., desired response); and the teacher reinforces the mand with access to the edible as a consequence. More specifically, in Pistolejvic and Greer (2006), attending participants were presented a stimulus picture and asked to emit a response or tact. A correct response or tact was reinforced via a generalized reinforcer such as verbal praise. If the response was incorrect or otherwise not emitted, the researcher provided a correction as a consequence of having the participant echo the correct response for which no reinforcement was provided. In their procedures, participants received instruction on five sets of stimuli, each consisting of four stimulus pictures per five categories (i.e., community helpers, transportation, animals, instruments, and food). Upon mastery of a set (i.e., 90 correct tacts out of 100 in two sessions or 100 correct tacts out of 100 in one session), participants were observed in non-instructional settings, such as the playground, hallway, and cafeteria, for pure mands and tacts. Pistolejvic and Greer (2006) demonstrated that such intense daily instruction increased pure, or spontaneous and unprompted, mands and tacts, results which were later replicated by Delgado and Oblak (2007).

Lydon, Healy, Leader, and Keohane (2009) also explored the effects of intensive tact instruction on the emission of pure tacts, pure mands, and conversational units. Lydon et al. (2009) demonstrated that although such instruction was less effective in increasing pure mands and conversational units, it was nonetheless effective in increasing pure tacts. Greer and Du (2010) further explored whether the increase in pure mands and tacts in non-instructional settings were due to intensive tact instruction or simply the increase in learn units delivered. As such, Greer and Du (2010) compared emission of pure tacts, mands, and intraverbals under generic instruction (e.g., calendar, letters, number) and under tact-targeted instruction, both conditions providing 100 additional stimuli presentations, or “learn units”. Greer and Du (2010) supported past conclusions that intensive tact instruction was, in fact, functionally related to an increase in pure tacts and pure mands as well as an increase in intraverbals. Moreover, this effect was not simply due to the increase in stimuli presentation.

Schauffler and Greer (2006) further explored the use of intensive tact instruction to increase school appropriate tacts and thus appropriate conversational units emitted by adolescents with emotional and behavioral disorders. Prior to instruction, participants emitted few tacts and few conversational units that followed standard language usage and that were functionally appropriate for school. Through 100 daily tact presentations, they showed that intensive tact instruction could also lead to a significant increase in appropriate speech. The effectiveness of tact instruction found in Schauffler and Greer (2006) can be attributed to the fundamental role tacts play in the development of more complex verbal repertoires like conversational units.

Overall, these studies indicate that intensive tact instruction is an effective intervention functionally related to emission of spontaneous and unprompted, or pure, verbal operants, namely of mands and tacts, with participants with developmental and language delays. Yet, as Delgado and Oblak (2007) note, such intensive tact instruction requires further implementation with

Table 1. Sets of stimuli for participants A and B

Category	Set 1	Set 2	Set 3	Set 4	Set 5
Home	Chair Spoon Fridge Pillow	Clock Fork Cup Knife	Bookshelf Light switch Sink Bed	Door Stove Table Sofa	Key Plate Telephone Lamp
Leisure	Train Bicycle Blocks Skate	Radio Helmet Tricycle Headphones	Car Bubbles Airplane Paint	TV Ball Puzzle Wagon	Trampoline Swings Bowling Boat
Food	Chicken Chips Popsicle Toast	Grapes Apple Hamburger Cookies	Hotdog Pizza Ice cream Carrot	Jelly Juice French-fries Candy	Banana Soda Cereal Bread
Clothes	Cap Underwear Blouse Dress	Diaper Sweater Pants t-shirt	Belt Snow hat Watch Sandals	Boots Shorts Lifejacket Swimsuit	Socks Mittens Sneakers Jacket
Health	Arms Eyeglasses Hand Foot	Dentist Toothache Ear Back	Stomach Legs Nose Mouth	Doctor Bandage Headache Earache	Hair Head Stomach ache Eye

typically developing children. To the researcher's knowledge, the literature reviewed did not touch upon the acquisition of such tact instruction with unique populations such as children with limited English proficiency.

Current study

The present study specifically aimed to explore the expected increase of mands and tacts via a modified intensive tact instruction in a non-instructional context with typically developing, preschool children. More specifically, would intensive tact instruction prior to play in a non-instructional setting increase the frequency of spontaneous mands and tacts in typically developing children?

» METHODS

Design

The present study utilized a multiple probe design across participants. This design included a baseline phase and multiple probes following instruction on each set of stimuli. The purpose of using probes was to keep participants on a treatment phase rather than withdrawing treatment.

Participants

The participants were a sibling dyad consisting of a four-year, 10-month old male, Participant A, and a three-year, 8-month old female, Participant B. The participants lived in a Spanish-speaking, two parent household with the parents and paternal grandparents as their primary caregivers. Their primary spoken language was Spanish and they were not proficient in English. Although the participants were able to repeat phrases in English when prompted and with prior instruction, tact and mand repertoires were primarily emitted in Spanish.

Participant A was in a part-time voluntary prekindergarten program. Parents self-reported that he had adjusted well to school and had thus far mastered his colors, numbers, and

letters. Several reinforcers, such as stickers, pencils, computer time, sweet edibles, and superhero caricatures, were identified as being potentially reinforcing. Participant B, on the other hand, was not enrolled in any school program. Potential reinforcers were also identified, including stickers, sour edibles, coloring or drawing, and princess caricatures. One-word speech, in Spanish, developed before 12 months of age for both participants. As such, both participants were considered typically developing and had not presented any developmental or language delays.

Setting

The observations and interventions were conducted in the participants' home environment. Initial observations of the participants' verbal behavior were conducted in the participants' 9 × 13 foot play room. The room consisted of a television set, couch, chairs, and children's toys, including male and female toys (e.g., superhero costumes, play kitchen, dolls). Interventions and ensuing observations were conducted in the same room using a rectangular children's table with two chairs.

Materials

Stimuli sets in the present study were modified from *Do2Learn*, a website that provides educational resources for children with disabilities. Specifically, two-inch, black and white picture cards were printed across five categories: home, leisure, food, clothes, and health. These picture cards were pasted on multicolored, 2.5 × 3 inch index cards to differentiate among categories (e.g., home pink; leisure green; food blue; clothes yellow; health purple). Moreover, because of their typical development and closeness in age, participants received the same types of stimuli sets (see Table 1). Clipboards and data sheets were used to record participants' tacts during instruction as well as spontaneous mands and tacts during observational sessions; a timer was also used during these observational sessions.

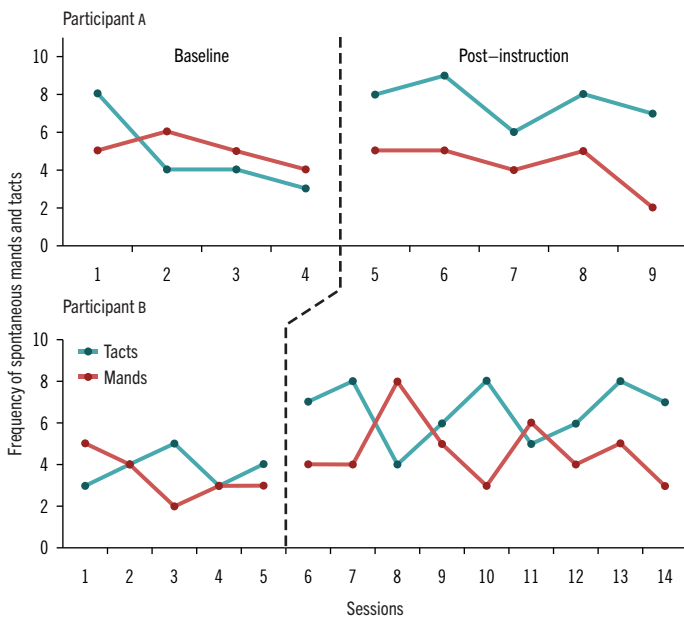


Figure 1. Spontaneous mands and tacts emitted pre and post-instruction

Dependent Variable

Frequency of spontaneous mands and tacts were identified as the target behavior to be observed. Spontaneous tacts were operationally defined as naming or tacting responses that occurred in the presence of physical stimuli (e.g., cookie) in the absence of a verbal stimulus (e.g., teacher asking “What is this?”). Spontaneous tacts emitted by participants included responses such as “puzzle,” “pencil,” and “mask” in the presence of these respective items. These tacts were emitted in the absence of prompts from the researcher. Likewise, spontaneous mands were operationally defined as demands that occurred without verbal prompts (e.g., do you want a cookie) and were reinforced by access to demands. Examples of spontaneous mands included demands such as “I want a piece of paper” or “crayons.” Furthermore, although participants were observed to provide autoclitic phrases such as “I want...” or “This is...,” mands and tacts were considered correct regardless of the emission of autoclitics as these operants were not previously trained.

Intervention

The intervention was implemented during instructional sessions prior to play. The length of these sessions varied upon how long the participants took to tact the stimuli. Intensive tact instruction involved the presentation of 100 picture card stimuli for each participant to tact. Participants received instruction across the five

sets of categories in no particular order. Categories in a set were alternated until the participants had received 20 presentations of the four stimuli in each of the set’s five categories, equivalent to 100 stimuli presentations per session. During instruction, the researcher presented the stimulus for the participants to tact, that is, name without prior prompting. If a correct response was emitted within three seconds of presentation, the researcher provided reinforcement in the form of nods and verbal praise. If an incorrect response was emitted or no response was emitted, the researcher corrected the participants by providing the correct response and asking participants to echo the response. The participants were not reinforced for correct responses during this correction procedure. Participants received instruction until mastery was achieved. Mastery level required at least 70 correct tacts out of 100 per two consecutive sessions or 80 correct tacts out of 100 tacts per session. This intervention was conducted in the participants’ primary language (i.e., Spanish). They were not proficient in English.

Procedure

Baseline. Prior to implementing the abovementioned intervention, participants were observed for emission of spontaneous mands and tacts during play at home in 15-minute sessions. Participant A began intensive tact instruction following the fourth session as stability was reached. Stability was achieved when the frequency of spontaneous mands and tacts varied no more than two standard deviations from each respective mean. Participant B remained on baseline until Participant A achieved mastery on the first set of stimuli. Participant B then began intensive tact instruction after the fifth session.

Intensive tact instruction. At the onset of each instructional session, participants were shown a potential reinforcer and told that at the end of the activity they would have access to the reinforcer. These positive reinforcers were identified a priori during a functional assessment and served to reward participants for completing the instructional sessions. Echoic training then ensued before beginning the intensive tact instruction. The researcher presented each stimulus or picture card in a category in a particular set to the participant, named the stimulus, and asked the participant to echo. The researcher individually presented and named the stimuli in the home category for Set 1 and the participant echoed the words “chair,” “spoon,” “fridge,” and “pillow” (see Table 1). This training was conducted at the onset of each new category of stimuli introduced in a set.

Subsequently, the researcher began intensive tact instruction with each individual participant. As mentioned above, the participant was presented with the picture cards to tact. If the

Table 2. Regression for main effects

	R	R ²	β	t	Significance
Constant	.64	.41	—	5.34	.000*
Participant A or B	—	—	.26	2.14	.039
Tact or mand	—	—	.42	3.53	.001*
Baseline vs post instruction	—	—	.46	3.80	.000*

Note. *p < .01. The value assigned to the independent variables were as follows: participant B = 1 and participant A = 2; mand = 1 and tact = 2; baseline = 1 and post = 2.

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participant emitted the correct tacting response within three seconds of presentation, the researcher provided reinforcement in the form of nods and verbal praise. If an incorrect or no response was emitted, the participant was then corrected and not reinforced. Participants received instruction on a particular set until mastery was achieved (i.e., at least 70 correct tacts out of 100 for two consecutive sessions or 80 correct tacts out of 100 tacts for one session). If mastery was achieved in one session, the participant moved on to the following set in the next session; if mastery was not achieved by participants in a particular session, the participant continued receiving intensive tact instruction on the set on the following session. Upon receiving instruction, the participants were observed for emission of spontaneous mands and tacts during play for 15 minutes.

Data collection

The frequency of spontaneous mands and tacts were recorded at baseline and after each instructional session. These 15-minute sessions occurred during play at home with both participants present. The researcher also collected data on the participants' number of correct tacts emitted during tact instruction.

Interobserver agreement

Interobserver agreement was randomly calculated for approximately 30% of post-instruction observations by dividing the smaller number of responses by the larger number of responses and multiplying by 100. Mean agreements of 72% and 74% were found for Participant A for mands and tacts, respectively. The mean agreements of mands and tacts emitted by Participant B were 77% and 83%, respectively.

» RESULTS

A multiple regression analysis was conducted with frequency of mands and tacts serving as the variable to be predicted. Table 2 presents the results of the main effect and each of the independent variables. The results showed that the intervention made the largest difference (baseline = 1, post intervention = 2). The frequency of mands and tacts ($\beta = .46$) made the second largest difference, followed by type of verbal behavior (mands = 1, tacts = 2) ($\beta = .42$) and individual differences (participant B = 1 and participant A = 2) ($\beta = 0.26$) made a smaller but still large difference. The overall main effect of all three independent variable together had an $R = .64$. Thus, the model was able to account for approximately 41% of the variance of participants responses, $R^2 = .41$.

As shown in Figure 1, at baseline, Participant A emitted an average of 4.7 tacts ($SD = 2.22$) and 5.0 ($SD = 0.82$) mands across four, 15-minute sessions during play. Further analysis of post-instruction sessions indicated that Participant A emitted an average of 7.6 tacts ($SD = 1.14$) in five sessions while an average of 4.2 mands ($SD = 1.30$) were emitted during this period. Furthermore, as Figure 2 illustrates, Participant A achieved mastery (i.e., 70 correct tacts out of 100 in two consecutive sessions or 80 correct tacts out of 100 in one sessions) on each of the five sets upon one session of instruction in each set, emitting an average of 87.6 correct tacts out of 100.

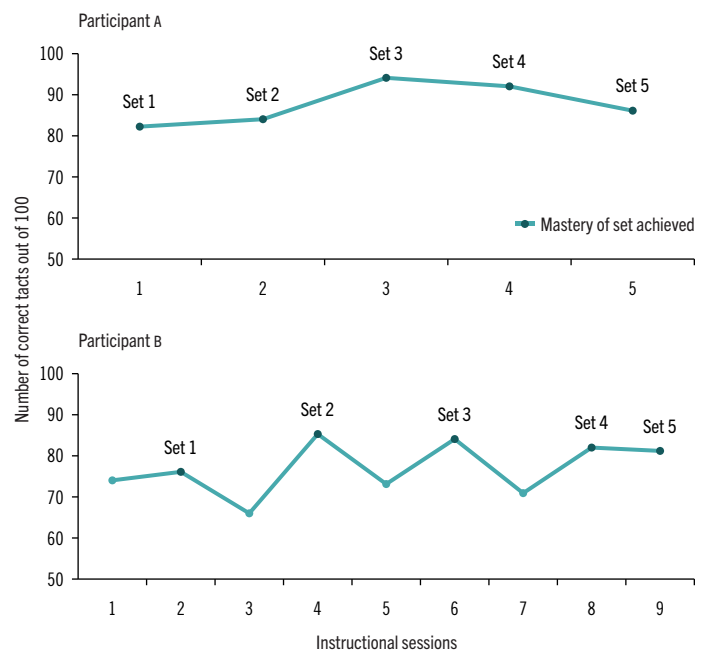


Figure 2. Number of correct tacts out of 100 emitted during instruction

Similarly, during baseline sessions, Participant B emitted an average of 3.8 tacts ($SD = 0.84$) and 3.4 mands ($SD = 1.14$). Although more variable, Figure 1 indicated an increase in tacts and a slight increase in mands after instruction. Across 9 sessions of instruction, Participant B emitted an average of 6.5 tacts ($SD = 1.42$) and 4.6 mands ($SD = 1.58$) during play following tact instruction. Participant B achieved mastery on each of the five sets after 9 sessions of instruction, as shown in Figure 2, and emitted an average of 76.8 correct tacts out of 100.

» DISCUSSION

The present study aimed to explore the effects of intensive tact instruction on the emission of spontaneous mands and tacts during play in typically developing children with limited English proficiency, an area that had not yet been addressed in the literature. Pre- and post-instruction results suggested that for both participants such instruction seemed to increase frequency of spontaneous tacts. Yet, as noted by Lydon et al. (2009), tact instruction did not necessarily lead to an increase in mands, particularly in Participant A who remained stable in the emission of spontaneous mands. Although Participant A emitted on average more tacts than Participant B, the latter emitted more spontaneous tacts during post-instruction when compared to baseline. Nevertheless, participants received unequal instructional sessions as Participant A reached mastery upon one session of instruction on each of the five sets and thus received less instruction. The differences noted between participants could also be potentially attributed to age differences as Participant B was 1 year and 2 months younger than the latter. It is also worth acknowledging that instruction (i.e., the 100 tacting presentations) was not dispersed throughout the day but rather conducted in its entirety prior to play. Moreover, due to time constraints, instructional sessions varied in the time of day delivered and were not conducted consecutively. A downward

trend for tacts and mands was also noted for participants during baseline and post instruction. This trend could be attributed to the presence of the researcher during observational sessions. This trend could also be a product of the reinforcement provided before and during instruction, which can lead to a decrease in the desired response during non-reinforced testing.

Moreover, the use of such tact instruction presents several implications. The present study served to expand the literature on the effects of intensive tact instruction in typically developing yet linguistically diverse children. This present study indicates that intensive tact instruction can be effectively implemented in participants' native language. Implementing tact instruction in individuals' primary languages could potentially benefit those who exhibit limited English proficiency and language delays. Similar to past studies (e.g., Delgado & Oblak, 2007; Pistoljevic & Greer, 2006), tact instruction was conducted in non-instructional settings, yet, it was implemented in the participants' home environment during play. This indicates that intensive tact instruction could be

effective in increasing such verbal operants in more cooperative and interactive contexts (i.e., children playing together).

Further research should be conducted to explore the effects of intensive tact instruction on the emission of spontaneous mands and tacts in non-primary languages, which could potentially benefit English language learners. Likewise, tact instruction should be investigated with individuals with developmental or language delays who are also limited English speakers. The context in which mands and tacts are emitted could also be explored, namely the effects of tact instruction in cooperative, interactive situations. It would also be worth exploring the differences noted among participants, such as the effects of receiving more instructional sessions on the emission of mands and tacts. In sum, despite a few limitations, the present study explored intensive tact instruction with a unique population and towards a more cooperative context, leading to other potential avenues in research and further supporting the previously established effectiveness of intensive tact instruction. ■

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