BRIEF REPORT

Observing Tacting Increases Uninstructed Tacts in Children with Autism

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Abstract The effects of observing an adult emitting tacts on children's rate of uninstructed (i.e., "spontaneous") tacts were examined in three children diagnosed with autism. Each participant was exposed to two conditions in four settings each: in condition 1, participants received 20 trials of teacher-initiated interactions in which the child was asked to tact 20 objects during 5 min. Condition 2 was identical to condition 1 except that the teacher also tacted 20 objects interspersed with the 20 tact trials. The number of uninstructed tacts was recorded in both conditions. Children emitted between 1.58 and 2.68 times more uninstructed tacts in condition 2 than in condition 1. These results indicate that teachers' emission of tacts increases the emission of uninstructed tacts in children with autism.

Keywords Tacts · Uninstructed tacts · Modeling · Language observing · Spontaneous speech · Induction · Autism

A tact consists of emitting a verbal response, such as saying a name, in the presence of an object or event, or a

property of an object or event, that results in generalized social consequences (Skinner 1957). Uninstructed tacts can be defined as tacts initiated without a specific request from a listener (they are also called *pure tacts*; e.g., Pistoljevic and Greer 2006). This type of tacting corresponds to what is often identified as a type of "spontaneous language" and is contrasted with what occurs when additional antecedent verbal stimuli are presented, such as asking the speaker to say the name of an object—the latter tacts may be referred to as instructed tacts (or impure tacts or intraverbal tacts; e.g., Greer and Ross 2008). Sometimes, children with autism do not acquire a tacting repertoire without these additional sources of verbal stimuli; thus, procedures to establish prompt-free tacting are an important linguistic step (Krantz and McClannahan 1998).

Early studies on *incidental teaching* (e.g., Hart and Risley 1975) demonstrated that children with autism can initiate instances of verbal behavior after being taught specifically to do so through prompting (e.g., Koegel et al. 1987; McGee et al. 1985). More recently, Williams et al. (2006) demonstrated that teaching children with autism to tact adult actions in the absence of cues (e.g., the teacher asking, "What is she doing?") resulted in increases in uninstructed tacts. The children in that study tacted on occasions that an adult performed an action, but the rate of emission of uninstructed tacts beyond that specific situation was not studied. It seems, however, that many factors involved in the emission of uninstructed tacts at a rate similar to that of typically developing children have not yet been studied.

Recently, several studies have demonstrated that the emission of uninstructed tacts can be increased indirectly with other interventions. Pistoljevic and Greer (2006) showed that an intensive tact-teaching program for

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teaching a large number of tacts at school resulted in an increase in uninstructed tacts in other settings (e.g., the bus stop). The effect of this teaching has been replicated with typically developing children and children with autism and other developmental delays (e.g., Lydon et al. 2008; Pereira-Delgado and Oblak 2007; Pistoljevic 2008; Schaufler and Greer 2006). The behavioral process involved in the increases of uninstructed tacts in these studies is a type of *induction*, defined by Catania (1998) as a generic term used to describe any process by which a change in behavior affects the rate of other behavior (see also Greer and Ross 2008; and Greer and Speckman 2009), quite different from other basic processes such as imitation or emulation. It is not imitation because the behavior produced by the child or the product of his or her behavior is different from that of the observer. It is not emulation because the consequences of the emitted and the observed behaviors are not the same (see Greer and Ross 2008, for a description of imitation and emulation).

Pereira-Delgado et al. (2006) showed in a recent study that a specific induction phenomenon occurs in operants other than tacts. These authors observed that after an adult imitated spontaneous gestures emitted by a child with autism, the child imitated these gestures when emitted by the adult at a higher rate. Thus, adult behavior, even with no apparent consequences for children's immediate behavior, altered the future response rate of the child's imitations. In that line, Hart and Risley (1996) demonstrated that the rate at which parents talked to their children was positively correlated with the number of words emitted by the children. It is possible that an *induction* process similar to that of Pereira-Delgado et al. (2006) could affect the rate of uninstructed tacts. Thus, it is possible that children emit more previously learned tacts if an adult tacts in their presence. Thus, the goal of the current exploratory study was to find out whether a teacher's tacting objects in the presence of children would increase the children's rate of uninstructed tacts.

Method

Participants

Participants were three children, Marcelo (male, 5 years, 0 months old), Marta (female, 4 years, 7 months old), and Ana (female, 5 years, 11 months old), who were diagnosed with autism and received individualized

teaching in a behavioral program with CABAS© components (e.g., Greer et al. 1989) for 25 h per week at the Centro Al-Mudaris in Cordoba, Spain. All of the children were Spanish speakers and the procedures were conducted in Spanish. The children had acquired a generalized motor-imitation repertoire and followed verbal instructions. They had learned to tact a series of objects and pictures after a single command such as "tell me what you see." Additional verbal skills are described in Table 1. The study took place after the children learned to tact objects and pictures. Thus, the next goal in their curriculum was to generalize picture and object tacting in a variety of settings.

For the purpose of the study, for each student, the experiment was conducted in four settings that each contained more than 20 two-dimensional and three-dimensional items that the participant could already tact. The settings used for each child appear in Table 2.

Procedure

Independent Variable

All sessions were 5 min in length and one to three sessions were conducted per day. Two different conditions were conducted across four different settings.

Condition 1 (tacts only) consisted of presenting 20 tact trials. During the session, the teacher and the child walked around the room. In each trial, the teacher pointed to an item that the child had learned to tact and waited for the child to touch the item to ensure attention to the target stimulus (if the child did not touch, the teacher told her or him to do so). The teacher then asked the child to tact the item by saying, "What's this?" ("¿Qué es?" in Spanish) or, "Look, what's this?" ("Mira, ¿qué es?"). If the child responded correctly within 3 s, the teacher provided praise in the form of saying, "Very good," "Fantastic," ("Muy bien", "Fantástico") or similar expressions that had proven to be effective reinforcers for teaching other skills in the school. If the child said an incorrect name or did not respond within 3 s, the teacher provided a correction by repeating the question and telling the child the name of the item, and waited for the child to repeat the name (no reinforcement or other consequences were provided). Thus, the child's responses were instructed tacts. The teacher kept silent between trials.

Table 1 Skills documented in the three participants

Skills	Participant		
	Marcelo	Marta	Ana
Echoics (generalized echoic repertoire)	With two- and three-syllable words and sentences with more than two words	With two- and three-syllable words	With two- and three-syllable words and sentences with more than two words
Mands	Level III mands* (e.g., “Give me a red block” with autoclitics related to color, size, and membership) 150–200	Level II mands* (e.g., “Give me the horse”) 200–250	Level III mands* 150–200
Tacts	100+ objects	200+ objects numbers 1 to 20	200+ objects
Stimuli selected on command	Colors and numbers	None documented	None documented
Naming**	Tacts or mands after learning to select stimuli on command	Tacts or mands after learning to select stimuli on command	Tacts or mands after learning to select the specific stimuli on command
Other emergences	About 20	About 30	About 20
Intraverbals	No documented	Yes	No documented
Emergence of intraverbals***			

*Terminology used by Williams and Greer (1993)

**Documented by the emergence of the tacts after learning to select stimuli on command or the opposite as defined by Home and Lowe (1996)

***Such as answering, “Which animal says moo?” after learning, “What does the cow say?”

Condition 2 (tacts plus observed tacts) was identical to condition 1 except that in condition 2 the 20 tact trials were intermixed with 20 occasions on which the teacher herself tacted an object or event. For example, the teacher pointed to a dog, waited for the child to look, and said, “Look, Ana, the dog” (“Mira, Ana, el perro”) or “Look, a table” (“Mira, una mesa”). The stimuli that the teacher tacted were different from those that the child was asked to tact in either conditions 1 or 2, and varied across sessions depending upon the items present in the particular setting. After tacting a stimulus, the teacher did not request any behavior from the child or provide differential consequences for any behavior. If the child repeated any word emitted by the teacher, this response was not followed by any consequence (i.e., it was not reinforced).

Experimental Design

The experimental design was an alternating treatment design, in which the child was exposed to the two conditions in four settings each. The order in which the children were exposed to each of the first three settings and the order in which each condition was presented in each setting were counterbalanced across children (see Table 2). The fourth setting (a toy library) was presented last to all children.

Teacher Training

The three teachers who conducted sessions were selected according to their skills. They were taught the specific procedures of the study using role-playing and feedback until they performed the procedures without errors. In

addition, they were periodically evaluated using procedures described by Ross et al. (2005).

Dependent Variable and Interobserver Agreement

Dependent Variable

The dependent variable was the number of uninstructed tacts that the child emitted during sessions. An uninstructed tact was defined as saying the name of an object while looking at it in the absence of a verbal antecedent stimulus (touching the object was not required). Saying the article of the noun was not required (e.g., saying “cuadro” [painting] was considered correct as well as “un cuadro” [a painting]). When the child repeated a word or a sentence that the teacher had just said, it was not considered a tact and it was not recorded. A tact was not recorded when the child said something, but pronunciation was not clear. Uninstructed tacts received the same consequences as instructed tacts.

For a part of the data analysis, we computed a measure that we term the *induction effect*, defined as the result of dividing the number of uninstructed tacts in condition 2 by the number of uninstructed tacts in condition 1. An induction effect greater than 1 indicates a positive effect; i.e., a greater number of tacts in condition 2 (tacts plus observed tacts) than in condition 1 (tacts only).

Interobserver Agreement

A second observer recorded data on 511 trials out of the 757 total trials, during 65 % of the trials conducted with Marcelo, 65.9 % of the trials conducted with Marta, and 70.7 % of the trials conducted with Ana. Interobserver

Table 2 Day and setting in which each session was conducted with each child

Session	Condition	Marcelo			Marta			Ana		
		Day	Setting		Day	Setting		Day	Setting	
1	1	1	1	Kitchen	1	2	Supermarket	1	3	Classroom
2	2	1	2	Supermarket	2	3	Multipurpose room	2	1	Kitchen
3	1	2	3	Classroom	2	1	Kitchen	2	2	Supermarket
4	2	2	1	Kitchen	3	2	Supermarket	3	3	Classroom
5	1	2	2	Supermarket	3	3	Multipurpose room	4	1	Kitchen
6	2	3	3	Classroom	3	1	Kitchen	5	2	Supermarket
7	1	4	4	Toy library	4	4	Toy library	5	4	Toy library
8	2	4	4	Toy library	4	4	Toy library	5	4	Toy library

agreement ($[\text{agreements}/(\text{agreements} + \text{disagreements})] \times 100$) was 98 % (range across children 96.6 to 100 %).

Results and Discussion

All three children responded above 90 % correct in instructed tact trials in all sessions and settings. They also emitted uninstructed tacts in both conditions and across all settings. All children emitted consistently more uninstructed tacts across settings in condition 2, in which the teacher tacted 20 items, than in condition 1, in which the teacher did not tact any objects (see Fig. 1). Specifically, Marcelo emitted 2.41 times more uninstructed tacts in condition 2 than in condition 1 (41 tacts versus 17), Marta emitted 2.68 times more (67 versus 25), and Ana 1.58 times more (79 versus 50). There were no order effects: The children emitted 2.04 times more uninstructed tacts in condition 2 than in condition 1 when condition 1 was first, and they emitted 2.00 times more uninstructed tacts when condition 2 was first.

The magnitude of the effect varied according to the setting: The induction effect across children was 2.68 in setting 2 (supermarket) and 2.63 in setting 4 (toy library), the two settings that were outside of the school. In contrast, the induction effect was of 1.75 in setting 3, (either the ordinary classroom or the multipurpose room) and 1.16 in setting 1 (the school kitchen).

In summary, the children emitted twice as many uninstructed tacts when the teacher herself emitted tacts than when the teacher did not emit them. Thus, a new process involved in the rate of uninstructed tacting in children was observed.

The effect varied with the setting, as the children emitted more uninstructed tacts and the induction effect was greater in the settings outside the school than in the school and in their classroom (either the ordinary or the multipurpose room) than in the kitchen. Two possible factors may explain this difference as follows: (a) the fact that the settings with greater induction effects were unusual to the children, and (b) the fact that these settings had a higher proportion of stimuli to tact. Within the present study, is not possible to determine which factor is responsible for these differences. If further research, however, finds that the effect is due to the novelty of the settings, it would be consistent with Skinner's (1957) hypothesis that people tact more in the presence of unusual situations.

Fig. 1 Uninstructed tacts emitted by each child in a period of 5 min in each setting in condition 1 (tacts only) and condition 2 (tacts plus observed tacts). Marcelo and Ana received sessions in the classroom and Marta in the multipurpose room

One interesting question is the nature of the effect shown, which is similar to generalized imitation. Baer et al. (1967) demonstrated that an observer imitates any action of a model after a few imitations have been reinforced (Greer et al. 2006). The children in the present study, however, observed another person tacting and then tacted different objects (or if they tacted the same objects, they did not do so immediately). Thus, the increase of uninstructed tacting in the present study shows an effect broader than that of generalized imitation. Further research should address this issue.

The present results were consistent across participants and settings, but the effects of a teacher's tacting on children's tacting should be replicated in further research. One limitation of the present research is the absence of a baseline without any intervention; another one was that there was only one condition in which the teacher tacted. Moreover, it is likely that the optimum rate of teacher tacting is different from the specific rate used here (i.e., 20 tacts in 5 min); further research may be needed to determine the rate that produces the highest rate of uninstructed tacting. The participants in this study had acquired a number of tacts, had learned to emit them without specific instructions, and generalized them to novel figures. It may be that these and other related skills are requisite for the process demonstrated in this study to occur. The procedure used in the present study is very simple to implement and therefore may be useful for increasing the rate of uninstructed tacting as well as perhaps other verbal operants, in individual and in-group instructional formats.

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