

## Using a Rapid Echoic Tact Procedure to Reduce Vocal Stereotypy and Palilalia and Increase Tacts

Hyesuk LeePark\* · Jeanne Marie Speckman\*\*

---

< 초 록 >

---

Four preschool females with autism diagnoses participated in an experiment to test the effects of a rapid echoic tact procedure on reducing vocal stereotypy and palilalia and the number of tacts emitted during book and puzzle activities. The dependent variables were (a) the number of 5-second intervals in which vocal stereotypy and/ or palilalia occurred and (b) the number of tacts emitted by students during five minute probe sessions of looking at books and puzzle activities. The independent variable was a rapid echoic tact procedure during book and puzzle activities. The experimenter provided rapid echoic prompts for tacts of either pictures in books or pictures on puzzle pieces and the participants were required to echo the prompts. A multiple baseline across activities within a participant was employed for all four participants. The results of this experiment showed that (a) the rapid echoic tact procedure was functionally related to decreased vocal stereotypy and palilalia during treatment probes of book and puzzle activities and (b) for some students, the implementation of treatment resulted in a higher number of tacts during post treatment probes of book and/or puzzle activities.

---

**Key Words:** Response Interruption and Redirection (RIRD), Vocal Stereotypy, Rapid Tact.

---

\* 공주대학교 특수교육대학원 객원교수(교신처, E-mail: hyesuk11@live.com).  
Dept. of Special Education Graduate, Konju National Univ.

\*\*

F. S. Keller School Associate Director.

# I . Introduction

Repetitive or stereotyped behavior is one of core symptoms of autism spectrum disorders (American Psychiatric Association, 2013). Research reported significant differences in prevalence of stereotypy between children with autism and children with other developmental disabilities (Kim, 2012; Rapp, & Vollmer, 2005; Reed, Hirst, & Hyman, 2012). Persistence of stereotypic behaviors in individuals with autism impedes appropriate social interaction and skill acquisition and is stigmatic (Ahearn, Clark, MacDonald, & Chung, 2007; Reed et al., 2012). Stereotyped behavior refers to noncontextual restricted and repetitive motor or vocal behavior without apparent adaptive function (Ahearn et al., 2007; Miguel, Clark, Tereshko, & Ahearns, 2009; Reed et al., 2012).

Recent research support the notion that stereotypy is operant behavior maintained by consequences that follow the behavior (Dixon, Benedict, & Larson, 2001; Kennedy, Meyer, Knowles, & Shukla, 2000; Mace & Lalli, 1991; Rehfeldt & Chambers, 2003; Roantree & Kennedy, 2006). The consequences can be socially mediated such as obtaining other's attention or escaping from demanding tasks (Durand & Carr, 1987; Kennedy et al., 2000; Roantree & Kennedy, 2006). Sensory consequences were reported to be another major maintaining source for stereotyped behavior in individuals with autism (Iwata, Pace, Cowdery, & Miltenberger, 1994; Shabani, Wilder, & Flood, 2001).

The understanding of stereotypy as operant behavior poses implication on designing intervention according to functional classes of the behavior, not just the form of the behaviors (Dixon et al., 2001; Iwata et al., 1994; Kennedy et al., 2000). Researcher used experimental procedures for functional analysis to identify sources of stereotypic behaviors since Iwata et al. (1982) first reported results of their experiments. Social contingencies identified to be sources for stereotypic behaviors were removal of demanding situation (Durand & Carr, 1987), obtaining others' attention (Goh et al., 1995), tangibles, or multiple social contingencies (Kennedy et al., 2000). Similarly, research reported that inappropriate verbal behaviors (e.g., bizarre speech, delusional vocalizations, or perseverations) were maintained by social

## Using a Rapid Echoic Tact Procedure to Reduce Vocal Stereotypy and Palilalia and Increase Tacts

consequences such as obtaining attention or escaping demands (Dixon et al., 2001; Rehfeldt & Chambers, 2003). Research reported that adapting those identified social contingencies was a critical component of effective intervention (Durand & Carr, 1987; Goh et al., 1995; Kennedy et al., 2000; Rapp & Vollmer, 2005).

Intervention of stereotypic behaviors is one of major elements of education programs for children with ASD (Cunningham & Schreibman, 2008) and yet difficult to reduce. Especially intervening non-socially mediated and automatically reinforced behavior can be challenging because it involves withholding reinforcer that is intrinsic to the behavior itself (Shabani et al., 2012; Taylor, Hoch, & Weissman, 2005). Automatically reinforced behavior is self-stimulatory behavior which is maintained by reinforcing sensory stimuli that the behavior itself produces. Controlling variables for self-stimulatory behavior lie inner side of the individuals and thus difficult to change the behavior. Several areas of research demonstrated that removal of sensory outcome (e.g., sensory extinction), providing alternative appropriate forms of sensory inputs which matched to those from the stereotypy, or providing differential reinforcement of other or alternative behaviors reduced stereotypy (Paik & Kim, 2002; Piazza, Adelinis, Hanley, Goh, & Delia, 2000; Rapp, 2006; Rincover, 1978).

Recently, research were conducted to reduce automatically reinforced vocal stereotypy and palilalia. Vocal stereotypy is repetitive emission of sounds and consonant-vowel combinations with similar tone and pitch that are not true words, and which appear to have no verbal function for the individual. Palilalia has been defined as the delayed repetition of words and phrases (Skinner, 1957). Reduction of vocal stereotypy is difficult because the sensory consequences may not be easily blocked or modified through physical intervention (Ahrens, Lerman, Kodak, Worsdell, & Keegan, 2011). Research has shown that palilalia can be reduced and replaced with more appropriate responses by implementing mand training (Durand and Crimmins, 1987; Ahrens et al., 2011) and tact training (Karmali, Greer, Nuzzolo-Gomez, Ross, & Rivera-Valdes, 2005). Karmali et al. (2005) presented tacts as corrections contingent on emission of palilalia in children with autism. When the experimenters modeled a tact associated with the activity (e.g., "I am

coloring,” or “That’s a book.”) in which the student was engaged when participants emitted palilalia, its frequency decreased and tacts and mands increased.

More recently, a line of research were conducted on using Response Interruption Redirection (RRID) in reducing automatically reinforced vocal stereotypy (Ahearn et al., 2007; Ahrens et al., 2011; Dickman, Bright, Montgomery, & Miguel, 2012). Ahearn et al. (2007) first used RIRD procedure which involved blocking vocal stereotypy and redirecting participant to emit three appropriate vocal responses contingent on occurrence of vocal stereotypy. Results showed that RIRD was effective in reducing the occurrence of vocal stereotypy and increasing appropriate vocalization. In their study, RIRD functioned as sensory extinction for the stereotypy and simultaneously, reinforcement for alternative responses. However, the procedure is not readily used with individuals who are noncompliant with redirections. Moreover, if the reinforcement provided contingent upon the alternative vocal responses fails to compete with nor substitute for the automatic consequences of stereotypy, the procedure wouldn’t reduce automatically maintaining vocal stereotypy (Ahrens et al., 2011).

In the present study, vocal stereotypy emitted during specific play activities such as looking at books or playing with puzzles was targeted. Instead of interrupting ongoing activities as in previous research, non-contingent rapid presentations of echoics as vocal prompt for appropriate tacting for items in the books or puzzles were delivered while the participants engaged in looking at books or playing with puzzles.

In 1957, Skinner described the verbal operants of mands and tacts. Tacts and mands are verbal operants which are not under the control of verbal antecedents, but instead, are evoked by stimuli with which individuals come in contact (tact) and an individual’s state of deprivation (mand). A tact is defined as a “verbal operant in which a response of a given form is evoked (or at least strengthened) by a particular object or event or a property of an object or event. This, reinforcement for tacts is generalized. Pistoljevic and Greer (2006) and Pareira-Delgado and oblank (2006) found that increasing the number of tacts taught per day by 100 resulted in increases in tacts in generalized, non-instructional settings for preschoolers with language-based

## Using a Rapid Echoic Tact Procedure to Reduce Vocal Stereotypy and Palilalia and Increase Tacts

disabilities. Another significant result of this experiment was that the participants emitted tacts in generalized settings that were not targeted during the tact training procedure. These findings suggest that by increasing tact learn units, a generalized tact repertoire was established and for the participants.

In the current experiment, Karmali et al. (2005)'s study was replicated. We implemented a rapid echoic tact procedure in order to reduce palilalia and vocal stereotypy during book and puzzle activities. We also investigated the effects of this procedure on the emission of tacts. The following research questions were investigated in the present study: (a) Would implementation of a rapid echoic tact procedure reduce palilalia and vocal stereotypy emitted by children with autism while they looked at books or played with puzzles? (b) Would the implementation of the procedure increase tacts during the activities with books or puzzles?

## II. Method

### 1. Participants

Four preschool females with developmental disabilities participated in the study. Participant E and Participant S had speaker repertoires and early reader repertoires and Participant K and Participant A had speaker repertoires. All participants manding with full sentences (e.g. "I want\_\_\_\_please", "Can I have\_\_\_\_please") and they tacted with full sentences (e.g., "It's a\_\_\_\_", "I see a\_\_\_\_"). These students were chosen to participate in this research because they emitted vocal stereotypy and/or palilalia while they were engaged in social and play activities (e.g., putting puzzle pieces together or looking at books) as well as during academic and verbal behavior instruction in the classroom. According to their parents' reports, all participants also emitted the target behaviors at home at high rates.

Participant K was a 4 year 9 month-old girl diagnosed with autism. According to the result of Preschool Language Scale-4 (PLS-4) (Zimmerman,

Steiner, & Pond, 2002), she had an age equivalent of 1.1 in auditory comprehension and an age equivalent of 1.1 in expressive communication when she was 4.7 years old. She answered some “wh” questions and had some early reading and writing repertoires. She emitted palilalia at high rates in the classroom during all school activities.

Participant E was 5-year old girl diagnosed with autism. She presented with severe language delay in listener and speaker behaviors. According to the results of PLS-4, she had an age equivalent of 2.4 in auditory comprehension and an age equivalent of 2.7 in expressive communication when she was 5 years old. She followed three-step vocal directions. She engaged in looking at books or putting puzzle pieces together when she was in free play settings however, her play was very frequently accompanied by her singing songs. Participant E sang songs during instruction as well, and did not respond to teacher directions that “it was not time for singing” or “it is time for quiet”. She also emitted high-pitched vocal sounds during instruction and free play activities.

Participant A was a 4-year old girl with diagnoses of cerebral palsy and autism. According to the results of PLS-4, she had an age equivalent of 1.1 in auditory comprehension and an age equivalent of 1.9 in expressive communication when she was 5 years old. She engaged in manipulating puzzles or looking at books in a free play setting, however she emitted vocal stereotypy (e.g., /ee/) or palilalia while she was engaged in the activities. The student also emitted the vocal stereotypy during instructions as well as in free play settings.

Participant S was a 5-year old girl with a diagnosis of autism. She showed significant delays in language and speech. According to the results of PLS-4, she had an age equivalent of 1.9 in auditory comprehension and an age equivalent of 1.4 in expressive communication when she was 5 years old. She engaged in looking at books or putting puzzle pieces together when she was in a free play setting however, her play was very frequently accompanied by her singing songs. Participant S sang songs during instruction as well, and did not respond to teacher directions that “it was not time for singing” or “it is time for quiet”. She also emitted frequent laughing episodes which could last for several minutes at a time. Table 2-1 shows

Using a Rapid Echoic Tact Procedure to Reduce Vocal  
Stereotypy and Palilalia and Increase Tacts

description of participants definition of vocal stereotypy and palilalia of each participant.

Table 2-1. Description of Participants and Palilalia/ Vocal Stereotypy

Participant/ Age	Preschool Language Scale-4th(PLS-4)	Palilalia Vocal Stereotypy
K 4.9 Years	<ul style="list-style-type: none"> <li>• 1.1 Age equivalent AC</li> <li>• 1.1 Age equivalent EC</li> </ul>	“Hooray!”, “Good-bye”, Phrases from Videos Loud Screams
E 5 Years	<ul style="list-style-type: none"> <li>• 2.4 Age equivalent AC</li> <li>• 2.7 Age equivalent EC</li> </ul>	Singing Nursery Rhymes Loud Screams, High Pitched Giggling, Loud Humming
A 5 Years	<ul style="list-style-type: none"> <li>• 1.1 Age equivalent AC</li> <li>• 1.9 Age equivalent EC</li> </ul>	“Mama”, “I want, I want, I want, etc” “Ayeeeeeee”
S 5 Years	<ul style="list-style-type: none"> <li>• 1.9 Age Equivalent AC</li> <li>• 1.4 Age equivalent EC</li> </ul>	Reciting Nursery Rhymes, Singing, “Chugga, Chugga, Choo Choo” No Vocal Stereotypy

Note. AC refers to auditory comprehension and EC refers to expressive communication.

## 2. Setting

This study was conducted in a special education preschool outside a major metropolitan area. All instruction and probes took place in the participants’ classrooms. Participant K attended a full day special education class with a student to teacher to assistants ratio as 6:1:2. Participants E, A and S all attended a full-day one to one ratio program with six children in each class. Classrooms consisted of a one to one instruction area, a group area and a play area. All sessions for this study were completed in the one to one instruction area at a small child sized table with child sized chairs. The school employed the CABAS® (Comprehensive Application of Behavior Analysis to Schooling) system of schooling. The experimenter was a head teacher of the one to one ratio program and held a Master Teacher rank of the CABAS®.

## 3. Response Definitions and Data Collection

### 1) Intervals with stereotypy

Stereotypy has been defined as cycles of repetitive behavior that have no apparent social consequences for the individual who is emitting them beyond the actual behavior itself (Greer, Saxe, Becker, & Mirabella, 1985). Palilalia has been defined as the delayed repetition of words or phrases (Benke & Butterworth, 2001; Skinner, 1957). During baseline and reversal probes, continuous partial interval recording was used to record the presence or absence of palilalia or vocal stereotypy during 5-second interval trials. Sessions lasted 5 minutes long so that each session contained sixty interval trials. The experimenters were cued at the beginning and end of each interval by an audible tone previously recorded on an audio tape. If any instance of palilalia or vocal stereotypy occurred during a 5-second interval, a plus (+) for presence of P or VS was recorded on a data form as the tone that ended the interval sounded. If P or VS occurred simultaneously with the tone that ended the interval, a plus was recorded for that interval. However, a plus would not be recorded for the next interval (the end tone for one interval was also the beginning tone for the next interval). If the student did not emit any instances of P or VS, a minus (-) was recorded for that interval. The definitions of P and VS differed among all of the participants and can be found in Table 2-1.

## **2) Tacts**

For purposes of this experiment, tacts were defined as correct vocal responses to pictures or items with which the participant was currently in contact. For example, if the participant was looking at a page of a book containing a dog, and she emitted the vocal response “dog”, this was considered a correct tact. A vocal response that had no correspondence to the picture or object present was not counted as a tact. If student had emitted tacts of items in their environment that were not on the book pages or puzzle pieces, these would also have been counted as tacts.

## **4. Independent variable**

Treatment consisted of a rapid echoic tact procedure that was



## Using a Rapid Echoic Tact Procedure to Reduce Vocal Stereotypy and Palilalia and Increase Tacts

implemented by the experimenter during 3-minute sessions of looking at books or playing with puzzles. During the echoic tacts with books condition four or five books were presented on a table in front of the student and the experimenter sat next to the participant. The experimenter would start a count down timer. Each participant already had a “looking at books” repertoire which meant that they looked at the pages, turned pages and chose a new book once they were finished looking through another. As the participants looked at the books, the experimenter would point to pictures in the books and provide echoic prompts for tacts of pictures. The participant was required to echo the experimenter. Correct student echoics were consequted with praise statements (“Yes, you’re right”; “Excellent!”, “Nice job”; “That is a\_\_\_”). All four students who participated had fluent echoic repertoires. If a student did not echo, however, the experimenter would re-present the echoic prompt and again gesture to the same picture. This was repeated until the student emitted the correct echoic response. The procedure continued until the 3 minutes had elapsed. The experimenter who was implementing the procedures was cued that the 3 minute session was over by a beep tone from the count down timer.

For the echoic tacts with puzzles condition, four or five puzzles were presented on a table in front of the student. The experimenter would start a count down timer. Each participant already had a “playing with puzzles” repertoire which meant that they placed puzzle pieces in their correct inserts, took puzzles apart when necessary and chose new puzzles once they were finished completing another. As the students played with the puzzles, the experimenter would point to different puzzle pieces and provide echoic prompts for tacts of these pieces. The remainder of the procedure was identical to the echoic tacts with books procedure.

## 5. Experimental Design and Procedure

A multiple baseline across activities within a participant design was employed for four participants. The experimenter conducted baseline probes for all four participants in order to (a) determine the number of 5-second

partial intervals during which the students engaged in palilalia or vocal stereotypy during 5-minute observations, and (b) how many tacts the participants emitted during the 5-minute observations. Next, the experimenter implemented the rapid echoic tact procedure for each student for one of the two activities; looking at books or playing with puzzles. One participant had the puzzles condition first and three students had the book condition first. The 3-minute echoic tacts procedure was conducted once or twice per day and a 5-minute probe was conducted after every five sessions of treatment for each activity. No probe session followed a treatment session within 3 hours. For example, when the experimenter completed five treatment sessions for looking at books across school days after the last probe session for looking at books, she waited at least for 3 hours before she conducted another probe session with books. The experimenter initiated treatment before she secured a stable level of responding during baseline conditions across activities considering the nature of target responses (vocal stereotypy and/or palilalia) which interfered learning and appropriate social interaction of the participants. The experimenter provided some participants with more sessions of treatment than others, due to scheduling issues, absences and other programmatic and logistical reasons.

## **6. Procedural Reliability and Interobserver Agreement**

Procedural reliability was assessed by a supervisor who held an Associate Behavior Analyst rank of CABAS® during (a) 1 session of book treatment and two sessions of puzzle treatment for Participant K, (b) two sessions of book treatment and two sessions of puzzle treatment for Participant E, (c) one session of puzzle treatment and one session of book treatment for Participant A and (d) two sessions of puzzle treatment for Participant S. The procedural reliability was measured using the Teacher Performance Rate and Accuracy (TPRA, Ingham & Greer, 1992). The supervisor observed the performance of the experimenter and recorded accuracy of presentation of echoics as antecedents for the participant's responses and consequences to the participants responses to the echoics. The procedural reliability was calculated by dividing the total number of accurate presentations with the

## Using a Rapid Echoic Tact Procedure to Reduce Vocal Stereotypy and Palilalia and Increase Tacts

total number of opportunities to present and multiplying by 100. The procedural reliability was 100% across all of the participants.

Interobserver agreement was assessed by independent observers with at least one CABAS® teacher rank. The second observer collected data simultaneously and independently while the experimenter recorded data on the performance of the participants during the experimental sessions. Interval-by-interval agreements between the two sets of data were examined after the sessions. Interobserver agreement was calculated by dividing the total number of agreements with the number of agreements plus the number of disagreements. For Participant K, interobserver agreement was conducted for one baseline session of the puzzles condition and one treatment session of the books condition. For the baseline puzzles condition, interobserver agreement was 95% for intervals with P or VS and 93% for number of tacts. For the treatment books condition, interobserver agreement was 96% for intervals with P or VS and 60% for number of tacts. For Participant E, interobserver agreement was conducted for one baseline session of the puzzles condition. Interobserver agreement was 90% for intervals with P or VS and 75% for number of tacts. For Participant A, interobserver agreement was conducted for one treatment session of the puzzles condition. Interobserver agreement was 90% for intervals with P or VS and 75% for number of tacts. For Participant S, interobserver agreement was conducted for one baseline session of the puzzles condition. Interobserver agreement was 92% for intervals with P or VS and 100% for number of tacts.

### III. Results

The numbers of 5-second intervals in which participants showed vocal stereotypy or palilalia and the number of tacts during 5-minute probe sessions are shown at Figure 3-1 through Figure 3-4.

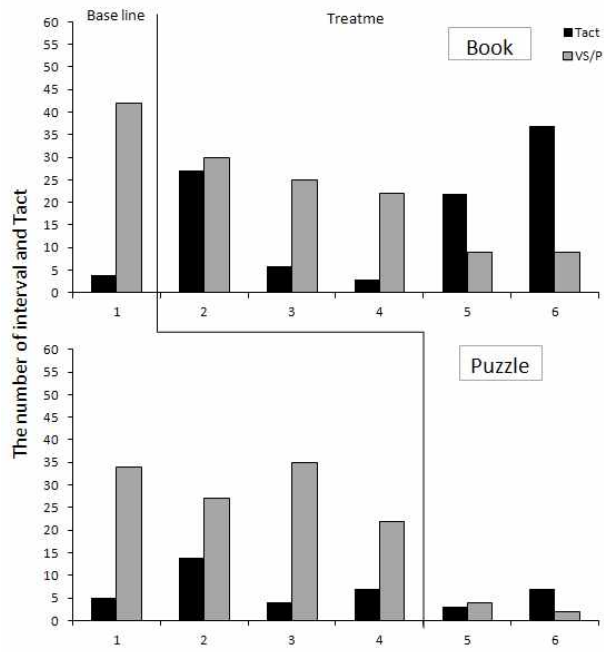


Figure 3-1. The number of interval and Tact of Participant K

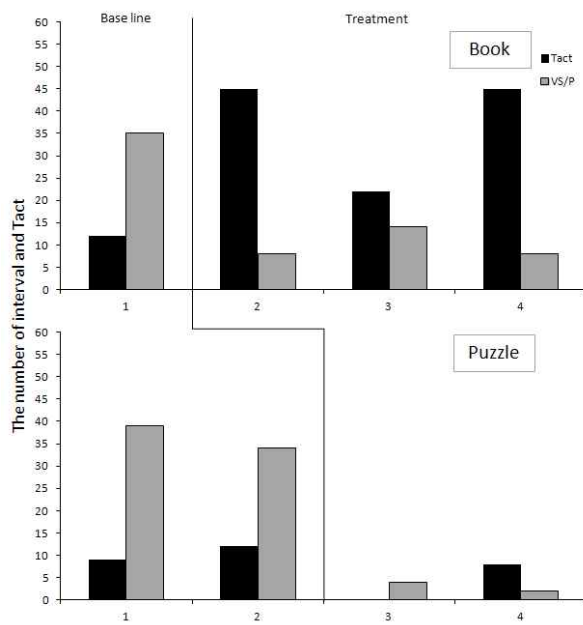


Figure 3-2. The number of interval and Tact of Participant E

Using a Rapid Echoic Tact Procedure to Reduce Vocal Stereotypy and Palilalia and Increase Tacts

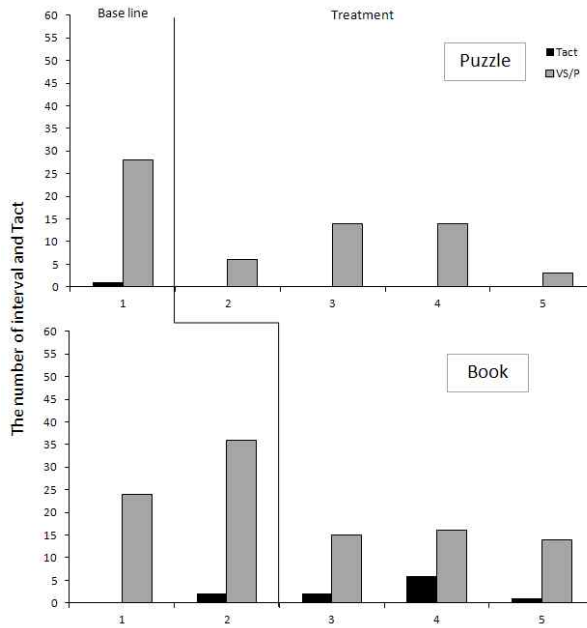


Figure 3-3. The number of interval and Tact of Participant A

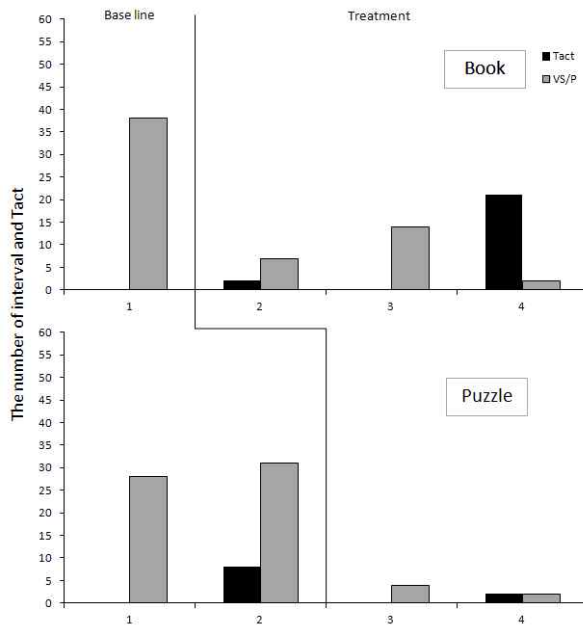


Figure 3-4. The number of interval and Tact of Participant S

The mean number of intervals with ranges for vocal stereotypy/palilalia and tacts during the probe sessions are shown at Table 3-1. During baseline probes for looking at books, Student K had 42 intervals out of 60 during which she emitted VS/P. During baseline probes for playing with puzzles, she had 34, 27, 35 and 22 intervals during which she emitted VS/P. After one baseline session for looking at books, Student K received twenty-five sessions of rapid echoic tact treatment and following every fifth session she received a return-to-baseline probe. Subsequent probes showed that Student K's number of intervals with VS/P decreased as treatment continued and the data were 30, 25, 22, 9 and 9. Student K received 10 sessions of rapid echoic tact treatment for puzzle play after four sessions of baseline were conducted. She received a probe under a return-to-baseline condition following the fifth and the tenth treatment sessions and the number of intervals with VS/P was 4 and 2. Student K emitted 4 tacts during the 5-minute looking at books baseline probe. She emitted the following numbers of tacts during the subsequent probes described above: 27, 6, 32, 22 and 37. Student K emitted 5, 14, 4, and 7 tacts during the four 5-minute playing with puzzles baseline probes. She emitted the following numbers of tacts during the subsequent treatment probes described above: 3 and 7.

During baseline probes for looking at books, Student E had 35 intervals out of 60 during which she emitted VS/P. During baseline probes for playing with puzzles, she had 39 and 34 intervals during which she emitted VS/P. After one baseline session for looking at books, Student E received fifteen sessions of rapid echoic tact treatment and following every fifth session she received a return-to-baseline probe. Subsequent probes showed that Student E's numbers of intervals with VS/P were significantly lower during treatment and the data were: 8,14 and 8. Student E received 10 sessions of rapid echoic tact treatment for puzzle play after 2 sessions of baseline were conducted. She received a return-to-baseline probe following the fifth and the tenth treatment sessions and the number of intervals with VS/P was 4 and 2. Student E emitted 12 tacts during the 5-minute looking at books baseline probe. She emitted the following numbers of tacts during the subsequent probes described above: 45, 22 and 45. Student E emitted 9 and 12 tacts during the four 5-minute baseline probes for playing with puzzles.

Using a Rapid Echoic Tact Procedure to Reduce Vocal  
Stereotypy and Palilalia and Increase Tacts

She emitted the following numbers of tacts during the subsequent treatment probes described above: 0 and 8.

Table 3-1. Number of Intervals with Stereotypy and Number of Tacts during Probes

Participant	Activity	R	Condition	Mean(Range)
K	Book	Tact	BL	4.0(4)
			T	24.8(6 ~ 37)
		VS/P	BL	42.0(42)
			T	19.0(9 ~ 30)
	Puzzle	Tact	BL	7.5(4 ~ 14)
			T	5.0(3 ~ 7)
		VS/P	BL	29.5(22 ~ 34)
			T	3.0(2 ~ 4)
E	Book	Tact	BL	12.0(12)
			T	37.3(8 ~ 14)
		VS/P	BL	35.0(35)
			T	10.0(9 ~ 12)
	Puzzle	Tact	BL	10.5(9 ~ 12)
			T	4.0(0 ~ 8)
		VS/P	BL	36.5(34 ~ 39)
			T	3.0(2 ~ 4)
A	Book	Tact	BL	1.0(0 ~ 2)
			T	3.0(1 ~ 6)
		VS/P	BL	30.0(24 ~ 36)
			T	15.0(14 ~ 16)
	Puzzle	Tact	BL	1.0(1)
			T	0(0)
		VS/P	BL	28.0(28)
			T	9.25(3 ~ 14)
S	Book	Tact	BL	0(0)
			T	7.7(0 ~ 21)
		VS/P	BL	38.0(38)
			T	7.7(2 ~ 14)
	Puzzle	Tact	BL	4.0(0 ~ 8)
			T	1.0(0 ~ 2)
		VS/P	BL	29.5(28 ~ 31)
			T	3.0(2 ~ 4)

During baseline probes for playing with puzzles, Student A had 28 intervals out of 60 during which she emitted VS/P. During baseline probes for looking at books, she had 24 and 36 intervals during which she emitted VS/P. After one baseline session for playing with puzzles, Student A

received twenty sessions of rapid echoic tact treatment and following every fifth session she received a return-to-baseline probe. Subsequent probes showed that Student A's number of intervals with VS/P were significantly lower during treatment and the data were: 6, 14, 14 and 3. Student A received 15 sessions of rapid echoic tact treatment for looking at books after 2 sessions of baseline were conducted. She received a return-to-baseline probe following the fifth, tenth and fifteenth treatment sessions and the numbers of intervals with VS/P were 15, 16 and 14. Student A emitted 1 tact during the 5-minute playing with puzzles baseline probe. She emitted the following numbers of tacts during the subsequent probes described above: 0, 0, 0 and 0. Student A emitted 0 and 2 tacts during the two 5-minute looking at books baseline probes. She emitted the following numbers of tacts during the subsequent treatment probes described above: 2, 6, and 1.

During baseline probes for looking at books, Student S had 38 intervals out of 60 during which she emitted VS/P. During baseline probes for playing with puzzles, she had 28 and 31 intervals during which she emitted VS/P. After one baseline session for looking at books, Student S received fifteen sessions of rapid echoic tact treatment and following every fifth session she received a return-to-baseline probe. Subsequent probes showed that Student S's number of intervals with VS/P were significantly lower during treatment and the data were: 7, 14 and 2. Student S emitted 0 tacts during the 5-minute looking at books baseline probe. She emitted the following numbers of tacts during the subsequent probes described above: 2, 0 and 21. Student S received 10 sessions of rapid echoic tact treatment for puzzle play after 2 sessions of baseline were conducted. She received a return-to-baseline probe following the fifth and the tenth treatment sessions and the number of intervals with VS/ P was 4 and 2. Student S emitted 0 and 8 tacts during the two 5-minute playing with puzzles baseline probes. She emitted the following numbers of tacts during the subsequent two treatment probes described above: 0, and 2.



## IV. Discussion

The purpose of the current study was to test the effects of a rapid echoic tact procedure on the emission of palilalia, vocal stereotypy and tacts by four preschoolers with autism. Each of the participants were chosen because they emitted high rates of palilalia (P) and vocal stereotypy (VS) across instructional settings, structured play settings and free play settings in school. The parents of all four participants also reported that they emitted high rates of P and VS at home across activities. All participants looked at books and put puzzles together in one to one and small group settings with little to no prompting at the onset of the study, but P and/or VS occurred as well during these activities.

Prior to the study, during group activities the emission of vocal stereotypy and palilalia by the participants was often disruptive to other students in the classroom; occasioning students to look up from their activities and/or “stare” at the participants. Also, while the participants were engaged in P or VS, it was difficult for teachers or peers to gain their attention if their attention was required. Therefore, decreasing P and VS was an educational goal for all participants.

The rapid echoic tact procedure was effective in decreasing P and VS for all participants across book and puzzle activities. The multiple baseline design across activities showed that there was a functional relation between the procedure and these target behaviors when certain materials or stimuli were present (books and puzzles.) These findings are consistent with the findings of Karmali et al. (2005), in that providing echoic tact prompts to students decreased their emission of palilalia. We have found that vocal stereotypy can also be decreased using echoic tact prompts, and therefore vocal stereotypy may serve a similar function to palilalia.

Greer et al. (1985) and Sundberg, Michael, Partington, and Sundberg (1996) have suggested that palilalia and stereotypy may serve an automatic reinforcement function for individuals. The participants were very likely to emit P and/or VS during book and puzzle activities in school prior to the study. If we are to assume that P and VS are automatically reinforcing, then

the decrease of these behaviors can be attributed to either the decrease in reinforcement value, punishment or competing reinforcers. The participants were required to emit tacts rapidly while they manipulated books or puzzles and it functioned as extinction of sensory stimulation. It is likely that echoic tacts in the presence of books and puzzles, which were followed by teacher approval, acquired a reinforcement function greater than the automatic reinforcement of palilalia or vocal stereotypy. In Ahearn et al. (2007)'s and in Karmali et al. (2005)'s study, the participants were required to emit vocal responses, which resulted in interruption of activities the participants were engaged in. In the present study, the target items for tacts were in the books or puzzles, and thus the treatment was tightly associated with the activity itself.

Hugh-Pennie (2006) found that any change in environmental conditions immediately following the emission of vocal stereotypy or palilalia may serve to decrease these behaviors. Therefore, environmental changes such as the addition or removal of music or the addition or removal of voices may function to punish P and VS. It is possible that the rapid echoic tact procedure functioned as consequences for P and VS which served to decrease their occurrences.

The results of the present study indicated functional relations between the treatment and decrease in VS and P, however, we should notice that the vocal stereotypy and/or palilalia still maintained to a noticeable degree after they received the treatment sessions, especially with Participant K and Participant E. These results indicated some possibilities that the vocal stereotypy might be also reinforced by other socially mediated consequences and automatic reinforcement was not the only source for maintaining the vocal stereotypy. Therefore, social contingencies as maintaining variables should have been excluded with a functional analysis prior to an implementation of echoic tact procedure. Omission of the functional analysis for the purpose is one of limitations of the study. Other limitations of this study included lack of data points with which would indicate more stable level of responding during the baseline conditions and lack of post-treatment and generalization probes. Combining baselines across participants as well as across activities would have provided a more powerful research design which

Using a Rapid Echoic Tact Procedure to Reduce Vocal  
Stereotypy and Palilalia and Increase Tacts

would yield more systematic information about relations among the examined variables.

Although, the rapid tact procedure was associated with decrease in stereotypy and palilalia in general, there was no clear increase in tacts during puzzle play across all of the participants. Lack of variety of stimuli presented on the puzzle pieces might attributed to this low level of appropriate tacts during the puzzle play. A systematic experimentation needed to identify variables which affect increase in appropriate vocal language for the future studies.

Hart and Risley (1995) found that early childhood exposure to language is a predictor of later language capabilities. For the participants in this study, increasing language experiences in the presence of particular materials and activities served to decrease inappropriate “vocalizations” and “language” in some cases, increase vocabulary and correct language usage.

## References

- Ahearn, W. H., Clark, K. M., MacDonald, R. F., & Chung, B. I. (2007). Assessing and treating vocal stereotypy in children with autism. *Journal of Applied Behavior Analysis, 40*, 263-275.
- Ahrens, E. N., Lerman, D. C., Kodak, T., Worsdell, A. S., & Keegan, C. (2011). Further evaluation of response interruption and redirection as treatment for stereotypy. *Journal of Applied Behavior Analysis, 44*, 95-108.
- American Psychiatric Association (2013). *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.). Washington, DC: Author.
- Dickman, S. E., Bright, C. N., Montgomery, D. H., & Miguel, C. F. (2012). The effects of response interruption and redirection (RIRD) and differential reinforcement on vocal stereotypy and appropriate vocalization. *Behavioral Interventions, 27*, 185-192.
- Durand, V. M., & Carr, E. G. (1987). Social influence on "self-stimulatory" behavior: Analysis and treatment application. *Journal of Applied Behavior Analysis, 20*, 119-132.
- Durand, V. M., & Crimmins, D. B. (1987). Assessment and treatment of psychotic speech in an autistic child. *Journal of Autism and Developmental Disorders, 17*, 17-28.
- Goh, H. L., Iwata, B. A., Shore, b. A., DeLeon, I. G., Lerman, D. C., Ulrich, S. M., et al. (1995). An analysis of the reinforcing properties of hand mouthing. *Journal of Applied Behavior Analysis, 28*, 269-283.
- Greer, R. D., Saxe, C. D., Becker, B. J., & Mirabella, R. F. (1985). Conditioning histories and setting stimuli controlling engagement in stereotypy or toy play. *Analysis and Intervention in Developmental Disabilities, 5*, 269-284.
- Ingham, P., & Greer, R. D. (1992). Changes in student and teacher responses in observed and generalized settings as a function of supervisor. *Journal of Applied Behavior Analysis, 25*, 153-164.
- Iwata, B. A., Dorsey, M. F., Slifer, K. J., Bauman, K. E., & Richman, G. S. (1982/1994). Toward a functional analysis of self-injury. *Journal of*

Using a Rapid Echoic Tact Procedure to Reduce Vocal  
Stereotypy and Palilalia and Increase Tacts

*Applied Behavior Analysis, 27*, 197-209.

- Iwata, B. A., Pace, G. M., Cowdery, G. E., & Miltenberger, R. G. (1994). What makes extinction work: An analysis of procedural form and function. *Journal of Applied Behavior Analysis, 27*, 131-144.
- Karmali, I., Greer, R. D., Nuzzolo-Gomez, R., Ross, D. E., & Rivera-Valdes, C. (2005). Reducing palilalia by presenting tact corrections to young children with autism. *The Analysis of Verbal Behavior, 21*, 145-153.
- Kennedy, C. H., Meyer, K. A., Knowles, T., & Shukla, S. (2000). Analyzing the multiple functions of stereotypical behavior for students with autism: Implications for assessment and treatment. *Journal of Applied Behavior Analysis, 33*, 559-571.
- Kim, K. M. (2012). The effects of swimming program on stereotyped behaviors in children with high-functional autism. *Journal of Emotional & Behavioral Disorders, 16*, 235-253.
- Mace, F. C., & Lalli, J. S. (1991). Linking descriptive and experimental analysis in the treatment of bizarre speech. *Journal of Applied Behavior Analysis, 24*, 553-562.
- Miguel, C. F., Clark, K., Tereshko, L., & Ahearn, W. H. (2009). The effects of response interruption and redirection and sertraline on vocal stereotypy. *Journal of Applied Behavior Analysis, 42*, 883-888.
- Paik, U. H., & Kim S. H. (2002). The effects of differential reinforcement and response cost procedures on stereotypic behavior in children with mental retardation. *Journal of Emotional & Behavioral Disorders, 16*, 235-253.
- Pareira-Delgado, J., & Oblank, M. (2006). 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 Intensive Behavioral Intervention, 4*, 392-410.
- Piazza, C. C., Adelinis, J. D., Hanley, G. P., Goh, H. L., & Delia, M. D. (2000). An evaluation of the effects of matched stimuli on behaviors maintained by automatic reinforcement. *Journal of Applied Behavior Analysis, 33*, 13-27.
- 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 settings. *Journal of Early Intensive Behavioral*

- Interventions*, 3, 103-119.
- Rapp, J. T. (2006). Toward an empirical method for identifying matched stimulation for automatically reinforced behavior: A preliminary investigation. *Journal of Applied Behavior Analysis*, 39, 137-140.
- Rapp, J. T., & Vollmer, T. R. (2005). Stereotypy. I. A review of behavioral assessment and treatment. *Research in Developmental Disabilities*, 26, 527-547.
- Reed, F. D., Hirst, J. M., & Hyman, S. R. (2012). Assessment and treatment of stereotypic behavior in children with autism and other developmental disabilities: A thirty year review. *Research in Autism Spectrum Disorders*, 6, 422-430.
- Rehfeldt, R. A., & Chambers, M. R. (2003). Functional analysis and treatment of verbal perseverations displayed by an adult with autism. *Journal of Applied Behavior Analysis*, 36, 259-261.
- Rincover, A. (1978). Sensory extinction: A procedure for eliminating self-stimulatory behavior in developmentally disabled children. *Journal of Abnormal Psychology*, 6, 299-310.
- Risley, T. R., Hart, B., & Bloom, L. (1995). *Meaningful differences in everyday experience of young American children*. Baltimore: Paul H. Brookes.
- Roantree, C. F., & Kennedy, C. H. (2006). A paradoxical effect of precession attention on stereotypy: Antecedent attention as an establishing, not an abolishing operation. *Journal of Applied Behavior analysis*, 39, 381-384.
- Ross, D. E. & Greer, R. D. (2003). Generalized imitation and the mand: inducing first instances of speech in young children with autism. *Research in Developmental Disabilities*, 24, 58-74.
- Shabani, D. B., Wilder, D. A., & Flood, W. A. (2001). Reducing stereotyping behavior through discrimination training, differential reinforcement of other behavior, and self-monitoring. *Behavioral Interventions*, 16, 279-286.
- Skinner, B. F. (1957). *Verbal Behavior*. Cambridge, Mass: B. F. Skinner Foundation.
- Sundberg, M. L., Michael, J., Partington, J. W., & Sundberg, C. A. (1996). The role of automatic reinforcement in early language acquisition. *The*

Using a Rapid Echoic Tact Procedure to Reduce Vocal  
Stereotypy and Palilalia and Increase Tacts

*Analysis of Verbal Behavior*, 13, 21-37.

Taylor, B. A., Hoch, H., & Weissman, M. (2005). The analysis and treatment of vocal stereotypy in a child with autism. *Behavioral Interventions*, 20, 239-253.

Tsouri, I., & Greer, R. D. (2003). Inducing vocal verbal behavior through rapid motor imitation training in young children with language delays. *Journal of Behavioral Education*, 12, 185-206.

Woods, T. S. (1984). Generality in the verbal tacting of autistic children as a function of "naturalness" in antecedent control. *Journal of Behavioral Therapy & Experimental Psychiatry*, 15(1), 27-32.

【논문 접수: 2014. 4. 28. / 수정본 접수: 2014. 6. 3. / 게재 승인: 2014. 6. 13.】

## 국문 초록

### 고속으로 제시되는 의음적 언어촉구(echoic prompt)가 자폐성 아동이 보이는 음성상동행동 및 지연된 동어반복행동 (palilalia)의 감소와 택트 (tact)의 증가에 보이는 효과

박혜숙 · Jeanne Marie Speckman

본 연구의 목적은 만 4세에서 5세 사이의 4명의 자폐스펙트럼 장애 유아동을 대상으로 고속으로 제시되는 의음적 언어촉구(echoic prompt)를 통한 택트(tact) 훈련이 음성상동행동 및 지연된 동어반복증(palilalia)의 감소와 적절한 택트의 증가에 보이는 효과 검증을 하는 것이다. 연구설계는 대상자 내 활동 간중다 기초선 설계를 사용하였다. 본 연구는 첫째, 고속으로 제시되는 의음적 언어촉구가 프로브 회기 중 보이는 음성상동이나 지연된 동어반복증의 감소에 효과적인지, 둘째 위의 절차가 적절한 택트의 수를 증가하는데 효과적인지를 검증하였다. 종속변인은 (ㄱ) 5분 동안의 프로브 회기 중 음성상동이나 지연된 동어반복 증을 보이는 5초 간격 수와, (ㄴ) 5분 동안의 프로브회기 중 보이는 적절한 택트(tact)의 수였다. 독립변인은 아동이 책을 보거나 퍼즐을 하는 동안 아동이 책 속의 그림이나 퍼즐 조각의 그림에 대한 택트를 유발시키기 위해 고속으로 제시되는 의음적 언어촉구였다. 본 실험의 결과에 의하면 고속으로 제시되는 의음적 언어 촉구가 아동들이 보이는 음성상동행동을 감소하는데 기능적으로 관련이 되었고, 네 명의 아동 모두 책을 볼 때 택트의 증가를 보였다. 본 연구의 시사점으로는 언어적 촉구 절차의 한 유형으로서 의음적 언어촉구의 유용성이 증명되었고, 아동들의 주요 특정 놀이 활동 중에 나타난 상동행동을 목표로 함으로써, 자유놀이 상황이나 비 구조화 된 상황에 나타난 음성 상동행동에 집중했던 관련 연구 분야의 기존 문헌을 확장하는데 기여 하였으며, 음성상동을 대체할 적절한 언어행동의 증가시켰다는 것이다.

**핵심 단어:** 음성상동행동, 지연된 동어반복증(palilalia), 고속 의음적 언어 촉구.