4-23-2017

Increasing Vocalization and Echoic Stimulus Control

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Abstract

Deficits in verbal behavior can be harmful to children's growth and development of other crucial skills and can also increase problem behavior (Eldevik, Eikeseth, Jahr, & Smith, 2006; Charman, Magiati, & Howlin, 2007; Cividini-Motta, 2014). Results from previous research show that vocal imitation training, stimulus-stimulus pairing, rapid motor imitation, and mand-model approaches have been successful in teaching echoic behavior. However, there is little evidence to show that these methods are successful for children who are making little to no verbal responses. (Carroll & Klatts, 2008; Bennett & Yoon, 2000; Greer & Ross, 2003; & Hawkins & Schuster, 2007). The purpose of this project is to increase vocalizations and establish echoic stimulus control in three young boys who have displayed deficits in the acquisition of verbal behavior. In the first two phases, a reinforcement contingency will be implemented on appropriate and variable vocalizations. In the last phase, a reinforcement contingency will be implemented on correct echoic responses. It is expected that the implementation of this procedure will increase the vocalizations and establish echoic stimulus control in each of the participants.

Key *words:* autism, vocalizations, echoic stimulus control

Increasing Vocalizations and Echoic Stimulus Control

Because we use verbal behavior as our main form of communication with those around us, it is crucial in the development of children with developmental disabilities. Children with autism often have deficits in acquiring verbal behavior. They often do not request items, label objects, nor imitate other speakers. Studies have shown that children with higher language functioning make more progress with other skill development (Eldevik, Eikeseth, Jahr, & Smith, 2006; Charman, Magiati, & Howlin, 2007). Cividini-Motta (2014, p. 3) states that "communication deficits can be associated with the development of problem behavior". Increasing vocalizations and establishing echoic stimulus control can lead to decreases in problem behavior as well as increases in functional communication.

Typical Approaches

Vocal imitation is critical for language development for children with developmental disabilities. New words can easily be acquired from imitating other speakers (Cividini-Motta, 2014). Without an echoic repertoire, it can be challenging to teach a child to communicate verbally. When a child is not displaying an echoic repertoire, echoic procedures are put in place to gain echoic stimulus control. There are four common approaches to these echoic procedures. These include vocal imitation training, stimulus-stimulus pairing, rapid motor imitation, and mand-model (Civdini-Motta, 2014).

Vocal imitation training consists of providing a reinforcer contingent on the imitation of the target sounds given by the model. Carroll and Klatt's (2008) study shows that direct reinforcement for vocal imitation has increased echoic behavior in some cases.

Stimulus-stimulus pairing involves pairing an unconditioned or conditioned reinforcer with target sounds. The purpose is to make the target sounds automatically reinforcing in the

absence of a listener. Studies have shown mixed results with this particular procedure. Yoon and Bennett (2000) did a study which showed stimulus-stimulus pairing was more effective in preschoolers with severe language and communication deficits than vocal imitation training. However, Normand & Knoll (2006) did a study accessing the failures associated with stimulus-stimulus pairing and found that the procedure gave ambiguous results in increasing echoic behavior in three boys with autism.

Rapid Motor Imitation is a procedure that requires a strong imitative repertoire. The procedure calls for reinforcement contingent on correct imitation of a verbal target after several correct physical imitative responses (Shane, 2016). Recent research by Ross and Greer (2003) has shown that rapid-motor imitation procedure has promising results in cases of children with the imitative repertoire prerequisite.

Mand-model trains echoics in an 'incidental teaching' fashion. Situations are contrived so that the child must mand, or request, for an item before receiving the desired item. Receiving the desired object is the reinforcement contingent on appropriately manding (Shane, 2016). This approach has proven effective for most participants, usually those with budding echoic stimulus control already (Hawkins & Schuster, 2007).

Goal of Intervention

The purpose of this procedure is to establish echoic stimulus control to lower functioning children with little to no vocalization or echoic behavior in their repertoire. Gaining an echoic repertoire can increase independence and reduce problem behavior (Civdini-Motta, 2004). In order to do this, we borrowed from traditional approaches and adapted it into a molecular approach. The procedure includes 5 phases, 1-3.2 (see appendix A). The procedure begins with increasing any appropriate vocalization through direct reinforcement in a free operant setting.

Dominant sounds will then be put on extinction in order to increase sound variability. Dominant sounds from previous phases will then be used as target sounds to gain echoic stimulus control. Children without many vocalizations in their repertoire will benefit from this procedure by gaining the ability to make more verbal sounds in their everyday life along with the ability to imitate fluent speakers to learn more advanced verbal operants.

Methods

Participants

Participants were chosen from the early intensive behavioral intervention classroom at West Campus Kalamazoo RESA building in Kalamazoo, Michigan. Three participants were selected to partake in the intervention. Inclusion of this study required a low rate of vocalizations and lack of echoic stimulus control. Initial observations were made of all the children in the classroom. Those with high vocalization frequencies and echoic stimulus control in their repertoires were excluded. Those with vocal-verbal behavior curriculum already in place were also excluded. This exclusion was based on the fact that our procedure called for children with low and non-emerging vocalization and echoic skills. After initial observations, three children were selected to complete a pretest, the Early Echoic Skills Assessment (EESA). A low score on the test showed poor echoic stimulus control and warranted inclusion in the study. All participants exposed to the pretest were included in the study. Two participants, Eli and Cameron, were three-year-old males while Robert was a four-year-old male. Robert and Cameron were given an autism diagnosis while Eli was diagnosed with a speech delay.

Setting and Materials

The study was conducted in the early intensive behavioral intervention classroom at West Campus Kalamazoo RESA building in Kalamazoo, Michigan. The sessions took place in the

child's work environment. During sessions, the area was completely cleared of any materials that did not belong to the procedure.

Materials utilized during the session included: a video camera (when available), a table, two chairs, a timer, and the reinforcer. The reinforcers were highly-preferred edibles determined by a formal preference assessment. In addition to these materials, one to two researchers were present. One researcher was responsible for delivering the reinforcer and collecting data. The other researcher, when present, was responsible for collecting data to ensure interobserver agreement (IOA) and for recording treatment integrity.

Design

An ABC single-subject design was used to measure the effects of the differential reinforcement and shaping of vocalization and echoic stimulus control.

Procedure

The procedure followed the same general phases and steps for each participant. Sessions were generally ran five times a week for each participant.

Independent variable. The independent variable was the delivery of highly preferred edibles contingent on vocalizations and echoic stimulus control.

Dependent variable. For the first two phases, the dependent variable was the frequency of appropriate vocalizations. Appropriate vocalizations were operationally defined as speech sounds such as "mmm", "da", "ba", etcetera. Inappropriate vocalizations, which were not reinforced, were operationally defined as crying, whining, screaming, or vocal stereotypy sounds. For phases 3-3.2, the dependent variable was the frequency of correct echoics.

Baseline. Baseline data was taken before any phases were implemented. Observations of each participant were done one to three times to record any sounds being emitted before the intervention took place.

Phase I (Free-operant reinforcement of all sounds). The first phase was implemented to increase any appropriate vocalization. To implement this phase, the booth was first cleared of any unnecessary items. This was done so that the participant could not mand for, or otherwise be distracted by, these extra objects. Next, a timer was set for five to ten minutes. The participant and researchers sat across from each other and the timer was started. A highly-preferred edible reinforcer was delivered contingent on any appropriate vocalization emitted from the participant. Shaping was required in some cases with reinforcing prerequisite skills to vocal behavior such as the participant opening his mouth. If any response other than appropriate vocalization was made, the researchers ignored the behavior. Frequency data was collected to record the amount of appropriate vocalizations made within the five to ten-minute session (see Appendix B). Phase change criteria was set to emitting three or more responses per minute for three consecutive sessions.

Phase II (Free-operant reinforcement of low-rate sounds). The second phase was implemented once participants met the phase change criteria of phase I. The purpose of this second phase was to increase variability of vocalizations. In order to do this, dominant sounds were put on extinction and reinforcement was contingent on novel sounds. When novel sounds were emitted, a highly-preferred edible reinforcer was delivered immediately. If a dominant sound was emitted or any other response was made, then the behavior was ignored. Data was collected in the same manner as phase one (see Appendix B). Phase change criteria was set to

exhibiting three or more high rate sounds (occurring at more than three responses per minute) throughout phase II.

Phase III (3-3.2) (Echoic training). The third phase was implemented to gain echoic stimulus control. Dominant sounds from phases one and two were chosen as target sounds. Once a model was given, the child's echoic behavior was reinforced if they emitted a matching sound within three to five seconds. When consistent echoic responses were made to the first target sound, another dominant sound was added as a model. Eventually, novel sounds were added as models as well. In the event of an incorrect response or no response, a prompting hierarchy was followed. This prompting included repeating the target sound up to three times and ending the trial in a neutral 'good'. Data was collected on the number of correct trials per session (see appendix E).

Interobserver Agreement

Interobserver agreement was collected during 31.08% of sessions during phase I and was 100%. IOA was collected during 25% of phase II and phase III sessions and was 100%.

Treatment Integrity

Treatment integrity was collected during all phases (see Appendices C, D, F, G, and H). During Phase I, treatment integrity was collected during 9.46% of the sessions and was 100%. Treatment integrity was collected during 25% of sessions during Phase II and was 100%. During Phase III, treatment integrity was collected during 66.67% of sessions and was 100%.

Results

The purpose of this procedure was to increase vocalization and establish echoic stimulus control with children who had little of each in their repertoire. This procedure was significant to each participant because studies have shown that children with more advanced verbal operants

tend to exhibit less problem behavior and show increased functional communication and progress with other developmental skills (Cividini-Motta, 2014; Charman, Magiati, & Howlin, 2007). The intervention yielded mixed results between the three participants.

Eli

The procedure with Eli produced an increase in appropriate vocalizations after shaping. During baseline, observations of him were done with no demands placed. These observations showed no vocalizations other than infrequent, closed mouth "mmm"'s occurring around 0.61 times per minute. A baseline for echoics was also done using the EESA. Eli was told, "Say (one of the speech sounds in group one on the EESA)". Repeating the correct sound within three to five seconds was considered a correct response. Repeating an incorrect sound or repeating the correct sound past the acceptable time limit was considered an incorrect response. Out of 25 target sounds, Eli made zero correct responses (see Appendix I). Phase I of the procedure was then implemented. Appendix J shows Eli's performance during Phase I sessions. This phase began with low rates and low variability of vocalizations being emitted by Eli. The only appropriate vocalization made was the closed-mouth "mmm" sound with varying low rates. However, during session 27 and after reinforcing open mouth movements for shaping, the vocalization of the "mmm" sound was made with an open mouth (see Appendix J). The rate of this sound and mouth movement combination increased, peaking at 4 sounds per minute during session 29 (see Appendix J).

Robert

The procedure did not yield an increase in vocalizations with Robert. During baseline, observations of Robert's sounds were done without placing any demands. He had low rates of vocalizations (around one sound per minute) with a fairly high variability of sounds. However,

many of these sounds were classified as vocal stereotypy. The EESA was also conducted with Robert and out of the 25 possible target sounds, he made zero correct responses (see Appendix K). Phase I of the intervention was then implemented. Appendix L shows his performance during Phase I sessions. Throughout this phase, Robert had emitted the speech sounds “ah”, “ba”, “da”, “eh”, “mmm”, “ooh”, and “uh”. The rate of the “ah” response peaked during session 17 with 0.6 responses per minute, but then decreased. The rate of “ba” and “da” peaked at 0.2 responses per minute during session two, but then consistently decreased. During session 22, the “eh” response occurred at 0.25 times per minute, but then decreased as well. During sessions four and nine, the rate of “mmm” peaked at 0.1 responses per minute, and then decreased to zero responses per minute. The rate of the “ooh” response peaked during session four with four responses per minute. However, that response also steadily decreased. The “uh” response peaked at 0.57 responses per minute during session 25 (see Appendix L). Phase change criteria was never met, and only Phase I was ran with this participant due to a lack of increase in vocalizations.

Cameron

The procedure with Cameron produced an increase in appropriate vocalizations, but did not increase echoic stimulus control. During baseline, Cameron showed higher frequency of sounds emitted than the other two participants. However, when the EESA was administered with him, he also made zero correct responses (see appendix M). Phase I of the intervention was then implemented. During this phase, Cameron emitted the sounds “ah”, “ay”, “ba”, “be”, “da”, “eee”, “eh”, “me”, “mmm”, “nana”, “nomnom”, “oh”, “uh oh”, and “tee”. The rates of the sounds “ah”, “ay”, and “oh” increased during this phase. The “ah” response peaked during session 11 at 0.57 responses per minute. During session 15, the “ay” response peaked at 0.43

responses per minute. The “oh” response peaked during session 14 with 4.86 responses per minute. Once phase change criteria (three sessions with three or more responses per minute) was met, phase II was implemented. During this phase, the “oh” response was put on extinction to increase variability of sounds emitted. During this phase the sounds “ah”, “ay”, “be”, “da”, “eee”, “eh”, “ha”, “heh”, “mmm”, “oh”, and “tee” were emitted. The sounds “ah”, “eh”, and “mmm” increased while the “oh” sound decreased. The “ah” response peaked at session 31 with 1.71 responses per minute. The “eh” response peaked during session 18 with 2.86 responses per minute. During session 32, the “mmm” response peaked with 8.57 responses per minute. During extinction, the “oh” response showed an extinction burst during session 18 with 7.29 responses per minute. After that session, the response steadily decreased. After 27 sessions of implementation of this procedure, the EESA was conducted with Cameron again. During this probing, Cameron made three correct responses which increased his score from 0% to 12%. After this probing, Cameron was moved along to phase III. During this phase, echoic stimulus control did not increase. Appendices N and O show his performance during all three phases.

Discussion

While the procedure was successful with increasing vocalizations with two participants, it was not successful with this for the third participant. The intervention was also not successful in increasing consistent echoic stimulus control for any of the participants. The increase in vocalizations for two of the participants was due to the reinforcement contingency. Delivering highly preferred edibles immediately after the emission of an appropriate sound increased the frequency of appropriate sounds. The inconsistent echoic control exhibited in one participant could have been caused by the averseness of phase III.

Limitations and Future Research

There were various limitations to this intervention including early termination, poor attendance, and high rates of vocal stereotypy. Due to Eli moving onto a less intensive classroom, he was removed from the study before higher rates of vocalization could be observed. Robert had poor attendance and would often miss sessions. Due to this, the reinforcement contingency did not yield the results it may have if better attendance occurred. Robert also engaged in high rates of stereotypy which were not reinforced. This led to little reinforcement of appropriate sound during sessions since the majority of sounds being emitted were inappropriate. It would be ideal to run this procedure for a longer time period especially with children with lower functionality. With more time and more sessions, the reinforcement contingency could have yielded higher, increased rates of vocalization. Another change that could be beneficial for replications of this procedure would be to implement a phase to decrease vocal stereotypy rates for participants who this issue may apply to. If vocal stereotypy is put on extinction during the procedure and by all tutors and support coordinators working with the child, then higher rates of reinforced, appropriate sounds may be observed.

The results of this intervention contribute to other research done on increasing vocalization and echoic stimulus control. This study especially extended the research on increasing echoic stimulus control with children who made low rates of vocalizations initially. Very little research has been done with this particular population, and it would be interesting to see more research implemented in the future for longer periods of time.

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Appendix A

Increasing Vocalizations and Establishing Echoic Stimulus Control (Joe's Procedure)
PROCEDURE SHEET

Pupil:		**Teacher:**	**DM MN**
		Procedure Writer:	**JS/AW**
		Date Written:	**1/26/2016**
IEPC Goal:			
Objective:	**P1 – increase vocalization rates P2 – increase vocal variability P3 – establish echoic stimulus control**		
Materials:	**Timer, table, chairs, preferred reinforcers (edible, tangible, video, etc.)**		
Data collection:	**Record the number of vocalizations made by the student during each session for Phase 1 and 2, and accuracy of echoic responses in Phase 3**		

Phase	**Tutor Presentation/Preparation**	**Correct Response**		**Incorrect Response**		**Criteria for Change**
		Pupil Behavior	**Tutor Behavior**	**Pupil Behavior**	**Tutor Behavior**	
1	**The tutor sits facing the student at the table and starts the timer (sessions typically last five minutes, but ask your support coordinator). During the session the tutor should have powerful reinforcers ready to deliver quickly any time the child makes an**	**Student emits any appropriate sound (ask SC for help determining appropriate vs inappropriate sounds)**	**Immediately say "Good job!" and provide access to the most preferred 15einforce for 10-15 seconds.**	**N/A The child cannot make an incorrect response in this phase, because there are no SDs. Just wait for sounds and**	**N/A The tutor should wait for the child to make any sound. There is no prompting on this phase!**	**3 appropriate vocalizations per minute (average) for 3 consecutive sessions.**

	appropriate vocalization. Any sounds the child makes should be reinforced in this phase (except for crying, screaming, etc.). The tutor simply sits in front of the child and waits for them to make a sound. The tutor provides no SDs and does no prompting. They are simply there to reinforce any sounds the child happens to make. The tutor should record the number of vocalizations that the child makes throughout the session, and indicate what sounds were made. End the session when the timer goes off.			**reinforce them.**		
2	**Same as phase 1, except the child's Support Coordinator will tell you which sounds are now on extinction and will no longer be reinforced. Any rare or novel sounds should be reinforced whenever they occur. The sounds that are on**	**Student emits any appropriate sound that is not being extinguished.**	**Immediately say "Good job!" and provide access to the most preferred 16einforce for 10-15 seconds.**	**N/A** **The child cannot make an incorrect response in this phase, because there are no SDs. Just wait for sounds**	**N/A** **The tutor should wait for the child to make any sound. There is no prompting on this phase!**	**A total of three high-rate sounds (>3 responses per minute) have been observed throughout phase 2.**

	extinction should be ignored when they occur. **As new sounds become dominant, check in with the Support Coordinator to determine whether they should also be put on extinction.**			**and reinforce them. Do not reinforce sounds that are being extinguished.**		
3	***Echoic phase* – the work space is set up in the same manner as previous phases. The tutor provides free access to a 17einforce at the beginning of the session. After 10-15 seconds, silently remove the 17einforce, and wait an additional 10-15 seconds. Then say the target sound (ask the Support Coordinator which sound to use) in a clear, loud voice. Repeat this process as many times as time permits (session should last 5 minutes). There is only one target sound in these sessions (train one**	**The student emits the target sound for the first time following the model (even if it is very delayed or the child made other sounds in between)**	**Immediately say "Good job!" and provide access to the most preferred 17einforce for 10-15 seconds.**	**The child could:** **3) not respond** **B) make a non-matching sound** **C) respond before the model**	**The tutor should:** **3) wait and do nothing** **B) wait and do nothing** **C) wait and do nothing**	**80% or greater correct immediate (within 2 seconds of the model) echoic responses for 3 consecutive sessions**

	sound in isolation).					
3.1	***Echoic phase* – the work space is set up in the same manner as previous phases. The tutor provides free access to a 18einforce at the beginning of the session. After 10-15 seconds, silently remove the 18einforce, and wait an additional 10-15 seconds. Then say one of the two target sounds (use the sound from the previous phase, and ask the Support Coordinator which new sound to use) in a clear, loud voice. Repeat this process as many times as time permits (session should last 5 minutes). There are two target sounds in these sessions (one is new).**	**The student emits the target sound for the first time following the model (even if it is very delayed or the child made other sounds in between)**	**Immediately say "Good job!" and provide access to the most preferred 18einforce for 10-15 seconds.**	**The child could:** **3) not respond** **B) make a non-matching sound** **C) respond before the model**	**The tutor should:** **3) wait and do nothing** **B) wait and do nothing** **C) wait and do nothing**	**80% or greater correct immediate (within 2 seconds of the model) echoic responses TO BOTH TARGETS for 3 consecutive sessions**
3.2-?	**Continue to add new target sounds, and continue providing trials for the previously mastered sounds. Ask the**	**Same as above.**	**Same as above.**	**Same as above.**	**Same as above.**	**80% or greater correct immediate (within 2 seconds of the**

	Support Coordinator for a list of which sounds to target. **Generalized echoic testing should be conducted following mastery of each new sound.**					**model) echoic responses TO EACH TARGETS for 3 consecutive sessions**

Appendix B

	Frequency				
Target Sounds	Date & Initials:	Date & Initials:	Date & Initials:	Date & Initials:	Date & Initials:

Appendix C

Increasing Vocalizations and Establishing Echoic Stimulus Control Phase 1 Treatment Integrity

Participant: Date and Time:

Observer: Individual Observed:

Treatment Integrity Checklist:

Objective/Activity	Yes	No	N/A	Notes
Tutor clears booth of all materials				
Tutor sits facing the student at the table				
Tutor sets a timer for 5-10 minutes				
Tutor has powerful reinforce ready to deliver quickly				
Any appropriate sound student makes is reinforced				
Any reinforced sound is recorded and tallied				
Tutor ends session once timer goes off				

Appendix D

Increasing Vocalizations and Establishing Echoic Stimulus Control Phase 2 Treatment Integrity

Participant: Date and Time:

Observer: Individual Observed:

Treatment Integrity Checklist:

Objective/Activity	Yes	No	N/A	Notes
Tutor clears booth of all materials				
Tutor sits facing the student at the table				
Tutor sets a timer for 5-10 minutes				
Tutor has powerful reinforce ready to deliver quickly				
Any novel and appropriate sound student makes is reinforced				
Any dominant sound put on extinction by the support coordinator student makes is ignored				
Any reinforced sound is recorded and tallied				
Tutor ends session once timer goes off				

Appendix E

Name:	**Procedure:**	**Mastery criteria:**
SD:	***Additional sheet:* Sup initials: _____ | PC: _____ PC date: ____/____/____ | WB date: _____/_____/_____**	

Phase: ____ SD Prompt: ____________________

Trial	Target	Data	Correction	Date
1			G P F	
2			G P F	Initials
3			G P F	
4			G P F	WB / MC
5			G P F	N/A
6			G P F	PC?
7			G P F	Y / N
8			G P F	Code:
9			G P F	
10			G P F	
	%:		WB:	MC:

Phase: ____ SD Prompt: ____________________

Trial	Target	Data	Correction	Date
1			G P F	
2			G P F	Initials
3			G P F	
4			G P F	WB / MC
5			G P F	N/A
6			G P F	PC?
7			G P F	Y / N
8			G P F	Code:
9			G P F	
10			G P F	
	%:		WB:	MC:

Phase: ____ SD Prompt: ____________________

Trial	Target	Data	Correction	Date
1			G P F	
2			G P F	Initials
3			G P F	
4			G P F	WB / MC
5			G P F	N/A
6			G P F	PC?
7			G P F	Y / N
8			G P F	Code:
9			G P F	
10			G P F	
	%:		WB:	MC:

Phase: ____ SD Prompt: ____________________

Trial	Target	Data	Correction	Date
1			G P F	
2			G P F	Initials
3			G P F	
4			G P F	WB / MC
5			G P F	N/A
6			G P F	PC?
7			G P F	Y / N
8			G P F	Code:
9			G P F	
10			G P F	
	%:		WB:	MC:

Phase: ____ SD Prompt: ____________________

Trial	Target	Data	Correction	Date
1			G P F	
2			G P F	Initials
3			G P F	
4			G P F	WB / MC
5			G P F	N/A
6			G P F	PC?
7			G P F	Y / N
8			G P F	Code:
9			G P F	
10			G P F	
	%:		WB:	MC:

Phase: ____ SD Prompt: ____________________

Trial	Target	Data	Correction	Date
1			G P F	
2			G P F	Initials
3			G P F	
4			G P F	WB / MC
5			G P F	N/A
6			G P F	PC?
7			G P F	Y / N
8			G P F	Code:
9			G P F	
10			G P F	
	%:		WB:	MC:

Appendix F

Increasing Vocalizations and Establishing Echoic Stimulus Control Phase 3 Treatment Integrity

Participant: Date and Time:

Observer: Individual Observed:

Treatment Integrity Checklist:

Objective/Activity	Yes	No	N/A	Notes
Tutor clears booth of all materials				
Tutor sits facing the student at the table				
Tutor sets a timer for 5-10 minutes				
Tutor has powerful reinforce ready to deliver quickly				
Tutor allows access to the reinforce for 10-15 seconds				
Tutor removes reinforce and waits an additional 10-15 seconds before delivering demand				
Tutor says target sound (determined by the support				

coordinator) in a clear, loud voice				
Tutor repeats the above as many times as time permits				
Tutor reinforces any correct target sounds emitted by the student after the model				
Tutor ignores any incorrect sounds and sounds emitted by the student before the model				
Tutor ends session once timer goes off				

Appendix G

Increasing Vocalizations and Establishing Echoic Stimulus Control Phase 3.1 Treatment Integrity

Participant: Date and Time:

Observer: Individual Observed:

Treatment Integrity Checklist:

Objective/Activity	Yes	No	N/A	Notes
Tutor clears booth of all materials				
Tutor sits facing the student at the table				
Tutor sets a timer for 5-10 minutes				
Tutor has powerful reinforce ready to deliver quickly				
Tutor allows access to the reinforce for 10-15 seconds				
Tutor removes reinforce and waits an additional 10-15 seconds before delivering demand				
Tutor says one of two target sounds				

(sound from previous phase and sound determined by the support coordinator) in a clear, loud voice				
Tutor repeats the above as many times as time permits				
Tutor reinforces any correct target sounds emitted by the student after the model				
Tutor ignores any incorrect sounds and sounds emitted by the student before the model				
Tutor ends session once timer goes off				

Appendix H

Increasing Vocalizations and Establishing Echoic Stimulus Control Phase 3.2 Treatment Integrity

Participant: Date and Time:

Observer: Individual Observed:

Treatment Integrity Checklist:

Objective/Activity	Yes	No	N/A	Notes
Tutor clears booth of all materials				
Tutor sits facing the student at the table				
Tutor sets a timer for 5-10 minutes				
Tutor has powerful reinforce ready to deliver quickly				
Tutor allows access to the reinforce for 10-15 seconds				
Tutor removes reinforce and waits an additional 10-15 seconds before delivering demand				
Tutor says one of many target				

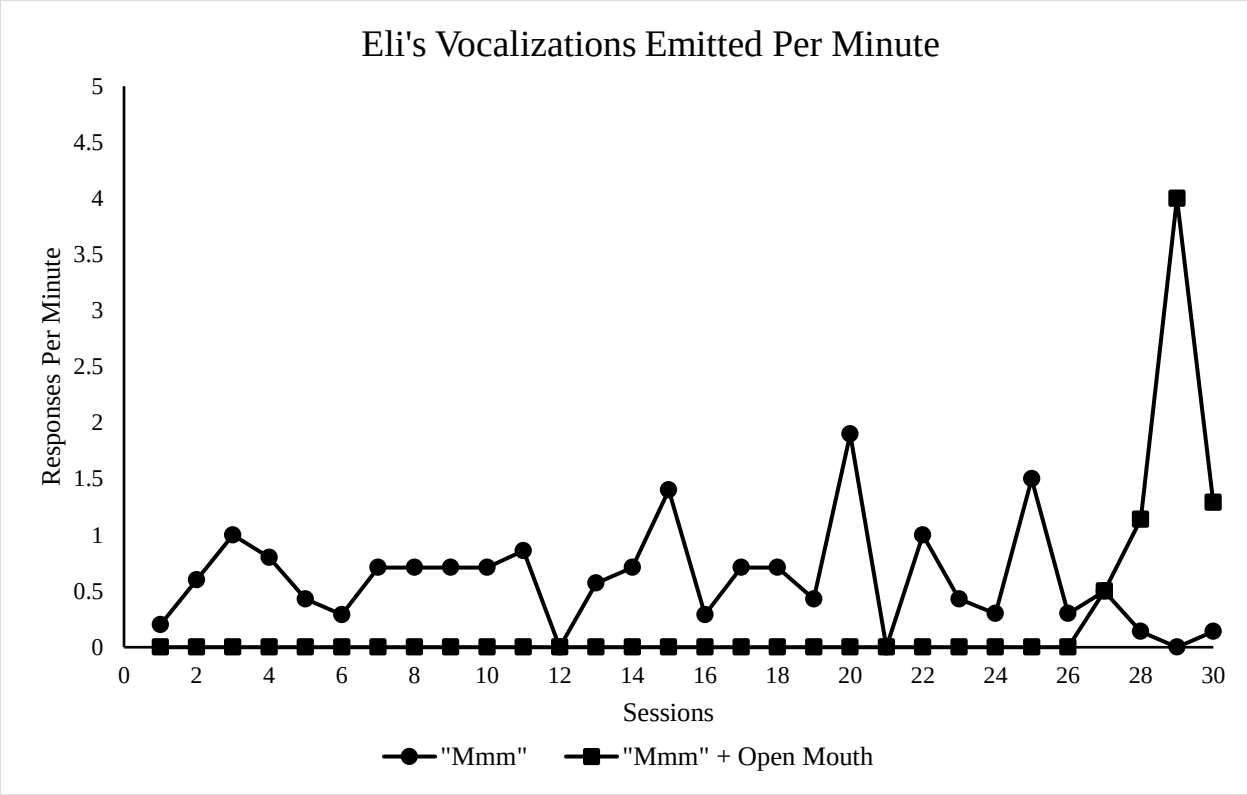
sounds (sounds from previous phase and sounds determined by the support coordinator) in a clear, loud voice				
Tutor repeats the above as many times as time permits				
Tutor reinforces any correct target sounds emitted by the student after the model				
Tutor ignores any incorrect sounds and sounds emitted by the student before the model				
Tutor ends session once timer goes off				

Appendix I

	Number Correct	**Number Possible**	**Percentage Correct**
Pre-test	0	25	0%
Post-test	N/A	N/A	N/A
Follow-up	N/A	N/A	N/A

Table 1A Eli's EESA Results

Appendix J

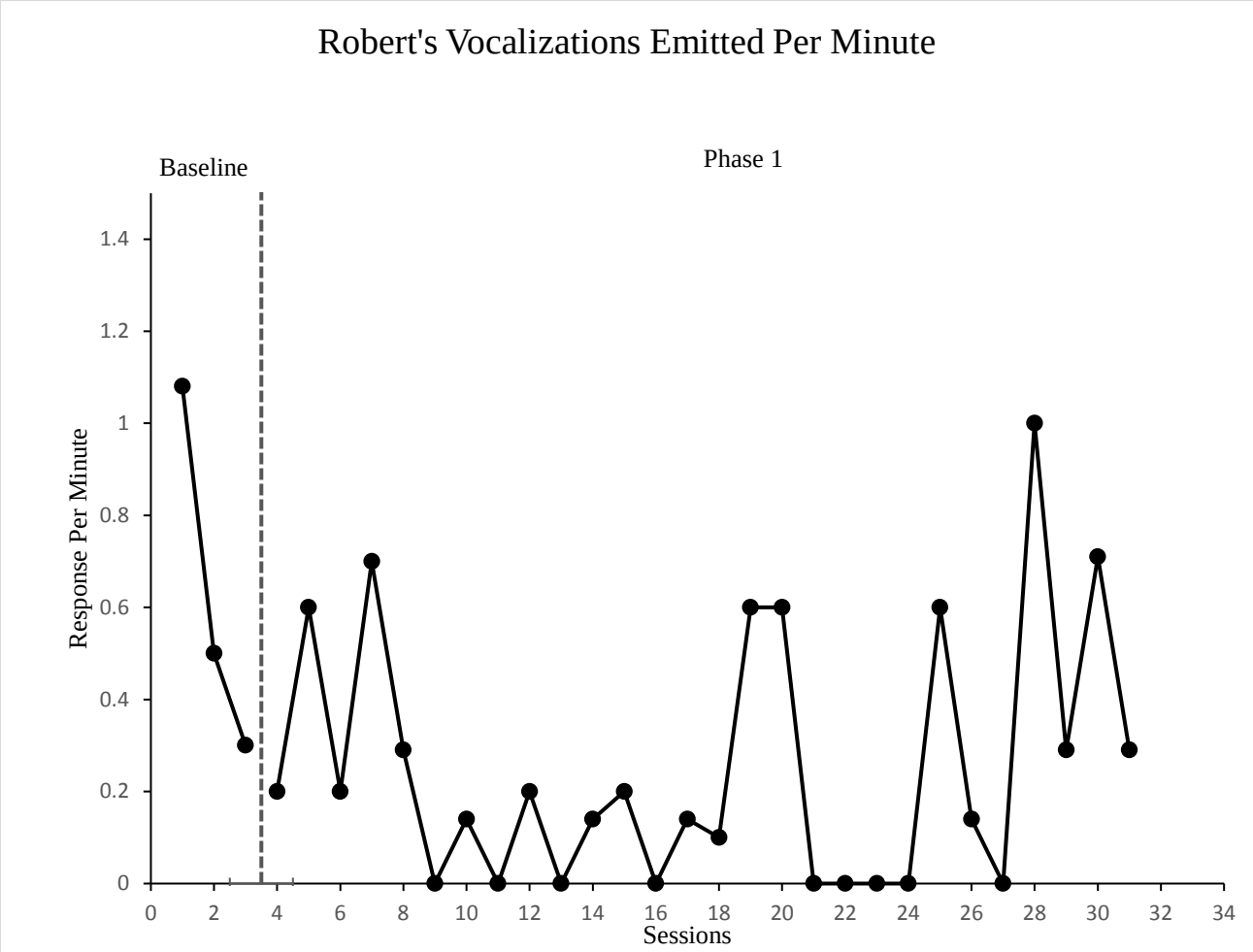

Eli's Vocalizations Emitted Per Minute
Responses Per Minute
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Sessions
"Mmm"
"Mmm" + Open Mouth

Appendix K

	Number Correct	**Number Possible**	**Percentage Correct**
Pre-test	0	25	0%
Post-test	N/A	N/A	N/A
Follow-up	N/A	N/A	N/A

Table 2A Robert's EESA Results

Appendix L

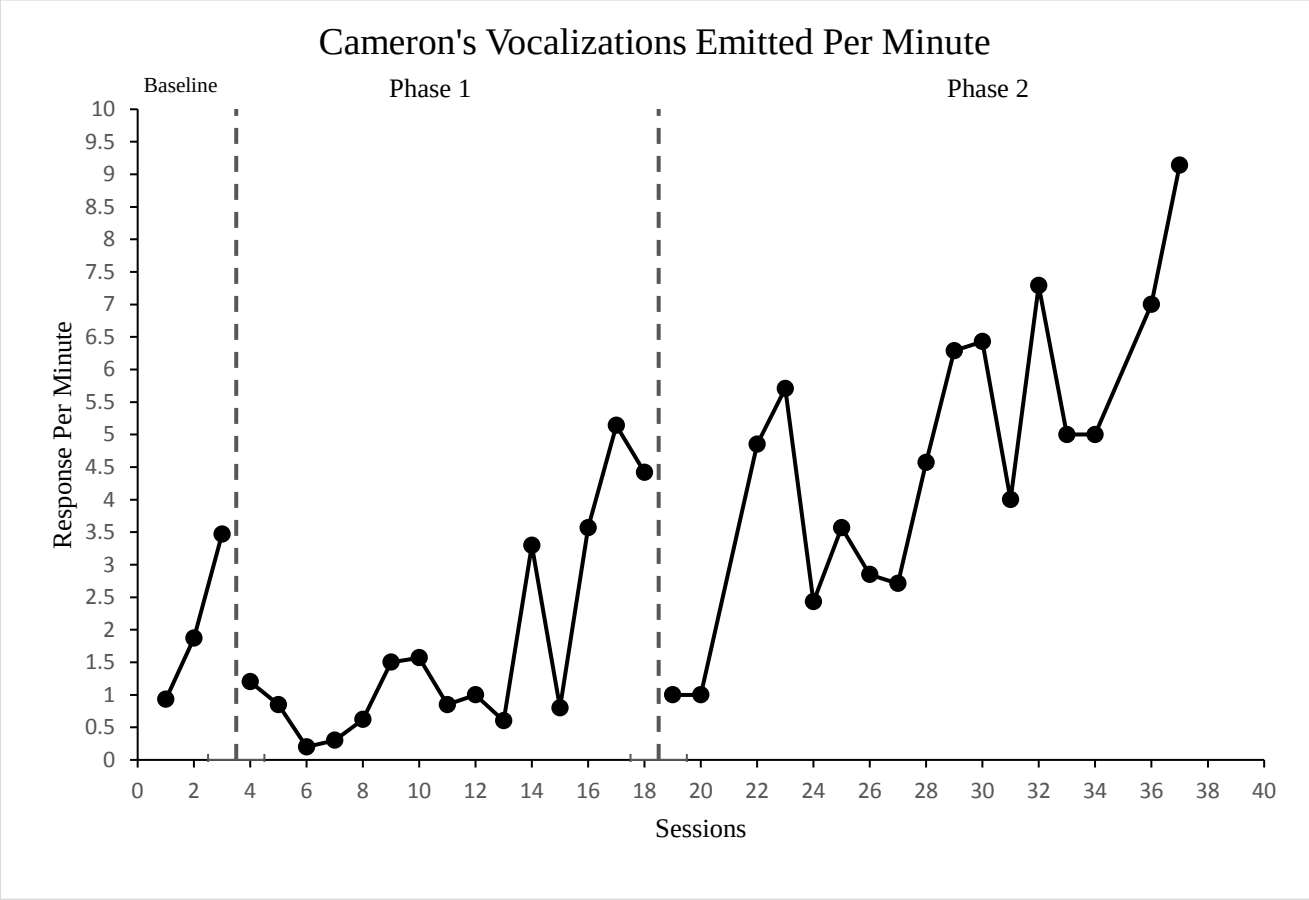

Robert's Vocalizations Emitted Per Minute
Baseline
Phase 1
Response Per Minute
0
0.2
0.4
0.6
0.8
1
1.2
1.4
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
Sessions

Appendix M

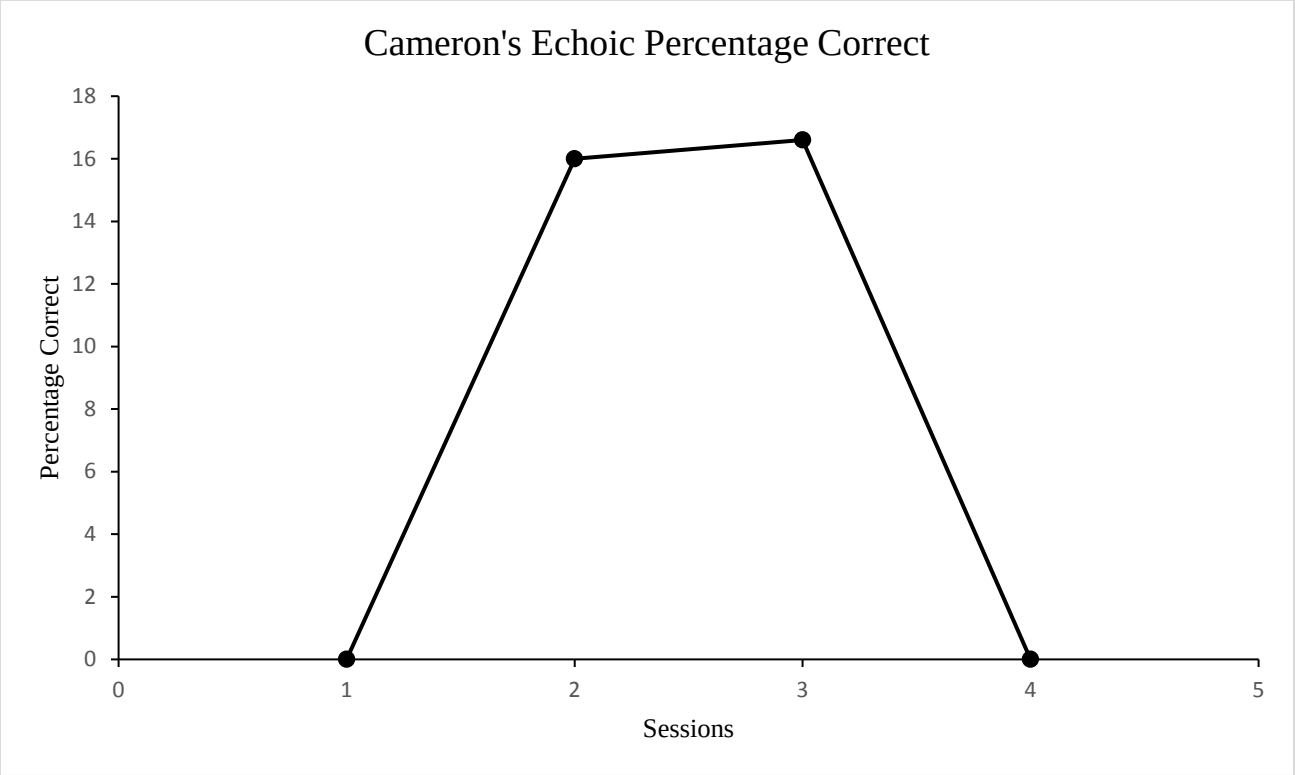
	Number Correct	**Number Possible**	**Percentage Correct**
Pre-test	0	25	0%
Mid-test	3	25	12%
Post-test	N/A	N/A	N/A
Follow-up	N/A	N/A	N/A
Extended Follow-up	N/A	N/A	N/A

Table 3A Cameron's EESA Results

Appendix N


Cameron's Vocalizations Emitted Per Minute
Baseline
Phase 1
Phase 2
Response Per Minute
Sessions
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6
6.5
7
7.5
8
8.5
9
9.5
10
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40

Appendix O


Cameron's Echoic Percentage Correct
Percentage Correct
18
16
14
12
10
8
6
4
2
0
0
1
2
3
4
5
Sessions