

Increasing Intraverbal Response Order Variability in a Child With Autism: Effects of Lag Schedule Combined With Differential Reinforcement

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Abstract

Children with autism spectrum disorder (ASD) often develop rigid, repetitive language patterns. Although discrete-trial training effectively establishes intraverbal responses—verbal behavior controlled by another's verbal stimuli—it frequently produces stereotyped sequences. In the present case, a fixed emission order (e.g., carrot → cabbage → eggplant for “vegetables”) led to blended utterances in which phonemes from adjacent words merged into a single unit, necessitating intervention. This study examined whether combining a Lag 1 schedule with differential reinforcement of different orders from the baseline sequence (DRDO) could increase response-order variability in a 12-year-old boy with ASD and severe intellectual disability. A multiple-baseline-across-behaviors design was employed across five semantic categories (fruits, vegetables, animals, insects, vehicles). Following baseline and instruction phases—during which instructions to vary response order produced no change—variability training was introduced sequentially. Two dependent variables were recorded: (A) the proportion of words emitted in a different order than the preceding trial, and (B) the proportion differing from the baseline sequence. Lag 1 alone produced minimal improvement. Adding DRDO—reinforcing sequences differing from the baseline order—substantially increased both measures in the first category (Non-overlap of All Pairs [NAP] = 1.00; Improvement Rate Difference [IRD] = 1.00 for Measure A; NAP = 0.94, IRD = 0.88 for Measure B). Gains generalized rapidly; later-trained categories reached criterion within one to three training trials, suggesting cross-category transfer. The classroom teacher responded positively on a 15-item social validity questionnaire. These findings suggest DRDO is an effective adjunct when instruction or Lag alone are insufficient and offer a classroom-feasible framework for sequencing interventions.

Keywords: autism spectrum disorder, intraverbal behavior, lag schedule of reinforcement, response variability, differential reinforcement

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Introduction

Children with autism spectrum disorder (ASD) frequently demonstrate difficulties in acquiring functional verbal communication (American Psychiatric Association, 2013). According to Skinner (1957), verbal behavior is classified based on its functional relations with antecedent stimuli and consequences. Among the functional verbal operants, intraverbal behavior—defined as a verbal response evoked by a prior verbal stimulus without point-to-point correspondence—is considered particularly important because it plays a critical role in social interaction (Partington & Bailey, 1993). Intraverbal responding has been successfully established in children with ASD through discrete-trial training (DTT) using model prompts, prompt-delay procedures, and prompt fading (Finkel & Williams, 2002; Goldsmith et al., 2007; Ingvarsson & Hollobaugh, 2011; Partington & Bailey, 1993; Watkins et al., 1989). One form of intraverbal responding involves naming multiple members of a semantic category (e.g., saying “apple” and “banana” in response to “Name some fruits.”).

A well-documented characteristic of ASD, however, is the presence of restricted and repetitive patterns of behavior (American Psychiatric Association, 2013). Consistent with this characteristic, children with ASD who have acquired verbal behavior through DTT with prompt-based procedures described above often emit fixed, stereotyped response patterns across trials (Sundberg & Partington, 1999). In the case of category-member naming, this stereotypy often manifests as emitting the same words in the same fixed order on every occasion. Such limited variability in verbal behavior may impair social interaction (Olin et al., 2020) and may also produce a variety of collateral problems, including reduced contact with reinforcement, failure to respond, and problem behavior (Contreras & Betz, 2016). These findings underscore the clinical importance of developing procedures that increase response variability.

One procedure that has been used to increase intraverbal response variability is instructive feedback (IF), in which the therapist provides verbal information indicating that alternative responses are acceptable (e.g., “You could also say it this way.”). Anthony et al. (1996) and Carroll and Kodak (2015) reported that IF effectively increased variability in verbal behavior. However, IF relies on the learner's ability to follow verbal instructions, and it may therefore be ineffective for some individuals. As described below, IF was not effective for the participant in the present study.

A second approach involves the use of lag schedules of reinforcement (lag schedules), in which reinforcement is delivered only when the current response differs from those emitted during the preceding n trials. Under a Lag 3 schedule, for example, reinforcement is delivered only if the current response differs from each of the responses emitted during the three immediately preceding trials. The effectiveness of lag schedules in increasing intraverbal response variability has been demonstrated across multiple studies (e.g., Contreras & Betz, 2016; Koehler-Platten et al., 2013; Lee et al., 2002; Olin et al., 2020; Silbaugh & Falcomata, 2019; Susa & Schlinger, 2012; Wiskow et al., 2018). Among studies involving individuals with ASD, Lag 1 has been used most frequently because higher lag values (i.e., Lag 2 and above) do not consistently increase response variability (Baruni et al., 2014). Nevertheless, Lag 1 schedules may produce stereotyped alternating response patterns rather than genuinely variable responding (Yamagishi, 2000).

The present study evaluated a procedure for increasing variability in the order of intraverbal category-member responses in a child with ASD. A Lag 1 schedule was initially implemented;

however, this procedure failed to disrupt the participant's highly stereotyped response sequence, likely because of an extensive history of reinforcement for the baseline sequence and the tendency of Lag 1 schedules to generate alternating patterns of responding. Therefore, a combined procedure involving Lag 1 and differential reinforcement of different orders from the baseline sequence (DRDO) was implemented. Under DRDO, reinforcement was delivered only when category members were emitted in an order that differed from the participant's baseline sequence.

Method

Participant and Reinforcers

One 12-year-old boy with ASD and severe intellectual disability who attended a special education classroom participated in the study. At the time of school enrollment, his developmental quotient (DQ) score on the revised Kyoto Scale of Psychological Development was 32 (Postural-Motor: 49; Cognitive-Adaptive: 37; Language-Social: 17). Prior to the present study, the participant had acquired the target intraverbal behavior—naming members of semantic categories—through a discrete-trial procedure involving the presentation and systematic fading of model, textual, and pictorial prompts (Finkel & Williams, 2001; Goldsmith et al., 2007; Ingvarsson & Hollobaugh, 2011; Partington & Bailey, 1993; Watkins et al., 1989). Although he had successfully acquired this repertoire, maintenance required frequent review sessions. The present study was conducted as part of one such review period.

Verbal praise (e.g., “OK,” “Great”) was used as the reinforcer. Based on the participant's prior history of acquiring behavior under contingencies involving this form of praise, verbal praise had previously functioned as an effective reinforcer for the participant.

Therapist and Setting

The participant's classroom teacher, who was also the first author, served as the therapist. All sessions were conducted in the participant's special education classroom, with the therapist and participant seated across from each other at a desk.

Experimental Design and Preassessment

The target behavior consisted of intraverbal responses in which the participant named members of five semantic categories: fruits, vegetables, animals, insects, and vehicles. The discriminative stimulus was the therapist's verbal presentation of the category name (e.g., “Name some fruits”), and the response consisted of a sequence of intraverbal responses naming members of the target category (e.g., “melon, watermelon ...”). A multiple baseline design across behaviors was used. The study consisted of three phases: baseline (BL)—instructional feedback (IF)—variability training.

All five categories entered the IF phase simultaneously. Variability training was introduced in a staggered fashion using a multiple baseline design across behaviors, with training initiated first for fruits, then vegetables, and finally for animals, insects, and vehicles concurrently.

A preassessment was conducted prior to the study to identify the participant's response repertoire. The therapist presented each category name and asked the participant to name as many members as possible. Each category was assessed a minimum of three times. Results

confirmed that the participant consistently emitted the same words in the same fixed sequence (hereafter referred to as the *original order*) across all assessment trials (see Table 1).

Table 1

Response Repertoire and Original Response Order Established During Preassessment

Category	Original Response Order
Fruits	melon → watermelon → lemon → orange → cherry → peach → grape → apple → persimmon
Vegetables	green onion → potato → pumpkin → lotus root → corn → burdock → bell pepper → bamboo shoot → carrot → cucumber → cabbage → daikon → broccoli → cauliflower
Animals	rabbit → gorilla → deer → bear → cow → horse → panda → white bear → zebra → elephant → giraffe → lion → monkey → crane → chicken
Insects	dragonfly → butterfly → mosquito → praying mantis → bee → katydid → cicada → wasp → spider → stag beetle → ladybug → tent caterpillar
Vehicles	motorcycle → bus → helicopter → helicopter → fire engine → plane → ambulance → police car → bicycle → car → taxi

Note. Arrow symbols (→) indicate the direction of sequential word emissions within a single trial.

Dependent Variables and Interobserver Agreement

The therapist recorded the words emitted by the participant on a data sheet during each trial. Dependent variable data were collected for all BL and IF trials, and for test trials during variability training. Two response variability measures, adapted from Contreras and Betz (2016), were calculated for adjacent word pairs within each trial.

Measure A: *Percentage of transitions that differed from the immediately preceding trial.* For each adjacent word pair within a trial, the pair was scored as variable if the two words were emitted in an order different from the corresponding pair in the immediately preceding trial. When a test trial immediately followed a training trial, the immediately preceding training trial served as the comparison trial for this measure. For example, if the preceding trial included the transition lemon→watermelon, then the transition lemon→orange in the current trial was scored as variable.

Measure B: *Percentage of transitions that differed from the original order.* For each adjacent word pair within a trial, the pair was scored as variable if the two words were emitted in an order different from the corresponding pair in the preassessment original order. For example, because melon was followed by watermelon in the original order, the transition melon→lemon in a given trial was scored as variable.

The participant typically said “none” (*nai*, the Japanese word for “none”) when he could not produce additional words; this utterance was also recorded as a word and included in the calculation of both measures, because “none” functioned as part of the participant's response repertoire, indicating the termination of responding. In addition, repetitions of previously emitted words within a trial occurred occasionally; the order of subsequent productions of repeated words was included in the calculation of both measures.

A classroom teacher who was naïve to the study's hypotheses served as a secondary observer. This observer watched video recordings of the training sessions and recorded which of the 58 unique words in the participant's repertoire were emitted in a trial (each word was scored once per recording). Interobserver agreement (IOA) with the primary observer was calculated as point-by-point agreement and was 98.3%.

Baseline

The therapist presented the discriminative stimulus (e.g., “Name some fruits”) and the participant was asked to name category members. If the participant paused without emitting the next word, the therapist prompted additional responding by saying “What else?” until the participant said “none” or did not respond for approximately 2 s. Each word emission was followed by the delivery of the reinforcer. No model prompts were provided. This constituted one trial. The intertrial interval was approximately 5 s (a duration maintained across all subsequent phases). Two trials were conducted per category per session.

Instructive Feedback

Procedures were identical to baseline, except that following delivery of the reinforcer after each trial, the therapist provided verbal instructions specifying an alternative response order for the first two words of the participant's sequence on the next trial. For example, because the participant emitted the fruits category in the order melon→watermelon→lemon ... during baseline, the therapist stated, “Next time, try saying lemon, grapes first.” Five trials were conducted per category per session.

Variability Training

Variability training included training trials and test trials. Two types of training trials were implemented:

1. Lag 1 + prompt: Reinforcement was delivered only when each transition differed from the corresponding transition in the immediately preceding trial. Model prompts were provided to occasion reinforcement-eligible responses.
2. DRDO + prompt: Reinforcement was delivered for each word emission only if the order of that word in relation to the preceding word differed from the original order established during preassessment. Model prompts were provided to occasion reinforcement-eligible responses.

Model prompts were initially delivered immediately and then faded using a progressive time delay procedure. Specifically, after two consecutive reinforced responses were emitted without errors, the prompt delay was increased to approximately 2 s, and once two consecutive reinforced responses were emitted at the 2-s delay, prompts were discontinued. However, additional prompts were occasionally provided outside of these criteria to maintain the participant's task engagement by increasing the rate of reinforcement; therefore, the prompt-fading procedure was implemented flexibly based on participant responding.

Transition from training trials to test trials occurred when the participant emitted three consecutive reinforcement-eligible responses without a prompt. In sessions in which both training types were implemented, DRDO + prompt training generally preceded Lag 1 + prompt training.

During the latter portion of variability training, the number of training trials was progressively reduced as data trends warranted. Some training trials were interrupted due to the need to attend to other students in the classroom who were working independently on academic tasks; the number of completed training trials is indicated in Figure 1.

Test trials followed the same procedure as baseline—no model prompts were provided—except that a Lag 1 reinforcement schedule was in effect: reinforcement was delivered for each word emission only if the order of that transition differed from the order emitted in the immediately preceding trial.

Social Validity

A 15-item questionnaire modeled after the Intervention Rating Profile-15 (IRP-15; Witt & Elliott, 1985) was developed. A second teacher, who had provided direct instruction to the participant in contexts unrelated to the present study but was not involved in conducting the study, was given a brief description of the study and asked to rate each item on a 6-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree).

Ethical Consideration

Written informed consent was obtained from the participant's parents prior to study implementation and for the subsequent publication of results.

Results

Figure 1 presents Measures A and B across all trials during the BL and IF phases and across test trials during the variability training phase. Numbers above data points indicate the number of training trials completed immediately prior to that test trial. Uncircled numbers indicate Lag 1 + prompt training trials, whereas circled numbers indicate DRDO + prompt training trials.

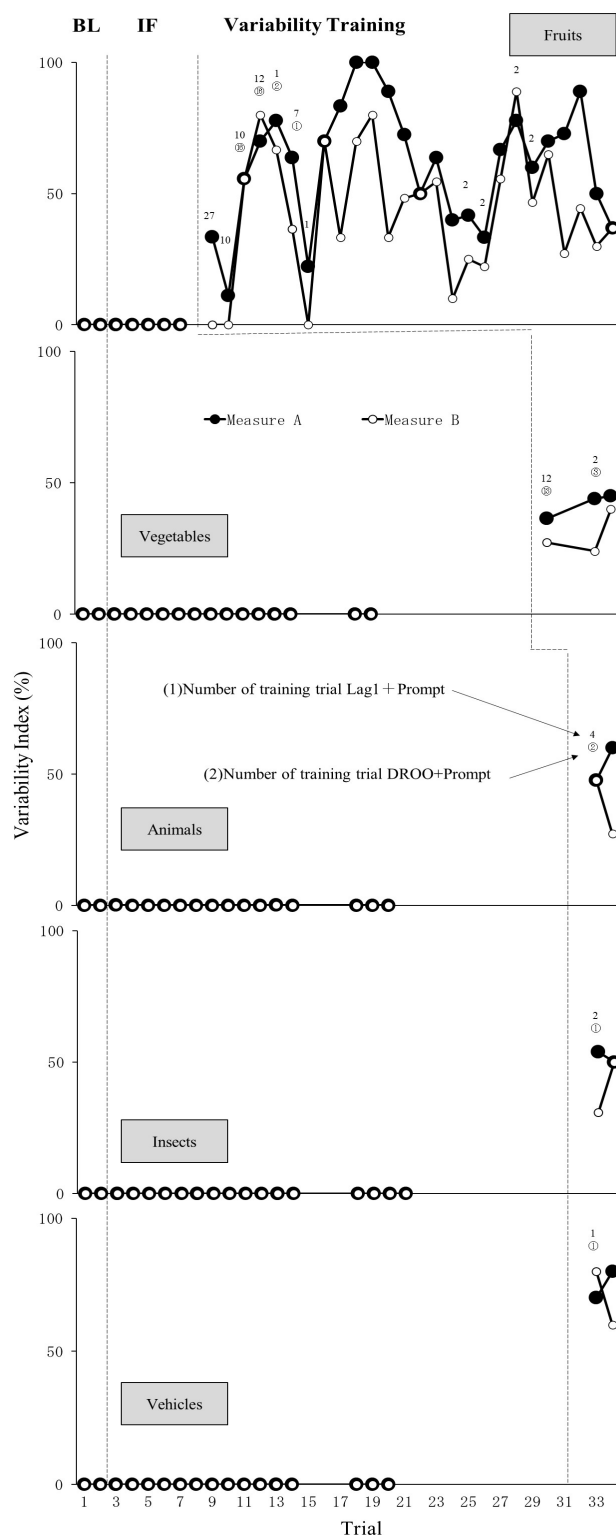
During the BL and IF phases, the participant consistently emitted category members in the original fixed order across all trials for all five categories, yielding values of 0% on both measures.

When variability training was introduced for the fruit category, Lag 1 + prompt training alone was initially implemented. The participant required 27 training trials to meet the criterion for transition to the first test trial, and subsequent test trial data showed no improvement or a decreasing trend on both measures. The participant began alternating between the original order and a single alternative order across trials. Based on this response pattern, DRDO + prompt training was introduced during the third set of training trials. Following the introduction of DRDO + prompt training, increases in both measures were observed. Similar improvements in both measures were observed across all remaining categories following the introduction of variability training.

The later categories (animals, insects, and vehicles) tended to meet the training criterion with fewer trials than the fruit category. In particular, the participant met the criterion for the vehicles category after only one training trial of each type (Lag 1 + prompt and DRDO + prompt), suggesting that fewer training trials were required for the later-trained categories.

Figure 1

Changes in Response Order Variability Measures Across Baseline, Instructive Feedback, and Variability Training Phases



Note. Filled circles (●) represent Measure A (percentage of transitions differing from the immediately preceding trial). Open circles (○) represent Measure B (percentage of transitions differing from the original preassessment order). Numbers above data points indicate completed training trials immediately prior to each test trial. Plain numbers indicate Lag 1 + prompt training trials; circled numbers indicate DRDO + prompt training trials. BL = baseline; IF = instructive feedback.

Effect sizes were calculated for the fruit category.¹ NAP and IRD (Parker et al., 2009) were calculated by comparing all BL and IF phase data points with all variability training phase data points. For Measure A, NAP = 1.00 and IRD = 1.00. For Measure B, NAP = 0.94 and IRD = 0.88.

The teacher who completed the social validity questionnaire provided predominantly positive ratings. Nearly all items were rated 5 (*agree*) or 6 (*strongly agree*). The sole exception was the item “This method of teaching category-member naming was consistent with the methods I typically use in my classroom,” which received a rating of 4 (*slightly agree*).

Discussion

The present study evaluated procedures for increasing variability in the order in which a child with ASD emitted category members during intraverbal responding. Although IF did not produce measurable changes in response order variability, variability training—combining a Lag 1 schedule with DRDO and model prompts—yielded increases in both dependent measures. Effect sizes for the fruit category exceeded established benchmarks: NAP values above 0.93 are classified as reflecting large or strong effects (Parker & Vannest, 2009), and IRD values above 0.70 to 0.75 are classified as reflecting large to very large effects (Parker et al., 2009).

The limited effectiveness of Lag 1 alone during the initial variability training of the fruit category is consistent with two known factors. First, the participant had an extensive training history with the original response order, which had been practiced repeatedly across prior review sessions, likely establishing a strong response preference for that order. Second, Lag 1 schedules have been reported to produce alternating response patterns rather than sustained variability (Yamagishi, 2000); such alternation was also observed in the present data. The addition of DRDO may have reduced the influence of the previously established response order and increased emission of alternative sequences.

Studies that have similarly targeted the order of multi-word emissions have reported that lag schedules (Contreras & Betz, 2016) and IF (Carroll & Kodak, 2015) can be effective. The present findings suggest that DRDO may be a useful supplementary procedure when these approaches alone are insufficient. It should be noted, however, that IF offers practical advantages: it is simple to implement (Carroll & Kodak, 2015), allows reinforcement to be delivered on every trial, and may thereby more easily sustain participant engagement. These findings suggest a possible decision sequence for practitioners. Practitioners might first attempt IF, then introduce a lag schedule if IF proves ineffective, and finally add DRDO if the lag schedule alone does not produce adequate variability. However, the present study did not include a component analysis comparing DRDO alone against the combined Lag 1 + DRDO procedure, nor was a design that would isolate the contribution of each component employed. Therefore, definitive conclusions regarding the independent or additive contributions of DRDO require further investigation.

¹ NAP is calculated by forming all possible pairs of data points between the baseline and intervention phases, assigning 1 point for each pair showing improvement in the expected direction, 0.5 for each tied pair, and 0 for each pair showing a change in the wrong direction, then dividing the sum by the total number of pairs. For full computational details, see Parker and Vannest (2009). IRD is calculated by removing data points in the baseline and intervention phases that overlap on the vertical axis and then calculating the proportion of remaining intervention-phase data points that changed in the expected direction. For full computational details, see Parker et al. (2009).

The tendency for the later-introduced categories to meet training criteria with fewer trials is noteworthy. The finding that the vehicles category—the last category to enter variability training—met criterion after only one training trial of each type raises the possibility that variability training may have produced generalized effects across semantic categories. However, it should also be noted that during the middle portion of fruit variability training, when training trials were eliminated, both measures showed a decreasing trend, suggesting that long-term maintenance without continued reinforcement may be a concern. The degree to which variability is maintained following training is an important question for future research.

The teacher respondent provided largely positive social validity ratings, consistent with prior research on the social acceptability of lag schedules (e.g., Contreras & Betz, 2016). The single item receiving a lower rating—consistency with typical classroom instruction—most likely reflects the fact that the procedures, including the lag schedule contingency, are not routinely employed in general or special education settings. This underscores the need for practitioner-friendly adaptations of behavioral procedures.

Conclusions

Combining a Lag 1 schedule with DRDO and model prompts increased intraverbal response-order variability beyond the levels achieved with IF or a Lag 1 schedule alone, and these gains generalized rapidly across semantic categories. These findings suggest that DRDO is an effective adjunct when instructive feedback or a Lag 1 schedule alone are insufficient, and they offer a classroom-feasible framework that practitioners can adapt when sequencing variability interventions for learners with highly stereotyped intraverbal response patterns.

Limitations

The following limitations of the present study should be acknowledged. First, only one participant was included, which limits the generalizability of findings. Second, although the participant's speech was highly intelligible, IOA data were collected on only a small subset of trials (approximately 3.5% of all trials), which constrains confidence in the measurement accuracy of the full dataset. Third, the criteria for delivering and fading prompts, as well as for reducing the number of training trials, were not operationally defined with precision, introducing potential for inconsistent implementation. Fourth, because a substantial number of sessions were devoted to the fruit category, the number of test trials completed for the remaining categories was too small to permit effect size calculations. Fifth, the procedures required one-to-one instruction, which requires that other students in the classroom can engage independently in academic tasks; thus, the approach may not be immediately applicable in all classroom contexts. Finally, the present study addressed only a basic form of intraverbal behavior—naming category members in response to a category cue. Whether these procedures would generalize to socially significant intraverbal behavior, such as conversational question–answering, remains unknown.

References

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). <https://doi.org/10.1176/appi.books.9780890425596>
- Anthony, L., Wolery, M., Werts, M. G., Caldwell, N. K., & Snyder, E. D. (1996). Effects of daily probing on acquisition of instructive feedback responses. *Journal of Behavioral Education*, 6(2), 111–133. <https://doi.org/10.1007/BF02110228>
- Baruni, R. R., Rapp, J. T., Lipe, S. L., & Novotny, M. A. (2014). Using lag schedules to increase toy play variability for children with intellectual disabilities. *Behavioral Interventions*, 29(1), 21–35. <https://doi.org/10.1002/bin.1377>
- Carroll, R. A., & Kodak, T. (2015). Using instructive feedback to increase response variability during intraverbal training for children with autism spectrum disorder. *The Analysis of Verbal Behavior*, 31(2), 183–199. <https://doi.org/10.1007/s40616-015-0039-x>
- Contreras, B. P., & Betz, A. M. (2016). Using lag schedules to strengthen the intraverbal repertoires of children with autism. *Journal of Applied Behavior Analysis*, 49(1), 3–16. <https://doi.org/10.1002/jaba.271>
- Finkel, A. S., & Williams, R. L. (2002). A comparison of textual and echoic prompts on the acquisition of intraverbal behavior in a six-year-old boy with autism. *The Analysis of Verbal Behavior*, 18, 61–70. <https://doi.org/10.1007/BF03392971>
- Goldsmith, T. R., LeBlanc, L. A., & Sautter, R. A. (2007). Teaching intraverbal behavior to children with autism. *Research in Autism Spectrum Disorders*, 1(1), 1–13. <https://doi.org/10.1016/j.rasd.2006.07.001>
- Ingvarsson, E. T., & Hollobaugh, T. (2011). A comparison of prompting tactics to establish intraverbals in children with autism. *Journal of Applied Behavior Analysis*, 44(3), 659–664. <https://doi.org/10.1901/jaba.2011.44-659>
- Koehler-Platten, K., Grow, L. L., Schulze, K. A., & Bertone, T. (2013). Using a lag reinforcement schedule to increase phonemic variability in children with autism spectrum disorders. *The Analysis of Verbal Behavior*, 29(1), 71–83. <https://doi.org/10.1007/BF03393125>
- Lee, R., McComas, J. J., & Jawor, J. (2002). The effects of differential and lag reinforcement schedules on varied verbal responding by individuals with autism. *Journal of Applied Behavior Analysis*, 35(4), 391–402. <https://doi.org/10.1901/jaba.2002.35-391>
- Olin, J., Sonsky, A., & Howard, M. (2020). Using a lag schedule of reinforcement to increase response variability in children with autism spectrum disorders. *The Analysis of Verbal Behavior*, 36(2), 169–179. <https://doi.org/10.1007/s40616-020-00129-y>
- Parker, R. I., & Vannest, K. (2009). An improved effect size for single-case research: Nonoverlap of all pairs. *Behavior Therapy*, 40(4), 357–367. <https://doi.org/10.1016/j.beth.2008.10.006>

- Parker, R. I., Vannest, K. J., & Brown, L. (2009). The improvement rate difference for single-case research. *Exceptional Children*, 75(2), 135–150.
<https://doi.org/10.1177/001440290907500201>
- Partington, J. W., & Bailey, J. S. (1993). Teaching intraverbal behavior to preschool children. *The Analysis of Verbal Behavior*, 11, 9–18. <https://doi.org/10.1007/BF03392883>
- Silbaugh, B. C., & Falcomata, T. S. (2019). Effects of a lag schedule with progressive time delay on sign mand variability in a boy with autism. *Behavior Analysis in Practice*, 12(1), 124–132. <https://doi.org/10.1007/s40617-018-00273-x>
- Skinner, B. F. (1957). *Verbal behavior*. Appleton-Century-Crofts.
- Sundberg, M. L., & Partington, J. W. (1999). *The need for both discrete trial and natural environment language training for children with autism*. In P. M. Ghezzi, W. L. Williams, & J. E. Carr (Eds.), *Autism: Behavior analytic perspectives* (pp. 139–156). Context Press.
- Susa, C., & Schlinger, H. D. (2012). Using a lag schedule to increase variability of verbal responding in an individual with autism. *The Analysis of Verbal Behavior*, 28(1), 125–130. <https://doi.org/10.1007/BF03393113>
- Watkins, C. L., Pack-Teixeira, L., & Howard, J. S. (1989). Teaching intraverbal behavior to severely retarded children. *The Analysis of Verbal Behavior*, 7, 69–81.
<https://doi.org/10.1007/BF03392838>
- Wiskow, K. M., Matter, A. L., & Donaldson, J. M. (2018). An evaluation of lag schedules and prompting methods to increase variability of naming category items in children with autism spectrum disorder. *The Analysis of Verbal Behavior*, 34(1–2), 100–123.
<https://doi.org/10.1007/s40616-018-0102-5>
- Witt, J. C., & Elliott, S. N. (1985). Acceptability of classroom intervention strategies. In T. R. Kratochwill (Ed.), *Advances in school psychology* (Vol. 4, pp. 251–288). Lawrence Erlbaum Associates.
- Yamagishi, N. (2000). Effects of reinforcement contingencies on variability of serial responses in humans. *Japanese Journal of Behavior Analysis*, 15(2), 52–66.
https://doi.org/10.24456/jjba.15.2_52