

INCORPORATING ADDITIONAL TARGETS INTO LEARNING TRIALS
FOR INDIVIDUALS WITH AUTISM SPECTRUM DISORDER

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Recently, researchers have investigated the effectiveness and efficiency of presenting secondary targets during learning trials for individuals with autism spectrum disorder (ASD). This instructional method may be more efficient than typical methods used with learners with ASD, because learners may acquire secondary targets without additional instruction. This review will discuss the recent literature on providing secondary targets during teaching trials for individuals with ASD, identify common aspects and results among these studies, and identify areas for future research.

Key words: autism spectrum disorder, instructional efficiency, instructive feedback, additional stimuli, nontarget stimuli

Early intensive behavioral intervention is likely to be costly (Jacobson, Mulick, & Green, 1998) and comprehensive (e.g., Lovaas, 1987); thus, it is important to identify procedures that lead to increases in instructional efficiency. One potential method to increase instructional efficiency involves the presentation of additional stimuli (hereafter referred to as *secondary targets*) within learning trials (Vladescu & Kodak, 2013). For example, within a teaching interaction, the instructor presents a primary target (e.g., labeling a picture of a couch). After the learner labels the couch, the instructor presents a picture of a bed and the statement, “This is a bed,” but the learner is not required to respond, and no feedback is provided if a response is provided. Later, the instructor may assess the learner’s ability to label the photo of the bed.

Although this instructional arrangement has been used with a variety of populations over the past

20 years (e.g., typically developing learners and those with learning, emotional, and cognitive disabilities; Anthony, Wolery, Werts, Caldwell, & Snyder, 1996; Caldwell, Wolery, Werts, & Caldwell, 1996; Wolery, Holcombe, Werts, & Cipolloni, 1993), it has only recently garnered attention for use with individuals with autism spectrum disorder (ASD). Therefore, the purposes of this review are to provide an overview of the recent literature published in the *Journal of Applied Behavior Analysis (JABA)* in the last 5 years on the incorporation of secondary targets within learning trials for individuals with ASD, to identify commonalities among this research, and to identify areas in need of further research. We identified three studies from *JABA* that evaluated the effects of presenting secondary targets within learning trials for individuals with ASD (Loughrey, Betz, Majdalany, & Nicholson, 2014; Reichow & Wolery, 2011; Vladescu & Kodak, 2013). Results from these studies indicated that instruction was most efficient in the conditions that included secondary targets; some participants acquired secondary targets in the absence of direct teaching or required fewer instructional trials to acquire these targets if direct teaching was needed. Among the

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factors that may influence the effectiveness or efficiency of presenting secondary targets within a learning trial are (a) the types and number of targets included in an instructional set, (b) the instructional setting in which learning trials occur, (c) the order of the secondary target in the learning trial, (d) how frequently secondary target probe data are collected, (e) generalization and maintenance, and (f) learner characteristics.

Types and Number of Targets

Reichow and Wolery (2011) described three types of secondary targets in terms of their relation to the primary targets. *Primary targets* refer to the stimuli in a learning trial that receive direct training and require a response from the learner, and instructor feedback is provided after the response. For example, the instructor presents a picture of a ball, the learner responds “ball,” and the instructor provides praise. *Expansion targets* involve primary and secondary targets that are either related conceptually or from the same curriculum content area (e.g., both sets of targets teach tacts of common objects). *Novel targets* involve primary and secondary targets that are neither conceptually related nor from the same instructional area (e.g., primary targets involve matching identical objects and secondary targets include gross motor imitation). *Parallel targets* are primary and secondary targets that have different antecedent stimuli but the same learner response (e.g., “How are you?” or “How’s it going?” evoke the response “well”).

All three studies in *JABA* evaluated expansion targets (e.g., tacts of common objects and fill-in-the-blank intraverbals). Future research should assess the acquisition of novel and parallel secondary targets with individuals with ASD, because these types of targets have not been used in previous studies. In addition, studies are needed to evaluate a wider array of primary and secondary targets and not just tacts of common objects and fill-in-the-blank intraverbals, including additional verbal targets (e.g., more complex

tacts or intraverbals) and motor targets (e.g., play skills, self-help, vocational skills).

An additional consideration during instruction is the number of primary and secondary targets. Gast, Doyle, Wolery, Ault, and Kolenda (1994) evaluated the effects of presenting up to two secondary targets per one primary target. They found that secondary targets were acquired by most learners when only one secondary target was included in a trial. However, the similarity of the targets might influence learning outcomes. That is, learners acquired two secondary targets when they were of similar content (e.g., both secondary targets were types of activities) but did not acquire two secondary targets with differing content (e.g., one secondary target was an activity and one secondary target was a street name). Differing content resulted in acquisition of one of the two secondary targets. Future studies are needed to evaluate whether the number or content of primary or secondary targets included in an instructional set would affect acquisition of these targets or the instructional efficiency of this procedure for individuals with ASD.

Instructional Setting

In the recent literature, secondary targets were only embedded in learning trials conducted during one-to-one instruction in the participants’ classrooms or therapy rooms (Loughrey *et al.*, 2014; Reichow & Wolery, 2011; Vladescu & Kodak, 2013). Future research should evaluate the effects of presenting secondary targets during group instruction (e.g., Gast *et al.*, 1994) and in other settings or contexts (e.g., home, play, transitions) for individuals with ASD. Such studies would be beneficial because they would provide data on whether the presentation of secondary targets in other instructional arrangements (e.g., small-group format) and settings (e.g., home) lead to instructional savings similar to those demonstrated in one-to-one instruction.

Order of Secondary Targets

Recent studies presented secondary targets in both the consequence (Loughrey *et al.*, 2014;

Reichow & Wolery, 2011; Vladescu & Kodak, 2013) and antecedent (Vladescu & Kodak, 2013) portions of learning trials. Typically, secondary targets presented during the consequence portion of a trial occur after the delivery of a reinforcer for correct responses to the primary target. For example, an instructor presents the primary target, a picture of a cup, and the learner responds “cup.” The instructor provides praise and then presents the secondary target, a picture of a plate and the statement, “This is a plate.” However, Loughrey et al. (2014) used a variation of this procedure in which they presented the secondary target before the delivery of the reinforcer. In this arrangement, an instructor presents the primary target, a picture of a blanket, and the learner responds “blanket.” The instructor immediately presents the secondary target, a picture of a table and the statement, “This is a table,” and then provides praise. Variations in the temporal location of the secondary target in the consequence portion of a learning trial is an interesting area of future research. For example, children who display limited attending to secondary targets during the reinforcement interval may benefit from the presentation of the secondary target before reinforcement.

When presented during the antecedent portion of a trial, the secondary target is presented after gaining the learner’s attention and before the delivery of the antecedent stimulus relevant to the primary target. For example, when the learner is attending, the instructor presents the secondary target, a picture of a chair, and the statement, “This is a chair.” The learner is not required to respond to this stimulus, and no feedback is provided if a response is given. The instructor then presents the antecedent stimulus relevant to the primary target, a picture of a door. The learner is required to respond to the primary target, and feedback is provided for this response. Vladescu and Kodak (2013) found small or inconsistent differences between conditions in which they presented secondary targets in the antecedent versus the consequence portion of learning trials. Although it is unclear why no differences between

conditions were obtained, this finding is consistent with those found for learners with intellectual disabilities (e.g., Wolery, Schuster, & Collins, 2000). Collectively, these results suggest that clinicians can use either arrangement.

Few studies evaluated whether secondary targets presented in instruction for primary targets led to mastery of secondary targets (e.g., Fiscus, Schuster, Morse, & Collins, 2002; Groskreutz, Karsina, Miguel, & Groskreutz, 2010). For example, an instructor presents a picture of a carrot and asks, “What vegetable?” In this example, the primary target is the tact “carrot” and the secondary target is the tact of the category in which carrot belongs (i.e., vegetable). Groskreutz et al. (2010) found that presenting a visual stimulus (e.g., photos, line drawings) and embedding a tact of that stimulus during match-to-sample training led to tacts of the previously unknown visual stimuli (e.g., instruments, animals). Although the authors did not relate their findings to the extant literature on embedding secondary targets into training of primary targets, their outcomes nevertheless demonstrate the efficacy of unique arrangements of secondary targets in learning trials. Future research should continue to evaluate embedding secondary targets into the instruction or prompt for primary targets.

Secondary Target Probes

The majority of studies including secondary targets conducted probes of secondary targets before and after direct instruction for primary targets, but not during training of primary targets. In doing so, researchers were typically unable to determine if learners acquired secondary targets while instruction relevant to primary targets was ongoing. However, Loughrey et al. (2014) and Vladescu and Kodak (2013) conducted probes of secondary targets while the primary targets were being taught to determine if these targets were acquired. They found that some participants acquired secondary targets concurrent with ongoing instruction for primary targets. Vladescu and Kodak also demonstrated

that secondary targets may be acquired more rapidly than the primary targets. This may have occurred due to the progressive prompt delay used for primary targets. Participants had up to 5 s to respond during probes of secondary targets, but responses to primary targets had to occur within the prompt delay in place for the session, which may have been less than 5 s. Future studies are needed to determine the generality of this finding for individuals with ASD and to identify an efficient methodology for replacing any mastered secondary targets with new secondary targets. Immediate introduction of novel targets when secondary targets are mastered may lead to further increases in the instructional efficiency of this procedure.

Generalization and Maintenance

Evaluation of generalization and maintenance of primary and secondary targets in the recent literature is limited. Of the studies reviewed, generalization of the acquired skills was never assessed, and maintenance was assessed in only one study (Reichow & Wolery, 2011), in which varying levels of maintenance of primary and secondary targets across conditions were found. Future research is needed to evaluate the generalization and maintenance of primary and secondary targets. Additional research in this area may evaluate whether learners respond when primary and secondary targets are presented in novel formats (e.g., an exemplar of a common object not associated with instruction) or by novel instructors. Also of interest is the degree of maintenance as a function of different factors, including the order of the secondary targets in the trial, the number of secondary targets included in the trial, or whether primary targets are maintained at different levels depending on whether secondary targets are included.

Learner Characteristics

Learners' skills or skill deficits may influence the acquisition of secondary targets. For example, an imitative repertoire may play an important role in

the acquisition of secondary targets. Participants in recent studies reportedly imitated single words (Reichow & Wolery, 2011) or almost always imitated the secondary target when it was presented (Vladescu & Kodak, 2013). For example, the instructor presented a picture of a seal and the verbal stimulus, "This is a seal," and the participant imitated the instructor's presentation of the secondary target, "seal." Although responses to the secondary targets are not required and do not result in feedback, it may be possible that overt or covert imitation of the secondary target aids in acquisition of these targets. If so, then a generalized imitative repertoire would be necessary for secondary targets to be acquired without direct training.

Loughrey *et al.* (2014) did not provide information regarding their participants' imitative repertoire or collect data on echoic responding following the presentation of the secondary targets. It is important to note that in their procedure, Loughrey *et al.* delivered reinforcers after the presentation of the secondary targets. Therefore, covert or overt responses to these targets may have been reinforced. In other words, if a learner engages in an imitative response following the secondary targets, acquisition of the secondary targets in this case may be the result of contiguity.

In comparison, Vladescu and Kodak (2013) found that all participants consistently imitated the presentation of the secondary targets; however, acquisition of the secondary targets in the absence of direct teaching was inconsistent across participants (one participant required instruction). Future research could evaluate the role of an imitative repertoire on acquisition of secondary targets and the acquisition of secondary targets with individuals who do not yet demonstrate a generalized imitative repertoire or those who do not readily engage in an imitative response. We recommend that future studies measure imitation during instruction to determine the potential role of imitative responding on the acquisition of secondary targets. In addition, future studies could test for bidirectional relations. For example, if tacts

of common objects are arranged as secondary targets, probes could be conducted to determine if the learner correctly responds to the targets as both a listener and speaker.

Behavioral Mechanisms

The behavioral mechanisms responsible for the acquisition of secondary targets are unknown, but may be conceptualized in several ways. Wolery, Werts, and Holcombe (1993) outlined multiple potential explanations, including observational or incidental learning, indiscriminable contingencies, and demand characteristics.

Wolery, Werts, et al. (1993) suggested that observational or incidental learning is the mechanism responsible for learning secondary targets. For example, the instructor demonstrates the response to the secondary target (e.g., the instructor says, "This is a dog," when presenting a picture of a dog), and the learner acquires this target based on being present in the learning environment and observing the demonstration (model) of the target response. No reinforcement is provided if the learner engages in the imitated behavior. A recent study by McGhan and Lerman (2013) showed that learners acquired conditional discriminations in a condition in which the instructor demonstrated the correct response and did not provide the learner with an opportunity to imitate the demonstrated response or receive reinforcement for doing so. Although observational and incidental learning may have some impact on acquisition of secondary targets, additional research is needed to fully explain this possible mechanism.

Another possible explanation involves the indiscriminable contingencies for responding to the presentation of primary and secondary targets. Primary targets, which require a response from the learner, and secondary targets, which do not require a response, may both be followed by reinforcement if the response to the primary target is correct. For example, Loughrey et al. (2014) provided reinforcement for correct responses to primary targets after the presentation of a primary and secondary target. These indiscriminable reinforcement contingencies

might establish a behavioral chain and promote acquisition of both types of targets. Similarly, discriminable contingencies may explain cases in which learners do not acquire secondary targets.

A generalized repertoire of imitation may also affect acquisition of secondary targets, and this repertoire may maintain due to indiscriminable reinforcement contingencies. Baer and Sherman (1964) found that reinforcement of some, but not all, imitative behaviors resulted in increases in both reinforced and nonreinforced imitative behaviors. In learning trials that contain primary and secondary targets, some imitative responses (i.e., responding correctly to models of the primary targets during teaching) are reinforced and others (i.e., responding to the presentation of secondary targets) are not. Therefore, generalized imitation may be a potential explanation for the acquisition of secondary targets.

Finally, demand characteristics may also affect the acquisition of secondary targets (Vladescu & Kodak, 2013; Wolery, Werts, et al., 1993). For example, both primary and secondary targets were presented to participants while in a similar location in a classroom (Reichow & Wolery, 2011) or while seated near the experimenter at a table (Vladescu & Kodak, 2013). A history of reinforcement for attending and responding to stimuli presented by an instructor in a learning environment may play a role in the acquisition of secondary targets presented during learning trials.

It may be possible that some or all of these explanations play a role in learners' responding to and acquiring secondary targets in the absence of direct training. Additional research is warranted to determine the behavioral mechanisms responsible for this acquisition as well as to determine whether any learner, procedural, or environmental factors affect secondary target acquisition. To evaluate whether learner characteristics may play a role in acquisition of secondary targets, studies could evaluate the presentation of secondary targets in trials with learners who do and do not demonstrate certain repertoires (e.g., learners who do not readily engage in imitative responses). To evaluate

whether it is important that primary targets be included for learners to acquire secondary targets, future research may include an experimental condition in which secondary targets are presented in isolation (similar to Vladescu & Kodak, 2013). To evaluate whether demand characteristics play a role in the acquisition of secondary targets, future research may evaluate the presentation of secondary targets in trials in settings in which there is no history of learning.

Identification of the behavioral mechanisms that are responsible for the acquisition of secondary targets in the absence of direct teaching is important to help guide practitioners to incorporate this procedure in their clinical work. More specifically, this information would help to ensure that (a) this arrangement is used with learners who will benefit from the procedure, (b) the most efficient procedural variations of this arrangement are used, and (c) this arrangement is used in environments in which the most efficient learning will occur. Because of the high costs of behavioral intervention and the commonly observed disparity between the skills of individuals with autism and their typically developing peers, research evaluating the use of this instructional arrangement with individuals with ASD is warranted to identify ways to increase instructional efficiency.

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