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A Progressive Approach to Discrete Trial Teaching: Some Current Guidelines

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Abstract

Discrete trial teaching (DTT) is one of the cornerstones of applied behavior analysis (ABA) based interventions. Conventionally, DTT is commonly implemented within a prescribed, fixed manner in which the therapist is governed by a strict set of rules. In contrast to conventional DTT, a progressive approach to DTT allows the therapist to remain flexible, making in-the-moment analyses and changes based on several variables (e.g., individual responding, current and previous history). The present paper will describe some guidelines to a progressive approach to DTT. The guidelines presented here should not be taken as a set of rules or as an exhaustive list.

Keywords: Applied behavior analysis, Autism; Discrete trial teaching; Progressive ABA

Introduction

Leaf and colleagues (2016) recently described Applied Behavior Analysis (ABA) as a science that involves progressive approaches with respect to the treatment of Autism Spectrum Disorders (ASD). Within the commentary, the authors described some components that constituted a comprehensive, flexible, and progressive approach to ABA (as relevant to functional analysis, data collection, instructional arrangements, range of available procedures including respondent conditioning, reinforcement, etc.). The authors assert that intervention based upon ABA should be implemented in a way in which therapists are free to make in-the-moment decisions and be flexible, which is accomplished, in part, through intensive experientially-based training in the principles and procedures of ABA. This assertion is in contrast to approaches to intervention in which the therapist is not free to make adjustments in the moment or be flexible as a result, in part, of training which emphasizes adherence to rigid protocols. While some

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have discussed the advantages (e.g., ensuring counterbalancing of stimuli) of developing and adhering to stringent protocols or datasheets (e.g., Grow & LeBlanc, 2013), the disadvantages of not adopting a progressive approach may outweigh those advantages (e.g. responding to the demonstrated and ongoing needs of the child and the documented outcomes for individuals diagnosed with ASD when a progressive model is implemented) (Leaf et al., 2011).

One procedure based upon the principals of ABA which can be implemented within a progressive model (Leaf et al., 2016) is Discrete Trial Teaching (DTT) (Lovaas, 1981, 1987). DTT refers to a systematic form of intervention which is commonly included with other treatment approaches/procedures to teach individuals diagnosed with ASD a variety of skills. Each discrete trial consists of three primary components: (a) a discriminative stimulus (e.g., an instruction from the therapist); (b) a response by the learner; and (c) a consequence (i.e., reinforcement or punishment) facilitated by the therapist based upon the learner's response. An optional fourth step is a therapist providing a prompt, prior to the learner's response, that increases the likelihood of the student responding correctly. Additional components to consider include inter-trial intervals, methods of data collection, and establishing operations (EO) (Keller & Schoenfeld, 1950; Michael, 1988).

DTT has been described in numerous research articles (Taubman et al., 2013), curriculum books (Leaf & McEachin, 1999), commentaries (Ghezzi, 2007; Smith, 2001), and book chapters (Lerman, Valentino, & LeBlanc, 2016). Researchers have demonstrated that DTT, when implemented as the sole intervention, has been effective in teaching a variety of skills including, but not limited to, receptive labels (DiGennaro-Reed, Reed, Baez, & Maguire, 2011), expressive labels (Conallen & Reed, 2016), question asking (Ingvarsson & Hollobaugh, 2010), play skills (Nuzzolo-Gomez, 2002), and social skills (Shillingsburg, Bowen, & Shaprio, 2014). DTT, implemented as part of a comprehensive behavioral model (i.e., with other ABA based procedures such as shaping, the teaching interaction procedure, and token economies), has also resulted in life altering changes (Lovaas, 1987; McEachin, Smith & Lovaas, 1993; Leaf et al., 2012).

Conventional DTT

DTT is commonly implemented in a fixed manner. This approach to DTT includes therapists following predetermined protocols and strictly adhering to "best practice guidelines" (Grow & LeBlanc, 2013) with little to no flexibility or individualization based upon the learner's responding. Recommendations of conventional DTT include, but are not limited to: A) providing simple instructions (e.g., "ball" rather than "Touch the ball"), B) not varying instructions across trials, C) adhering to one specific prompt type or prompting system and the fading thereof, D) avoiding extra stimulus prompts, E) favoring errorless learning and avoiding error correction, F) always taking trial-by-trial data, G) using a fixed progression such as massed trials to expanded trials to random rotation, and H) only teaching in a sterile/non-distracting environment. More recently, in an effort to prevent incorrect stimulus control, researchers have advocated for rigidly counterbalancing the order of target presentation and the placement of the target and the non-target stimuli within and across trials (Grow & LeBlanc, 2013)

Conventional DTT contrasts with a progressive approach to DTT in several ways. Therefore, the purpose of this paper is to provide some guidelines (i.e., recommendations and suggestions, not rules) on the implementation of DTT within a progressive model for individuals diagnosed with ASD. These guidelines are based upon current research and the authors collective years of clinical experience implementing progressive DTT with well over 5,000 individuals diagnosed with ASD. It is important to note that what is presented here are some of the guidelines we think are critical to a progressive approach to DTT, and

this is not meant to be an exhaustive list. Furthermore, readers should not take the guidelines as rules, but, rather, as considerations to be evaluated with each individual learner.

Guidelines to a Progressive Approach to DTT

One: Select Trial Targets and Placement of Stimuli Based Upon the Learner. A progressive approach to DTT does not strictly follow a counterbalanced set of trials or stimuli. The target for each trial should be determined based on a number of considerations, rather than a predetermined protocol prescribed to the therapist. One variable to consider when selecting the target for the next trial is learner responding on previous trials with the target. For example, if the learner has responded correctly on a few consecutive trials of the same target, it may be a good time to present a different target on the next trial. In the expanding trials method, the time delay and number of intervening distractor trials between trials of the target are systematically manipulated as a way of reducing the prompt effect that occurs when target trials occur consecutively. The instructor makes the decision about the order of presentation based on the learner's responses as they evolve. Adhering to a predetermined sequence of targets would prevent the instructor from using trial sequence as a means of fading the prompt effect.

Placement of the target and non-target stimuli within receptive label tasks should be done in a manner that does not lead to response patterns based on location of target within the array of choices. While strict counterbalancing can make it more difficult for learners to develop incorrect response strategies (e.g., a side bias), it is not necessarily the most effective nor efficient means of accomplishing this goal. Making location unassociated with the occurrence of reinforcement can be achieved through other means that may have advantages over strict counterbalancing. Also, counterbalancing can still lead to faulty stimulus control. For instance, if the target stimulus is counterbalanced in a manner that prevents the target from occurring two times in a row, the learner may learn to not respond the same way on the next trial. Second, if faulty stimulus control has already been established, counterbalancing may not establish the desired stimulus control. For example, if the learner selects the stimulus on the right on every trial, counterbalancing would result in 33% of trials ending in reinforcement. In contrast, a therapist free to assess and adjust in the moment can ensure 0% probability of reinforcement for the incorrect response pattern by never placing the target on the right.

In general, the selection of the target and placement of the target and non-target stimuli should be based on several different variables. Within a progressive approach to DTT the therapist should regularly assess these variables and make changes accordingly. Doing so can maximize learning and minimize the possibility of developing faulty stimulus control.

Two: Use Natural Language Instructions When Possible. Many instances of DTT involve the therapist presenting an instruction. For example, when teaching names of the individual's friends, the therapist may say, "Find Jim." Most researchers and clinicians would agree that instructions should be presented succinctly. However, there is much less agreement about how much and what type of language the therapist should use when presenting an instruction (i.e., the complexity of the instruction), for instance, when more complex/natural language instructions (e.g., "Where is Jim") or simple instructions (e.g., "Jim") should be used.

Some professionals have concluded that instructors should use the simplest possible language. For example, Green (2001) stated, "Another desirable practice is to limit the auditory stimulus to start each trial to the word to which one of the comparison is to be matched (e.g., 'spoon,' 'fork,' or 'knife') rather than starting each trial with a nominal instruction like 'Touch _____' or 'Point to _____.')" (p. 77). The rationale provided for

limiting the instruction is that it may be difficult for the learner to discriminate more complex instructions. Leaf and McEachin (1999) also recommended providing simple and concise instructions at the beginning stages of learning but go on to state, "As the student progresses, instructions should become more complex, and may be more wordy" (p. 133). Leaf and McEachin point out that providing more complex language may promote better generalization, prepares the student for incidental situations, models more natural language and makes the session more engaging to the student.

Within a progressive approach to DTT the complexity of instructions depends upon many variables. There is no black and white rule to always provide simple or more complex instructions. Additionally, a therapist might not always use simple instructions for younger learners or for learners who are new to therapy. Instead, the complexity of instructions should be regularly assessed and may vary across skills, targets, and individuals. There may be several conditions under which the therapist may choose to use a simple instruction (e.g., providing the instruction "Jim"). Some examples may include, when acquisition is slow, if the learner cannot sustain attending for longer periods of time, and if other aspects of the instruction begin to control responding (e.g., if "Touch" becomes the discriminative stimulus for selecting any picture in the array). Conversely, there may be several conditions under which the therapist may select a more complex or natural instruction. Examples may include learners with sophisticated or moderate verbal repertoires, working concurrently on expanding sustained attention, teaching to promote generalization, and structuring teaching in a way that mirrors typical learning environments. It is important for the therapist to regularly assess the form of instruction that will lead to the most efficient and effective learning. For example, if a learner is not responding correctly following several trials, the therapist could probe the effect of decreasing the complexity of the instruction on learner responding. In general, therapists should work toward providing natural language instructions (i.e., language that mirrors typical learning environments) as rapidly as possible to promote generalization and prepare the learner for more natural learning environments (e.g., by a teacher at school or by a parent).

Three: Vary Instructions As Soon As Possible. Another common recommendation of conventional DTT is to avoid varying the instructions for a given target (Grow & LeBlanc, 2013). For example, saying "Touch Ball" on every discrete trial as opposed to varying between "Touch the ball," "Find the ball," "Where's the ball" and "Point to the ball" across trials. As with the differing opinions on the complexity of instruction there are differing opinions about varying instructions; some professionals have put forth that the instruction should be the same from trial to trial (Ghezzi, 2007) while others say that the instruction could vary from trial to trial (Leaf & McEachin, 1999).

Instructions should be varied from trial to trial based upon several learner and environmental considerations. One consideration is how the learner responds to more complex instructions (described above). If acquisition is not slowed by more complex instructions the learner may be ready for varied instructions. However, if it has been determined that, currently, simple instructions are best for the learner, varied instructions may not be ideal. Another consideration is if generalization is a goal of the program. Varying the instruction in the early stages of learning may lead to slower acquisition, but more robust learning in terms of generalizability and maintenance. Ultimately, therapists should work toward providing varied instructions as they serve as multiple exemplars to promote generalization (Stokes & Baer, 1977), reduce learner boredom (Leaf & McEachin, 1999), and mirror instructions provided within other teaching environments.

Four: Use Flexible Prompt Fading. An optional step in any discrete trial is the teacher providing a prompt to the learner to increase the likelihood of a correct response (Lerman

et al., 2016). MacDuff, Krantz, and McClannahan (2001) defined prompts as "…auxiliary, extra, or artificial stimuli that are presented immediately before or after the stimuli that will eventually cue the learner to display the behavior of interest at the appropriate time or in the relevant circumstances" (p. 38). Two common classifications of stimulus prompts are within- and extra-stimulus prompts. Within-stimulus prompts alter some dimension(s) of the discriminative stimuli critical to the discrimination (e.g., making the bottom line in "E" larger for an "E" vs "F" discrimination). Extra-stimulus prompts are dimensions added to the discriminative stimuli (e.g., putting a circle around the correct stimulus) and can include: pointing to the correct response (Touchette & Howard, 1984), verbally stating the correct answer (Soluaga, Leaf, Taubman, McEachin Leaf, 2008), reducing the field (Soluaga et al., 2008), placing the correct response closer to the student (Soulaga et al., 2008), or physically guiding the student to the correct response (Leaf, Sheldon, & Sherman, 2010). Although researchers have demonstrated a variety of within- and extra-stimulus prompts to be effective (Schilmoeller, Schilmoeller, Etzel, & LeBlanc, 1979; Schimek, 1983; Touchette & Howard, 1984), some professionals have specifically recommended caution when using extra-stimulus prompts (Grow & LeBlanc, 2013). These recommendations have ranged from being judicious (Green, 2001) to recommending avoiding their use altogether for certain learners (Grow & LeBlanc, 2013).

Completely dismissing a prompt type ignores identifying the conditions under which a prompt is or is not effective, which does not align with a progressive approach to DTT. The therapist should be free to make in-the-moment assessments to determine which prompt type to use and when and how to fade that prompt, thereby not limiting therapists' implementation of any prompt type. However, a common approach to the use of prompts within conventional DTT is to use one specific prompt type, faded in one specific way, for one specific skill. For example, a therapist may implement most-to-least prompting with a vocal prompt (Leaf et al., 2014). Alternatively, he or she might implement no-no prompting, only providing a prompt after two consecutive errors (Leaf et al., 2010), but the therapist would not alternate between the two approaches.

In contrast to limiting the therapist to one prompting system, a progressive approach to DTT utilizes flexible prompt fading (FPF) (Leaf, Leaf, Taubman, McEachin, & Delmolino, 2014; Leaf et al., 2016; Soluaga et al., 2008). FPF is a prompting system which provides five general guidelines to the therapist. First, a therapist should be free to use any and all prompt types (e.g., physical, gestural, visual, positional, and reduction of the field) that may be effective for a learner on any given skill. Second, a goal to keep the learner responding correctly on about 80% of trials, using prompts as needed if the learner is not able to perform independently at that level of accuracy. The aim of 80% is not meant to be an exact target; the general goal is to have a reasonably high rate of success but probing frequently enough to ascertain likely the student is to respond accurately with a lower level of assistance. Third, the therapist should use the least assistive prompt possible while ensuring a correct response. Four, if unsure if the learner will respond correctly without a prompt, then prompt. Five, fade prompts as quickly as possible while keeping the learner successful.

A quick rule of thumb for the therapist is to ask, "Is the learner likely to get the next trial correct?" If the answer is yes, the therapist would elect not to provide a prompt. If, however, the answer is no, and the student is not likely to learn from an error, then the therapist needs to decide which type of prompt and what level of assistance to use. The therapist should then provide the least assistive prompt necessary. Additional variables for the therapist to consider may be the student's past history with the target skill, recent student responding (i.e., responding within the current teaching session), and the occurrence of aberrant behavior. Ultimately, FPF is a combination of all prompt types and

prompting systems. It is a system in which the teacher makes in-the-moment assessments to determine when to prompt, when to fade prompts, and what prompt to avoid.

FPF was the prompting system that was implemented as part of the UCLA Young Autism Project (Lovaas, 1987; Leaf et al., 2016). It was not until recently that FPF has been evaluated as a standalone prompting procedure as part of DTT (Leaf et al., 2014; Leaf et al., 2016; Soluaga et al., 2008). Soluaga and colleagues were the first to evaluate FPF, comparing FPF to a time delay prompt for five individuals diagnosed with ASD. The participants were taught sight words, math facts, sight letters, and to point to pictures of objects. Within this study the researchers limited the instructors to only using five prompt types (i.e., physical, gestural, visual, positional, and reduction of the field). The results of the study indicated both prompting procedures were near equally as effective, but the FPF condition required fewer trials to reach the mastery criterion making it the more efficient of the two.

Leaf and colleagues (2014) conducted a follow up study in which they compared FPF to error correction with four participants diagnosed with ASD. In this study the participants were taught how to label pictures of children cartoon characters. Unlike Soluaga et al. (2008), there were no restrictions on how the therapists implemented FPF. The results were similar to Soluaga et al. in that both procedures were effective but once again that FPF was more efficient prompting procedure. In a more recent study Leaf et al., (2016) compared most-to-least (MTL) to FPF for four individuals diagnosed with ASD. Participants were taught to label various pictures and the therapist was not restricted as to how he or she implemented FPF. The results showed both were effective although participants responded better during teaching with FPF and FPF was a more efficient procedure. Thus, the results on the research on FPF have shown it to be equally as effective as other commonly implemented prompting procedures, however, more efficient in terms of trials, sessions, and/or teaching time. Given the importance of implementing the most efficient procedures, a progressive approach to DTT would give strong consideration to FPF.

Five: Utilize Consequences to Teach Additional Skills. DTT has been described as a three-term contingency. This contingency consists of the therapist issuing an instruction, the learner responding, and the therapist delivering a reinforcing or punishing consequence based on the learner's response. Within this description only one behavior is learned. For example, if the therapist is teaching the label "ball" in the presence of a ball, the learner stating "ball" occasions reinforcement while all other responses do not. Eventually the learner comes to say "ball" with increasing accuracy in the presence of a ball. But, that is not where learning has to stop, and may not be the most efficient way to teach.

Recent research on instructive feedback suggests consequences can be more than just reinforcement and punishment (Nottingham, Vladescu, & Kodak, 2015). Instructive feedback involves "consistently presenting extra, non-target stimuli during the consequent events of instructional trials" (Werts, Wolery, Holcombe, & Gast, 1995, p. 56). For instance, in the aforementioned ball example the consequent event could consist of social praise (a presumed reinforcer) and additional information such as, "You bounce a ball!" Following an incorrect response in the same example could occasion the therapist to say, "No, this is a ball. You can bounce a ball." Delmolino, Hansford, Bamond, Fiske, and LaRue (2013) evaluated the use of instructive feedback across two experiments. In the first experiment instructive feedback was used within a one-to-one instructional formant with four individuals diagnosed with an ASD (5 to 13 years old). The second evaluated instructive feedback with two participants diagnosed with an ASD within a dyad format. Primary targets (i.e., labeling various pictures) were taught with a most-to-least response. Correct responses to the primary target (e.g., "pajamas") resulted in instructive feedback (i.e., the

secondary target) of a feature or function of the item (e.g., "wear to bed"). In the first experiment one of the four participants acquired the secondary targets, while in the second experiment both participants acquired the secondary targets without direct teaching.

In a more recent example, Leaf et al. (in press) evaluated the use of instructive feedback with nine children diagnosed with an ASD within a small group setting (i.e., three per group). Primary targets for each child in the group were independent (i.e., no child in the group was taught the same targets) and consisted of sports players or superheroes. Secondary targets were provided only within instructive feedback which followed correct and incorrect responses for the primary target. The results of a non-concurrent multiple-baseline showed that all nine participants learned their own primary and secondary targets, as well as the primary and secondary targets of other members of the group without direct teaching. Therefore, embedding instructive feedback within consequences can lead to more efficient teaching and the emergence of skills no directly targeted. As such, a progressive approach to DTT considers using instructive feedback within the consequent event of the contingency.

Six: Do not Blindly Avoid Error Correction. Within any given discrete trial a learner may make an error. While many teaching strategies are designed to prevent errors during acquisition, there is evidence that allowing the occurrence of errors can produce more efficient learning. When errors do occur, it is important that the learner contact appropriate contingencies, such as an error correction statement (e.g., "No that is not it," "Nope," or "Try again"). Error correction serves to highlight what the learner got incorrect and could promote the desired behavior change. Researchers have found error correction procedures to be effective in teaching a variety of behaviors to individuals diagnosed with ASD (Leaf et al., 2010; Leaf et al., 2014; Worsdell et al., 2005). Despite the effectiveness of error correction procedures, there have been some professionals recommending against allowing errors to happen out of concern that errors are associated with disruptive behaviors and that error correction procedures could make therapy aversive or hurt the self-esteem of the learner (Burk, 2008; Gast, 2011) Although some professionals have recommended against error correction, within a progressive DTT model, error correction is recognized as an important component of effective and efficient teaching.

There are some variables that must be considered with the use of error correction. First, the therapist should avoid utilizing a harsh tone or excessive volume with the learner; however, the therapist should ensure that the tone of the corrective feedback differs from that of instructions and praise. A second consideration is whether instructive feedback (described above) should be provided. If the task is relatively new, difficult, or requires a fine discrimination, instructive feedback may be desired to expedite learning. However, if the task is less difficult or if the learner responded incorrectly due to inattentiveness or other aberrant behavior (e.g., self-stimulatory behavior, self-injury, or non-compliance), then the therapist might refrain from providing instructive feedback as it could develop undesired patterns of responding (i.e., responding incorrectly first, receiving a prompt or the correct answer, and then responding correctly on the next trial). Finally, if faulty stimulus control is common for the learner, feedback should only address the primary target.

As with all of the guidelines discussed throughout this paper, the use of error correction should be determined on an individual basis. For some learners, a combination of errorless (i.e. proactive prompting) and error correction strategies may be the most effective, and for others a more trial-and-error approach (i.e. minimal proactive prompting) may be the most efficient. Ultimately, within a progressive approach to DTT

the therapist makes in-the-moment assessments to determine when and how to address errors.

Seven: Do Good and Take Data, (but on a Sliding Scale). A hallmark of any ABA based intervention is reliance on objective data collection (Baer, Wolf & Risley, 1968, 1987; Risley, 2001). The use of objective data allows therapists to evaluate the effectiveness of an intervention. Within DTT there are many types of data collection systems used to track a learner's progress. Some common data collection systems are trial-by-trial (Leaf et al., 2010), probe (Repp et al., 1976), and estimation (Taubman et al., 2013). Trial by trial data collection systems involve the therapist recording the learner's response on each trial. There are numerous types of probe data systems. For example, recording the learner's responses on the first trial, on the final trial, and at random times (e.g., momentary time sampling). Within an estimation data collection system, the therapist provides an approximation of the percentage of trials with correct responses, typically subsequent to completion of a series of trials. This is usually done by using a Likert scale (Taubman et al., 2013) and assigning different percentage ranges to the numbers on the scale.

Within a progressive approach to DTT data collection occurs on a sliding scale. At one end of the scale is trial-by-trial data and at the other, estimation data. Several variables contribute to selecting the data collection system that is the most appropriate for the learner and the skill. First and foremost, is the data system sensitive enough to show progress? If not, it may be appropriate to slide down the scale toward trial-by-trial data. Second, is the data system interfering with teaching? If the data system is so intrusive and involved that the opportunities for learning (e.g., learn units) (Greer, 1999) decrease or teaching momentum is lost, sliding up the scale toward estimation or probe data may be desired. DTT conducted in a group instructional format may also make the use of trial-by-trial data impractical. Third, is the data informing clinical decisions? Taking data for the sake of taking data does not help the learner or the therapist. The data should help inform changes to programming, targets, etc. Fourth, is the data system interrupting opportunities for social interactions? For example, if the therapist stopping at the end of a trial to mark data it may prevent delivering socially embedded consequences (Koegel, Vernon, & Koegel, 2009).

Eight: Teach Toward a Busy Environment. One common recommendation for DTT is to minimize distractions during teaching (Lerman et al., 2016). Minimizing distractions is common in early learning and then gradually faded as the learner progresses through programming with improvements in compliance and, attending (Lerman et al., 2016). However, it is not uncommon for DTT to be implemented in white wall settings or where a child is in a distraction free cubicle throughout the duration of the treatment program.

It is important to assess when a distraction free environment could and should be used. For example, if a learner has deficits in sustained attention in which various attending programs (e.g., providing reinforcement for attending) are not effective, a more distraction free environment may be desired. Otherwise it is recommended to have a child in environments that are representative of the student's natural environment. If a student is of preschool age then the environment should have posters of cartoon characters, sports, super heroes, or art projects. If a student is of high school age, then posters of presidents or maps would be more appropriate. Therapy should also occur where the learner is exposed to outside noise (e.g., traffic, children playing, people talking, etc.) as quickly as possible. This is done because quite simply people do not live, work, or play in distraction free environments and we have to prepare our students to be able to handle these distractions and learn in their presence.

Conclusion

DTT can result in life altering changes for individuals diagnosed with ASD (Lovaas, 1987; McEachin et al., 1993; Leaf et al., 2012). Researchers have demonstrated that the implementation of DTT can improve language, social, academic, and play skills. As such, DTT is commonly implemented for individuals diagnosed with ASD (Ghezzi, 2007). Today, unfortunately, DTT is typically applied in a conventional manner; in which therapists adhere to rigid protocols and are not free or encouraged to make in-the-moment assessments to determine adjustments tailored to children's individual needs and presentations. This paper provides some guidelines (i.e., how to present stimuli, how to provide the instructions, how to effectively prompt and fade prompts, how to use consequences to increase the rate of learning, how to measure behavior change, and what environment to work toward) of a progressive approach to DTT. There are other considerations, and the current list was not meant to be exhaustive, but, rather, a start.

Across all of the guidelines a few themes emerge. First, interventionists should not feel bound by inalterable rules. Rather, therapists need to make in-the-moment assessments to determine what, if any, changes should be made. As noted, for example, on any given trial, the therapist needs to consider whether to use simple or complex language, provide a prompt or not, and what would be the most appropriate and effective consequence. These decisions should occur on each trial and may be based upon many variables. One variable may be assessing the learner's performance in the current and past teaching sessions. Another potential variable is assessing attending and making changes based upon sustained or fleeting attending. Other potential variables include evaluating if the learner is engaging in interfering behavior, identifying the function of the interfering behavior, discerning how the interfering behavior is affecting learning, and determining if the selected consequence retains the desired impact, to name a few. Accordingly, a progressive approach to DTT requires a therapist to make constant and ongoing assessments of student responding and determine any changes based on those assessments.

Given the level of analysis required with this approach, therapists must be well trained in DTT as well as the principles of ABA. This level of training may take time and resources beyond what is needed if staff are robotically following step by step protocols. In our experience, it can require up to 600 hours of training to implement a progressive model of DTT independently. Thus, many may elect not to spend the time and money on training staff in this model, but, potentially run the risk of reducing children's rate of progress.

Two other points should be considered when training in a progressive approach is compared to mere instruction in protocols (Grow & LeBlanc, 2013). First, when staff are trained in a progressive model of DTT, training focuses on the development of generalized skills pertaining to the implementation of DTT in addition to the principles of ABA and fixed procedures. For instance, staff learn how to make in-the-moment assessments to determine the function of a behavior, employment of conditioned reinforcers, and the utilization of flexible prompt fading. Further these abilities can be utilized with other procedures such as the teaching interaction procedure, cool versus not cool, or incidental teaching. Thus, this training results in generalized skill sets that can benefit the implementation of other procedures and components of quality ABA. Second, the progressive model of DTT has resulted in life altering changes for individuals diagnosed with ASD (Lovaas, 1987; McEachin et al., 1993; Leaf et al., 2012). Although we use the term "progressive" this model was used as part of the UCLA Young Autism Project (Leaf, 2016) where DTT was first conceptualized for individuals diagnosed with ASD (Lerman et al., 2016). This model, when paired with other procedures, has been documented in research (Soluaga et al., 2008) and clinical practice (Leaf et al., 2011) resulting in children

developing sophisticated communication, meaningful relationships, and becoming indistinguishable from their peers. Therapists who use DTT during intervention with individuals diagnosed with an ASD have a tremendous responsibility, and therefore we should ensure that they receive intensive, comprehensive, and quality training.

This paper provides some current guidelines on how to implement a progressive model of DTT for individuals diagnosed with an ASD. Some of these guidelines are based on research and many years of clinical experience (e.g., flexible prompt fading), while some are based solely upon clinical experience (e.g., varying instructions). However, all align with the principles of behavior analysis. Nonetheless, future research should evaluate these guidelines, their various components and elements, as well as the effectiveness of the approach. Future researchers may also wish to compare a progressive model of DTT to the conventional model of DTT. We hope these guidelines help therapists improve upon the quality and effectiveness of DTT when working with individuals diagnosed with ASD.

Conflict of Interest

The first and second authors are employed by an agency that provides behavioral intervention, which include procedures similar to those discussed here, for individuals diagnosed with ASD. The third, fourth, and fifth author are directors of that same agency. The third, fourth, and fifth authors have commercial products for the procedures discussed here. It should be noted that all proceeds of these products are donated to non-for-profit agency to fund training, research, and dissemination of behavior analysis.

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