DISCRIMINATION TRAINING

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Teaching children with developmental differences to learn the differences between items can be tricky. The challenge is not with the child. The challenge is with us as teachers, instructors, parents, and therapists. As I am sure you can appreciate, we must have the proper tools to teach our learners with autism. While an errorless "transfer" procedure (Goldsmith et al., 2007) may prove useful at teaching some responses, others require a more systematic teaching procedure to reduce the likelihood of discrimination errors (i.e., not knowing the difference between one item and another). For example, when teaching Receptive Color Identification, where we teach a child to identify colors by touching or pointing to them, a child may identify "yellow" as "orange" or "black" as "white." How do you fix that? One of the tools that we should have at our fingertips is "discrimination training." This teaching procedure may fix discrimination errors and, if used proactively, may even help avoid them.

One of the past criticisms of discrimination training is that the first steps require the instructor to present a specific stimulus (e.g., object or instruction) in "isolation," or free of distracters in the field (i.e., on the table by itself). The argument is, "There is no discrimination occurring," which is correct at that initial phase! The initial steps call for the presentation of a stimulus to create an S^D.

Lovaas (2003) argued that when teaching discriminations to children that the first step was always to create the S^D, but what is an S^D? It is a " discriminative stimulus," represented by a capital "S," which is a "stimulus" that is "discriminative." Why is the first step the creation of the S^D? What does an S^D do? It "signals" that reinforcement is available. What if a learner has never seen the object or heard the instruction before? Its presence (i.e., the object) or delivery (i.e., the instruction) most likely would not signal that reinforcement is available. In other words, this new item or instruction would not hold any specific meaning and would probably not lead to any particular behaviors; hence, the first step is always to create the S^D (Lovaas, 2003).

To begin creating the S^D, the instructor places an individual item on the table by itself (in isolation). The instructor can present their instruction, prompt the learner to respond correctly, and then differentially reinforce responses (e.g., match the quality of the response to the magnitude of the reinforcement) until the learner is responding independently. The quality of the response involves the immediacy of it following the instruction's delivery, the speed at which it is completed, and the level of independence for the target response. For example, if you present a learner with pictures of a car, a truck, and a motorcycle, and then say, "Touch the car," the learner may start moving his hand to the truck and then move his hand to touch the car. It is excellent that the learner self-corrected, but self-correcting was not what we were looking for, so we may say, "That was good finding the car." Next, you switch the pictures on the table and tell the learner, "Touch the car." The learner quickly touches the picture of the car. Immediately you

say, "WOW! That was so super-fast finding the car! Awesome!" and then high-five the learner. In this example, the first response was correct, but not exactly what we wanted; therefore, the learner received "some" enthusiastic praise. The second attempt was a quick, accurate response, therefore your affect changes dramatically, your voice is louder, and you include the high-five. In other words, the learner received "more" reinforcement for the quick and correct response. The type of reinforcement delivered for correct responding varies across learners, including things like praise, high-fives, breaks, access to preferred activities, etc. To differentially reinforce, simply remember to give more, or better, reinforcement for better responses (Vladescu & Kodak, 2010).

Using differential reinforcement will help establish that the item's presence on the table (S^D2, e.g., the picture of the car) and the vocal antecedent (S^D1, e.g., "Touch the car") are both S^Ds that - when combined - indicate that reinforcement is available for identifying the item (e.g., touching the car) and "teaches learners to identify the relevant aspects of the teacher's instructions" (Lovaas, 2003). To be clear, the combination of the two S^Ds is required so that they become one whole S^D that indicates that reinforcement is available for responding in a specific way. For example, if a card is on the table, the learner should not touch it until the instruction "Point to the (item)" is presented. Often, learners begin to respond before the completion of the S^D. When this occurs, the instructor should stop talking, prompt the learner to return their hands to a neutral position, reestablish attending, and re-present the S^D. Waiting for the entire S^D to be completed before responding will increase the likelihood of the learner making the correct discrimination. Also, the complexity of discrimination will continue to increase as the learner achieves higher-level skills. Therefore, teaching the learner to wait for the completion of the entire S^D prior to beginning a response is necessary.

Once the learner is quickly and accurately identifying the first item upon the presentation of the card and the vocal antecedent, this target item will simply be referred to as "S^D1: Car," Then, it is time to condition the second stimulus as an S^D. Here, it may be "S^D2: Airplane," which will follow all the same steps for establishing the stimulus and pairing the response with differential reinforcement. Finally, the instructor will intersperse the two S^Ds until the learner responds correctly with mastery (e.g., with 90-100% independent correct responding for both the car and airplane when presented in random order). Note: You may use a blank card, an unrelated item, etc.

When targeting expressive responses, the teaching sequence can be the same as the receptive teaching sequence described above and below. One way to keep the teaching sequence the same is to use a receptive to expressive transfer procedure (Goldsmith et al., 2007). For example, if you're teaching expressive Action Labels, place three pictures on the table of people performing actions mastered as receptive responses. Then say, "Touch running." The learner will then touch the image of the person running. Instead of delivering reinforcement for that response, hold up the picture and say, "What is the person doing?" The learner should then say, "running." Using the receptive response to teach the expressive response will allow you to maintain the receptive response and use a previously acquired response to teach a new response.

The full outline of the discrimination training teaching procedure is described below, exemplified by teaching a learner to discriminate between three household items. The examples below are "Touch…cup" as S^D1, "Touch…toothbrush" as S^D2, and "Touch…shoe" as S^D3. *Please note that the "…" between the "Touch" and the name of the item indicates a slight pause between the presentation of the two words.* Also, the name of the item should be stated slightly louder than the word "Touch."

NOTE: MODIFICATIONS TO THE PROCEDURE ARE REQUIRED WHEN TEACHING EXPRESSIVE LANGUAGE PROGRAMS.

> **Keywords:**
> **Field:** A completely blank area, such as a desk or table.
> **Target Stimuli:** The physical item you are teaching (e.g., color card, action label card, etc.).
> **Mass Trials:** Consecutive trials of the same response with or without prompting and prompt fading.
> **Distracters:** Items placed in the array that the learner may or may not know.
> **Neutral Distracters:** Items placed in the array that the learner does not know.
> **Isolation:** The only thing on the top of the table.

Note: The learner should touch the item independently five consecutive times when the new item is in isolation. Then, when the target is with distracters, the learner should independently touch the item three consecutive times. When the target item is in isolation, the goal is to create an "S^D." Five is not a "magic number"; instead, it may increase the likelihood that the target item's presence may signal that reinforcement is available. Three consecutive independent/correct responses are required in specific later steps to demonstrate that the learner is starting to make the correct discriminations.

1. Mass Trial S^D1: "Touch…cup."
- Place the cup in the field with no distracters.
- Say, "Touch…cup." Prompt and fade the prompts across trials. Provide differential reinforcement for all responses.
- Change the position of the cup in the field on every trial. Move the cup in multiple locations on the table (the corners, the middle, any spot within reach); this will cause the learner to look for the item, reach for it, and vary the effort to respond.
- Repeat until the learner has responded five consecutive times correctly and independently. Go to step 2.

2. S^D1: "Touch…cup" with "neutral" distracters
- Place two unknown/neutral items in the field with the cup.
- Present the S^D: "Touch…cup" and prompt immediately, fade prompts over successive trials. Do your best to prevent the learner from making errors. While fading prompts if the learner is about to respond incorrectly, immediately guide them to the correct response. Then, begin fading prompts again, provide differential reinforcement for

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prompted responses, and the most reinforcement when the learner responds independently.

- Change the position of the target response every trial. Fade prompts until the learner responds correctly/independently across three consecutive trials. Go to step 3.

3. Mass Trial S^D2: "Touch…toothbrush."

- Place the toothbrush (i.e., target stimulus) in the field with no distracters.
- Say, "Touch…toothbrush." Prompt the responses and fade prompts across trials. Deliver differential reinforcement for all responses.
- Switch the position of the item in the field on every trial.
- Repeat until the learner has responded five consecutive times correctly/independently. Go to step 4.

4. S^D2: "Touch…toothbrush" with "neutral" distracters

- Place two unknown/neutral items in the field with the target response.
- Present the S^D and prompt immediately. Fade prompts over successive trials. Provide differential reinforcement for all responses.
- Switch the position of the target response every trial. Fade prompts until the learner responds to three consecutive trials correctly/independently. Go to step 5.

5. S^D2: "Touch…toothbrush" in the presence of S^D1 asking for S^D2 only

- Place the cup (S^D1) and the toothbrush (S^D2) in the field with one neutral distracter between the two target stimuli.
- Present the S^D for this step: only ask the learner to touch the toothbrush   . Switch the position of the toothbrush (S^D2) and the other stimuli in the field every trial. Fade prompts across trials until the learner responds to three consecutive trials correctly/independently.
- Be sure to provide differential reinforcement for all responses. Go to step 6.

6. S^D: "Touch…cup" in the presence of S^D2 asking for S^D1 only.

- Place the cup (S^D1) and the toothbrush (S^D2) in the field with one neutral distracter between the two target stimuli.
- Just as in the previous step, but with the opposite S^D. Present the S^D for the task: only ask the learner to touch the cup and prompt immediately. Provide differential reinforcement.
- Switch the position of the target (S^D1) and the other stimuli in the field every trial, and fade prompts until the learner responds three consecutive trials correctly/independently. Go to step 7.

7. S^D1 in the presence of S^D2 asking for S^D1 and S^D2 in fixed positions (randomizing the target asked for)

- Place the cup (S^D1) and the toothbrush (S^D2) in the field with one neutral distracter between the two target stimuli.
- Present the S^D for the task. DO NOT switch the positions of the targets (S^D1 and S^D2) and the other stimuli in the field; they must stay in fixed positions so the learner can

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practice a less effortful discrimination. Fade prompts until the learner responds with 90-100% independent/correct responding across two consecutive teaching sessions. Go to step 8.

8. S^D1 in the presence of S^D2 random rotation of target asked for and position in the field.
- Place S^D1 and S^D2 in the field with one neutral distracter between the two target stimuli.
- Present the S^D for the task. Switch the targets' position (S^D1 and S^D2) and the neutral distracter in the field every trial. Fade prompts until the learner responds with 90-100% independent/correct responding across three consecutive teaching sessions and at least two instructors (when possible).
- Once the learner has achieved the criteria, S^D1 and S^D2 will be mastered and should be maintained in separate sittings (from the practice of S^D3) at 90-100% independent/correct responding. Go to step 9.

9. Once S^D1 and S^D2 are mastered, introduce S^D3: "Touch…shoe" using the same sequence as noted for S^D1 and S^D2.
- Mass trial S^D3, no distracters
- Mass trial S^D3 with neutral distracters
- Place S^D3 in the field with S^D1 and S^D2 and ask for S^D3 only. Switch positions of the target every trial.
- Place S^D3 in the field with S^D1 and S^D2 and ask for any of the target responses but DO NOT SWITCH THE POSITION OF THE TARGET RESPONSES. Fade prompts until the learner responds with 90-100% independent/correct responding across two consecutive teaching sessions.
- Place S^D3 in the field with S^D1 and S^D2 and ask for any of the target responses SWITCH THE POSITION OF THE TARGET RESPONSES every trial. Fade prompts until the learner responds with 90-100% independent/correct responding across two consecutive teaching sessions, at which point S^D3 will be considered mastered.

One thing to remember is that some learners will be moving forward and backward through this teaching procedure. In other words, your learner may be working on step 7 and suddenly demonstrate consistent incorrect responding. When this happens, you can change the prompts and/or try fading prompts more slowly. I prefer to go back to the previous level of success in the procedure and then start moving forward again.

Establishing Instructional Control
Before implementing teaching, you must establish instructional control (Falcomata et al., 2008). I am referring to your ability as a teacher, parent, or therapist to deliver instructions to the learner that they respond to readily to demonstrate that they are sitting, attending, have their hands in a neutral position, and are free of non-contextual motor movements or non-contextual vocalizations. When learners have histories of engaging in these behaviors to avoid demands or these behaviors are present because the effort to teach appropriate replacement behaviors has not been exerted, they are less likely to offer their best effort. Before engaging your learner in discrimination training, be sure that you have established a history with your learner of

contacting reinforcement at a rate and/or magnitude that offsets the value of engaging in these behaviors. For example, when starting teaching at a table or desk, the instructions, "come here," "sit down," "fold your hands," and similar instructions should have been mastered during a Receptive Instructions program. Suppose these instructions were not mastered before implementing teaching at a table or desk. In that case, reinforcement should be delivered specifically for these behaviors with demands systematically faded into the teaching session to establish instructional control. Here is an example:

a. Instructor says to the learner, "Come here, please." The learner walks to the instructor, receives social praise as well as something tangible, is then instructed to leave the table, then the teacher plays with the learner.

b. Next, the instructor says, "Come here, please." The learner walks to the instructor, receives social praise and something tangible, and is then instructed to "sit down, please." The learner sits, more enthusiastic reinforcement is delivered, and then the learner is instructed to leave the desk. The teacher then returns to playing with the learner.

c. Next, the instructor says, "Come here, please." The learner walks to the desk, receives social praise with something tangible, and is instructed to "sit down, please." The learner "sits," more enthusiastic reinforcement is delivered, and then the instructor says, "Fold your hands" in a neutral tone. The learner folds her hands for a few seconds. The instructor provides enthusiastic praise, something tangible, and then returns to playing with the learner away from the desk.

d. Next, the instructor says, "Come here, please." The learner walks to the desk and is instructed to "sit down, please." The learner sits, enthusiastic reinforcement is delivered, and then the instructor says, "Fold your hands" in a neutral tone. The learner folds her hands for a few seconds. Then, the instructor delivers enthusiastic praise, something tangible, and then returns to playing with the learner away from the desk.

Over time, across many opportunities to practice, reinforcement is systematically faded as the learner walks to the desk, sits, folds their hands, and looks at the instructor. Then reinforcement is delivered at the desk, and the first demand is given. The number and complexity of demands are then systematically increased until the learner is seated at the desk and engaged in teaching for short time intervals. A critical component of establishing instructional control is having fun with the learner at the desk *and* away from the desk. Once your learner knows that you are fun and that you have great activities or toys for them, the value of your presence increases and should offset the value of interfering behaviors. Then, you have established instructional control (Henley et al., 2016).

Prompting
During discrimination training, you can select either "most-to-least" or "least-to-most" prompting (Cooper, Heron & Heward, 2019). Here is a hierarchy of prompting from Most intrusive to least intrusive;
4. Full physical guidance.
- The instructor physically guides the learner to emit the correct response.

3. Partial physical guidance.
- The instructor may nudge the learner's elbow or hand to guide her to the correct response.

2. Modeling
- The instructor performs the correct response, and the learner imitates the instructor's model.

1. Visual Prompt
- The instructor uses a picture, gesture, or positional cue to facilitate the learner emitting the correct response.

Avoid delivering vocal prompts after the initial instruction. For example, if you present a learner with the pictures of a red car, blue car, yellow car, red truck, blue truck, and a red house and then say, "Touch the red car," if the learner reaches for the red truck do not say, "The car" or provide additional vocal feedback to signal to the learner that they should change their response. Instead, provide light physical guidance before the error occurs to facilitate the correct response. Also, prompts should be delivered immediately following the instruction's presentation and faded to facilitate independent responding (Mueller, et al., 2007), not after an error has been made. For example:
a. "Touch the blue car" the instructor then provides light physical guidance to facilitate the correct response.
b. The learner responds correctly with the prompt, and the instructor delivers social praise.

Other forms of prompting include simultaneous prompting (Akmanoglu-Uludag & Batu, 2005) and time-delay procedures (Walker, 2008; O'Neill et al., 2020). Simultaneous prompting is used to significantly reduce and potentially eliminate errors. It involves the use of a controlling prompt (i.e., a prompt that results in the learner making a correct response 100% of the time) immediately following the instruction. Thus, the learner has no opportunity to err and always accesses reinforcement (Leaf et al., 2010). With time-delay procedures such as progressive time delay, always start with a 0-second delay. After a predetermined number of trials with a 0-second delay, the time between the instruction and prompt is gradually increased until a maximum delay interval is reached (Walker, 2008).

Reinforcement
When implementing discrimination training, it is vital to deliver a magnitude of reinforcement that matches the quality of the learner's response (Trosclair-Lasserre et al., 2008). In other words, a larger amount of something edible or maybe a more extended break to play on the floor; these reinforcers will only be delivered when the learner responds correctly and independently. When you provide prompts to the learner, the consequence for a prompted response could be a high-five or simply enthusiastic praise and a pat on the back, but not the highest value reinforcer or greatest magnitude of reinforcement. The essential component of reinforcement is to know what actually functions as a reinforcer for your learner. Remember, a reinforcer is defined by its effect on the learner's behavior; it should increase the likelihood that the behavior that preceded its delivery will occur again. Conducting frequent preference assessments should be standard protocol.

Problem Solving

You may be following the discrimination training procedure perfectly, and yet your learner is not successful. Remember that is not the fault of the learner but an issue with the teaching. So, what to do next? The first thing is to return to the previous level of success. For example, if the learner is making consistent discrimination errors during step 4, return to step 3, shape up the behavior again, and then re-introduce step 4. You may also want to review the kind of prompt used to facilitate the correct response. You may need to use a more intrusive prompt if a less intrusive prompt is not facilitating the correct response. Some learners will develop a reliance on prompts to respond correctly; therefore, when prompts are removed, the learner may not be responding or is consistently incorrect. When this occurs, the focus should be less on discrimination training and more so on reducing and potentially eliminating prompt dependency. Sometimes, changing the stimuli can yield positive results. There may be something idiosyncratic about the picture or object that is being presented, so you may get better results by using a different representation of the target response (e.g., instead of a blue paper cup with flowers on it for the target "cup," use a plain white paper cup). Also, be sure to brainstorm with a colleague what the challenge with the procedure may be. After all, two heads are better than one!

Conclusion

The ability to make the correct discriminations is critical to the success of our learners with autism. Discriminations will be as fundamental as learning to make the sound "vroom" when playing with a car instead of when playing with a train or responding correctly when instructed to "Put the little blue square next to the big red circle." It can be as complex as knowing the difference between a "stranger" versus a "family member," and responding appropriately to these different people's presence. As instructors, teachers, and therapists, we must be proficient at teaching discriminations to our learners so that they, in turn, can go on to make the necessary discriminations when we are not there to guide them.

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