DIFFERENTIAL REINFORCEMENT

A PRACTICAL GUIDE

About the Author

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Amelia Dalphonse is a Board Certified Behavior Analyst (BCBA), having earned a Master's in ABA from Ball State University in Muncie, Indiana. She has been working with learnerren since receiving her Bachelor's in Early learnerhood Education in 1996, and has been working specifically with learnerren with autism since 2009. Her passion is helping learnerren with autism and their families meet their full potential. You can find the story of how she became involved with learnerren with autism at https://masteraba.com/about.

Together with her twin sister, Dianna Kelly, she runs Master ABA to provide the support professionals are so often missing in the field. Dianna has a passion for learning, teaching, writing and helping others that have been instrumental in the success of Master ABA.

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DIFFERENTIAL REINFORCEMENT

INTRODUCTION

Applied Behavior Analysis (ABA) has many tools in the behavior toolbox but one of the most important is reinforcement, including differential reinforcement.

Differential reinforcement (DR) is an intervention that reinforces one topography of behavior while withholding reinforcement for other topographies. The intervention strengthens the desired behavior while simultaneously weakening target behavior.

Six varieties offer options for behaviors to reinforce:

- ✓ Differential Reinforcement of Other Behavior (DRO)
- ✓ Differential Reinforcement of Alternative Behavior (DRA)
- ✓ Differential Reinforcement of Incompatible Behavior (DRI)
- ✓ Differential Reinforcement of Lower Rates of Behavior (DRL)
- ✓ Differential Reinforcement of Higher Rates of Behavior (DRH)
- ✓ Other Differential Reinforcement (DR) Strategies

DIFFERENTIAL REINFORCEMENT

Differential reinforcement is well supported in the literature and has been determined to be an evidenced-based intervention (Wong et al. 2015). DR has a wide range of applications with different populations and within different settings.

Differential Reinforcement (DR) procedures are a cornerstone of ABA, offering a variety of options to tilt the behavioral balance in favor of more adaptive, desired behaviors. Leveraging DR, you value one behavior over another.

The beauty of DR lies in its versatility. It can reinforce a wide variety of behaviors along different dimensions of the behavior and can be applied with or without extinction. Each DR procedure you choose is more than a technique; it's a bridge towards greater autonomy, dignity, and quality of life for your learners.

Example: You are working with a learner, Jenny, who completes writing worksheets correctly, but often does so slowly, creating a situation where she takes her work home at night to finish in addition to her other homework.

You decide to differentially reinforce more rapid responses over slower responses (DRH).

She often takes 20 minutes to complete a simple writing worksheet. You decide to provide a stronger reinforcer any time she finishes a worksheet in under 15 minutes.

Even within this procedure, there are variations you can make to accommodate the needs of your learner. For example, if you're using a token economy system, you can provide 2 tokens for rapid responding and only 1 token for a correct response that is done slowly. This type of procedure reduces frustration on your learner's part over not providing any reinforcement for slow responding.

DIFFERENTIAL REINFORCEMENT

IMPLEMENTATION

There are 6 basic steps you will use when implementing a differential reinforcement procedure.

Some steps will look different depending on the specific DR procedure you choose, but the steps below provide the foundation for implementation. These steps help ensure the effectiveness of the intervention.

1.Define the target behavior.
2.Identify the function of the behavior either through a functional behavior assessment (FBA) or a functional analysis (FA).
3.Choose a functionally equivalent replacement behavior.
4.Determine whether you will use extinction or continue to allow the target behavior to achieve some form of reinforcement.
5.Define your procedures.
6.Train the interventionist.

Although traditional DR procedures don't necessarily include identifying the function of the behavior, the research has demonstrated that the intervention is more effective when the replacement behaviors address the function of the target behavior.

A study by Carr et al. (1990) found that DRI procedures that utilized incompatible behaviors that were functionally related to the target behavior resulted in the best outcomes. Given the extensive research on functionally equivalent replacement behaviors, it seems prudent to include identifying the function as a critical step in your DR procedure.

DIFFERENTIAL REINFORCEMENT

Types of DR

DIFFERENTIAL REINFORCEMENT OF OTHER BEHAVIOR (DRO)

DIFFERENTIAL REINFORCEMENT OF ALTERNATIVE BEHAVIOR (DRA)

DIFFERENTIAL REINFORCEMENT OF INCOMPATIBLE BEHAVIOR (DRI)

DIFFERENTIAL REINFORCEMENT OF LOWER RATES OF BEHAVIOR (DRL)

DIFFERENTIAL REINFORCEMENT OF HIGHER RATES OF BEHAVIOR (DRH)

OTHER DIFFERENTIAL REINFORCEMENT (DR) STRATEGIES

DIFFERENTIAL REINFORCEMENT

Choosing a Procedure

Which DR will you choose?

As with any intervention, you must choose interventions that are supported by research and fit your specific situation. One type of differential reinforcement will be appropriate for some learners or behaviors and not others. Consider factors such as:

- The skill of the interventionist
- Reinforcers available to your learner
- The severity of the target behavior
- Information available in the research
- Your learner's reinforcement history
- Other competing contingencies

Keep these factors in mind while reading about each of the DR procedures in the rest of this guide. There is never just 1 right answer.

Differential Reinforcement of Other Behavior (DRO)

DIFFERENTIAL REINFORCEMENT

DRO

Differential reinforcement of other behavior is a behavior reduction procedure. The terminal goal when implementing DRO is typically to eliminate the behavior entirely.

It is different than other DR procedures in that it doesn't teach a replacement behavior. DRO is a time-based intervention. For this intervention, you reinforce the absence of the target behavior. Ultimately this results in a decrease in the target behavior over time as the learner learns that there is a delay to reinforcement when the behavior occurs.

Research has demonstrated the effectiveness of Differential Reinforcement of Other Behavior to reduce challenging behaviors such as:

- SELF-INJURIOUS BEHAVIOR
- PICA
- AGGRESSION
- THUMB SUCKING
- DISRUPTIVE BEHAVIOR
- HYPERACTIVITY

DRO

TYPES OF DRO

Repp, Barton and Brulle (1983) described 2 main types of DRO procedures: interval and momentary, although there are some variations you may also choose to add (i.e.fixed or variable intervals). The best type of procedure depends on your specific situation and impacts your outcomes.

WHOLE-INTERVAL DRO :

Whole-interval DRO procedures provide reinforcement when the behavior does not occur for the entire interval.For these procedures, set the timer for the specified amount of time and provide reinforcement only if the behavior did not occur during that period of time. You may require that the interval be entirely reset or that the learner simply wait for the end of the following interval to receive reinforcement.

If the behavior occurs, you have 2 choices: reset the interval once the behavior stops or wait until the next specified interval. The choice is made at the onset of intervention and remains consent throughout treatment.

MOMENTARY DRO:

Momentary DRO is an interval method with some important differences from whole-interval DRO. For momentary DRO set the timer for the specified amount of time and if the behavior is not occurring at the moment the timer goes off, then deliver reinforcement.

The major disadvantage to this method is clear: you run a very high risk of providing reinforcement even if the behavior occurred extensively throughout the interval. By shortening the interval, you begin to mitigate this concern. The advantage is the ease of use of this system. It can be easily implemented in busy environments when 1:1 support is unavailable.

Whole Interval DRO	Momentary DRO
Reinforcement dependent on behavior across the entire interval	Reinforcement dependent on behavior at a specified moment in time
Requires continuously watching for behavior to occur	Requires looking for behavior at the specified time
Fixed or variable interval	Fixed or variable interval
Reset the interval if the behavior occurs	Withhold reinforcement if the behavior occurs

DRO

Response to Target Behavior

How interventionists respond to target behavior depends, in part, on whether you use whole-interval or momentary DRO. Another important factor is whether you include extinction as part of your procedure.

Extinction is withholding reinforcement for a previously reinforced behavior. For example, your learner hides under pillows when asked to brush his teeth. When you implement extinction, he is no longer allowed to escape the demand. Staff remove the pillows and present the toothbrush where he is.

You must use extinction with caution. While extinction is not technically a punishment procedure because no stimuli are presented or removed, in many situations it may require special approval prior to implementation (i.e by the local disabilities rights commission).

An extinction burst often occurs when extinction is introduced. An extinction burst occurs when the learner's behavior increases in frequency, intensity or duration following the implementation of extinction.

Prior to implementing extinction, ensure that your interventionists are prepared to tolerate these more intense behaviors. If they respond during an extinction burst, the result is a strengthening of the learner's more intense behavior through a variable schedule of reinforcement, making it very resistant to change. If there is any chance that the behavior will be reinforced, do not implement extinction.

DRO

Alternatives to Extinction

Alternatively, you can choose to allow the behavior to result in a lesser form of reinforcement and use stronger forms of reinforcement in the absence of the behavior. This strategy relies on the Matching Law to shape behavior.

The Matching Law describes how individuals allocate their behavior towards different sources of reinforcement that are available in the environment. According to this law, the proportion of responses matched to a particular choice is typically proportional to the proportion of reinforcements obtained from that choice.

In essence, the Matching Law suggests that the rate of a particular behavior will follow the rate of reinforcement received for that behavior, reducing reliance on extinction during DR procedures. This law is commonly expressed as:

“Behavior goes where reinforcement flows.”

This concept is particularly useful in DR procedures, as it offers insights into how competing reinforcement schedules can affect where and how often behaviors are exhibited. By understanding the matching law, practitioners can better shape behaviors and design interventions by manipulating reinforcement schedules to encourage desirable behaviors over less desirable ones.

For example, if your learner hides under the table, she can escape tooth brushing temporarily, but ultimately must brush her teeth for the full 2 minutes. If she does not hide under the table, she must only brush for 30 seconds. In addition, she will have access to the reinforcer determined by the DRO procedure.

While extinction can be powerful, use it carefully. Consider all your options before including it in your plan.

DRO

Implementation

When writing your implementation plan, you must decide if you will include:

1. A whole interval (with or without resetting the interval) or momentary DRO procedure
2. A fixed or variable interval
3. Extinction

Example

You are working with Peter, a 7-year-old diagnosed with autism. Peter is very verbal and uses profanity in his everyday language. This has become so problematic at school that he has been removed from the classroom.

Based on FBA data, you have hypothesized that being removed from the classroom may be reinforcing the behavior.

You decide to implement a whole interval DRO with interval reset to reinforce the absence of cursing. You decide you will use a fixed interval with extinction. Your baseline data tell you that he rarely goes longer than 30 minutes without cursing. You set your initial criteria at 25 minutes to ensure he experiences success.

During implementation, your interventionist sets the timer for 25 minutes. If Peter does not swear during the interval, he earns 5 minutes away from the classroom, typically in the form of a walk or a visit to a neighboring classroom.

If Peter swears, the interventionist resets the interval to 25 minutes without calling any attention to the behavior. Peter remains in the classroom and all activities continue as though the behavior did not occur.

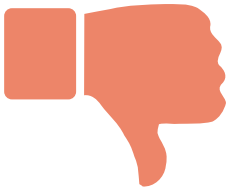
If he swears when there's 23 minutes left on the timer, the interventionist resets the interval to 25. If he swears when there's only 1-minute left on the timer, the interventionist resets the interval to 25 minutes.

You can see in this example that the intervention, although often effective, does not teach a replacement behavior. When using DRO, it's important to use it as part of a treatment package that includes an intervention that will teach the learner how to get what he wants.

In this example, we might also include functional communication training and teach Peter to ask to be removed from the classroom.

Advantages and Disadvantages of DRO

According to Vollmer, Iwata, Zarcone, Smith, and Mazaleski (1993), DRO is one of the most widely used interventions for reducing problem behavior (although this has likely changed since that study was released). As with anything, this procedure offers some risks and benefits that you must evaluate prior to implementation. Use DRO only once you carefully consider the advantages and disadvantages and you determine that the advantages outweigh the disadvantages.



DRO procedures are widely implemented in the field of ABA. Experienced professionals account for the risks associated with the intervention through the development of a comprehensive treatment package. DRO offers 3 primary benefits over other behavior reduction interventions:

- Easier to implement than other DR procedures
- Directly addresses the problem behavior
- Can use the reinforcer that maintains the problem behavior (i.e. attention, escape, etc.) (Vollmer, Iwata, Zarcone, Smith, & Mazaleski, 1993)

Despite these advantages, DRO has some important disadvantages that you have to account for if you plan to use it in your treatment package. Keep the following in mind when making your decision:

- You risk reinforcing behaviors not targeted by the intervention
- Does not teach an appropriate replacement behavior
- Requires a strong reinforcer
- Requires watching for every occurrence of the behavior if using an interval DRO

DRO

When to Use DRO

As with any intervention, you must choose interventions that are supported by research and fit your specific situation. Differential Reinforcement of Other Behavior will be appropriate for some learners or behaviors and not others.

Consider factors such as:

- The skill of the interventionist
- Reinforcers available to your learner
- The severity of the target behavior
- Information available in the research
- Your learner's reinforcement history
- Other competing contingencies

DRO is a behavior reduction procedure. By providing reinforcement only when the behavior does not occur, you ultimately delay reinforcement when the behavior does occur. This lower rate of reinforcement following the target behavior leads to the decrease.

As stated earlier, to be most effective, you must include a plan to teach a functionally equivalent replacement behavior in your intervention package. Using DRO alone will result in a reduction of the target behavior, but you might see a different undesired behavior take its place.

Use DRO:

- You have inexperienced interventionists
- You want to directly address the behavior
- You have minimal time for training
- Your client has strong motivation for a limited number of potential reinforcers
- There are competing contingencies that make implementing a DRI or DRA impractical

Avoid DRO:

- The child engages in a variety of challenging behavior
- You want to use only 1 intervention
- The child engages in a dangerous behavior you won't include in the DRO
- Your staff have experience with other DR procedures that include a component for teaching a functionally equivalent alternative behavior

DRO

Example of a Written Procedure

Differential Reinforcement of Other Behavior (DRO):

1. Offer Liam a visual menu of preferred items he can work for (i.e. bubbles, iPad, etc.).
2. Staff should set a timer for the prescribed step (see below).
3. At the end of every interval that Liam is free of target behaviors (i.e. aggression as defined above), staff should present verbal praise (i.e. "Great job having a safe body! You're doing awesome!") along with the item selected in step 1. Staff should set the time for the prescribed R+ interval (see below). If Liam selected an edible, the R+ interval ends once the edible is fully consumed.
4. If Liam engages in a target behavior, immediately stop the timer. Provide as little attention as possible while monitoring for safety. Do not respond verbally. It's important that staff present a calm demeanor and neutral facial expression/body language when Liam is escalated. Once at baseline, reset and restart the timer.
5. When the timer signals the end of the R+ interval, Liam should return to his regular activities.
6. Repeat steps 1-5

Step	DRO Interval	R+ Interval	Step	DRO Interval	R+ Interval
1	5 minutes	1 minute	5	9 minutes	3 minutes
2	6 minutes	1 minute	6	10 minutes	3 minutes
3	7 minutes	2 minutes	7	11 minutes	4 minutes
4	8 minutes	2 minutes	8	12 minutes	4 minutes

Criteria to increase step: *Two consecutive days with fewer than 4 incidents of target behavior.*

Criteria to decrease step: *Four consecutive days with more than 6 incidents of target behavior.*

Considering Other Interventions

Vollmer, Iwata, Zarcone, Smith and Mazaleski (1993) conducted a study comparing the effects of noncontingent reinforcement (NCR) and Differential Reinforcement of Other Behavior. The intent behind the study was to determine if noncontingent reinforcement could serve as an alternative to DRO and if that intervention assuaged the disadvantages of DRO.

The authors found both interventions were effective, possibly due to the relationship between the selected reinforcer and the identified function of the target behavior. NCR did in fact avoid some of the limitations of DRO, and was therefore, preferred by the authors.

A study by Waters, Lerman, and Hovanetz (2009) evaluated the separate and combined effects of DRO plus extinction and schedules. Schedules are an often-recommended intervention for parents and teachers. The authors sought to determine if schedules alone were sufficient in reducing maladaptive behavior during transitions.

The authors found that schedules alone did not produce significant behavior change. Real effects were observed only when extinction plus DRO were implemented and the presence or absence of schedules did not impact results.

Research dictates that, when practical, implementing interventions that reinforce a functionally equivalent replacement behavior typically result in more positive behavior change than those that do not. While it might be widely used, you must carefully consider all factors prior to implementing DRO in your practice.Learn more about some of the other differential reinforcement procedures and determine if they would be a reasonable alternative to DRO.

Differential Reinforcement of Alternative/ Incompatible Behavior (DRA/DRI)

DIFFERENTIAL REINFORCEMENT

DRA/DRI

Differential reinforcement of alternative behavior (DRA) and Differential Reinforcement of Incompatible Behavior (DRI) are very similar strategies and will be discussed together. Both interventions offer reinforcement for appropriate alternative behavior to the behavior targeted for reduction. The difference is in the relationship of the target behavior to the identified replacement behavior. As is suggested by the name, DRI requires that the replacement behavior be incompatible with the target behavior.

One of the most important parts of a DRA/DRI procedure is the replacement behavior selected for reinforcement. Although these interventions can be implemented with alternative behaviors that are not functionally related to the target behavior, you are likely to experience greater success if the behaviors are functionally equivalent.

When the alternative behavior serves the same function (access, escape) as the challenging behavior, you provide the learner with a means of getting their needs met in a new way.

During a DRA/DRI procedure, we often choose some form of communication as the functionally equivalent replacement behavior, although this is not always the case. Functional communication training (FCT) is a common form of DRA procedure. Communication can be incompatible with other vocal behaviors such as screaming or yelling, but is not incompatible with other types of behaviors commonly targeted for reduction such as aggression or SIB.

DIFFERENTIAL REINFORCEMENT

DRA/DRI

A review of research conducted by Petscher and Bailey (2008) found DRA effective in reducing challenging behaviors such as:

- PRELINGUISTIC COMMUNICATION
- SELF-INJURIOUS BEHAVIOR
- AGGRESSION
- PROPERTY DESTRUCTION
- DISRUPTIVE BEHAVIOR
- FOOD REFUSAL
- TASK REFUSAL

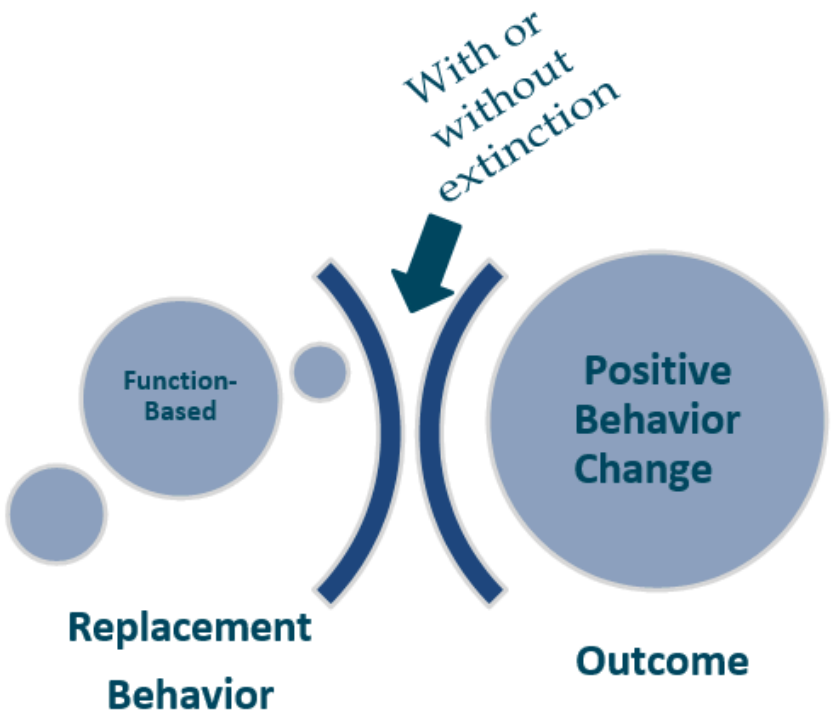
DRA/DRI

How DRA/DRI Works

Vollmer and Iwata (1992) describe differential reinforcement of alternative behavior as simultaneously withholding reinforcement for challenging behavior and providing reinforcement for a desired alternative behavior. DRI works in the same way and both can result in the dual effect of reducing challenging behavior and teaching a more adaptive alternative behavior. Although Vollmer and Iwata (1992) included extinction (withholding reinforcement) in their study, more recent studies have shown the including extinction is not a necessary component of the intervention.

Function-based replacement behaviors play a key role in the success of your DRA/DRI intervention procedure. When the replacement behavior is strongly related to the primary function of the challenging behavior, you will often see greater results than if the behaviors are more distantly connected.

Although some studies suggest DRA/DRI is more effective with an extinction component, it has been demonstrated to be effective both with extinction and without. What's of primary importance is the distinction between some element of the reinforcer (i.e.magnitude).



DRA/DRI

Response to Target Behavior

How interventionists respond to target behavior depends, in part, on whether you include extinction in your intervention.

Although extinction is often included as an element of a DRA procedure, the potentially serious results of this component (i.e. extinction burst) may make this element impractical. For example, if you are working with a large, strong learner, you might not be able to prevent him from escaping a task if he is determined to escape.

When extinction is not part of your intervention, you must have an alternative way to ensure that the reinforcer received for the desired behavior is superior in some way to the reinforcer available for the problem behavior. There must be some way for the learner to see that the desired behavior is more valuable than the undesired behavior.

Athens and Vollmer (2010) evaluated the effects of manipulating different variables of the reinforcer (i.e. duration, quality and delay) on the occurrence of problem behavior.The authors differentially reinforced by implementing longer duration, higher quality or shorter delay to reinforcement for the desired behavior and a shorter duration, lower quality and longer delay to reinforcement for problem behavior.

They found that when all 3 of these elements were manipulated, there was a more positive impact on behavior.Even when reinforcement is available for challenging behavior, manipulating elements of reinforcement and differentially reinforcing an appropriate alternative behavior improves outcomes.

As an alternative to extinction, consider changing one of the above elements. For example:

You work with Kyle, a 16-year-old who elopes from the table when it's time to do math. Through an FBA, you determine the behavior is escape- maintained. You use DRA to teach him to request a break. When he requests a break, he gets 5 minutes with a mid-preference item (either car magazines or his favorite music). When he elopes from the table, he still escapes the task, but doesn't access any other activities.

DRA/DRI

Implementation

Implementing a DRA or DRI procedure is quite different from implanting a DRO procedure. When writing your implementation plan, you must decide:

1. What the alternative behavior will be
2. What the reinforcer will be
3. If you plan to include extinction
4. If you will use a fixed or variable ratio schedule once mastery has been achieved

Remember that replacement behaviors that serve the same function as the target behavior will achieve the greatest outcomes. Learners engage in maladaptive behavior because it has been more effective in contacting reinforcement than other, more desired behavior. With a DRA or DRI procedure, you can make a more appropriate behavior effective.

Often when choosing a reinforcer, you can select something that is directly related to the behavior being taught. The more natural the reinforcer, the more likely the skill will become durable after intervention.

Natural reinforcers have a direct link to the behavior you are teaching. Consider the following reinforcers:

Note that each of the above reinforcers directly relates to the function of challenging behavior.

DRA/DRI

Choosing a Replacement Behavior

Maladaptive behavior is most often a form of communication. Either the learner doesn't have the skill to communicate what she wants, or her communication hasn't been reinforced in the past. As a result, most often, the appropriate alternative behavior comes in the form of some communicative response. When the replacement behavior is a form of communication, that DRA procedure is called functional communication training (FCT). FCT focuses on identifying what the learner wants then teaching the learner to use some form of language (spoken, PECS, or other AAC).

Although the replacement behavior is often communication, there are many other behaviors that might be appropriate depending on the specific situation. Look at the examples below, you can see that examples 1, 3, 4, 6 and 8 are communicative behaviors. Example 1 may be incompatible if you reinforce manding with a quiet voice. Example 5 is not functionally related, yet still may be effective in reducing the behavior. Examples 6, 7 and 8 are incompatible and functionally related to the target behavior.

Example	Target Behavior	Function	Example Replacement Behavior
1	Screaming	Access to a tangible	Manding for a desired item
2	Hitting	Escape from loud noises	Wearing headphones
3	Eloping	Access to an activity	Manding for the desired activity
4	Refusal	Escape from a difficult task	Manding for help
5	Throwing	Access to attention	Appropriate play
6	Swearing	Escape from the classroom	Manding for a walk
7	Biting hands (SIB)	Access to sensory	Biting chewlery
8	Hiding	Escape attention	Mand for time alone

When to Use DRA/DRI

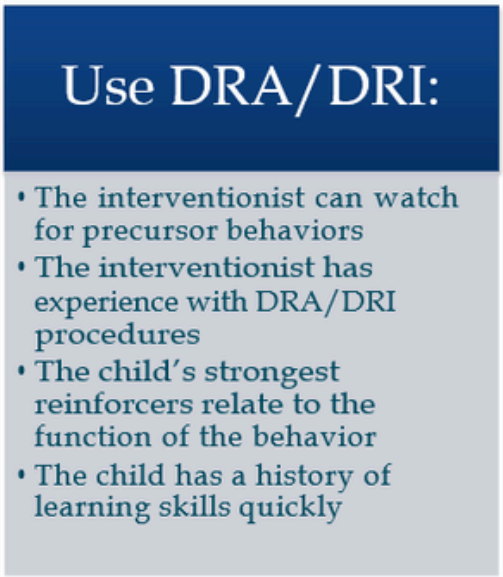
While it's important to consider the research, DRA/DRI procedures have few disadvantages and can be applied in a wide variety of situations. Rarely will you encounter situations where teaching a more appropriate replacement behavior is inappropriate; however, there are some important things to consider prior to selecting DRA/DRI for your intervention.

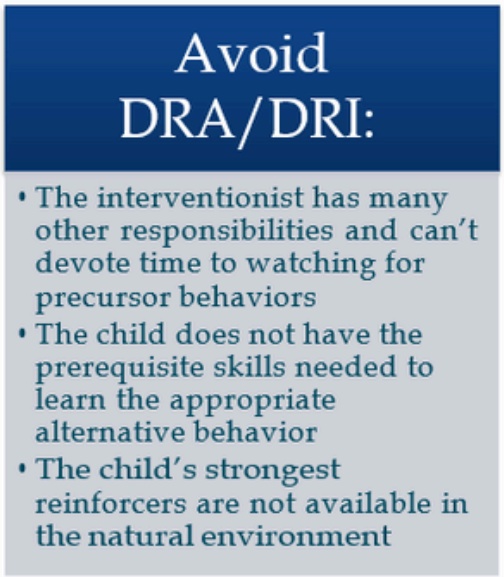
Consider factors such as:

- The skill of the interventionist
- Reinforcers available to your learner
- Time available to the interventionist
- Information available in the research
- Your learner's reinforcement history
- Other competing contingencies

Unless you will be implementing the intervention yourself, you must consider the skill and experience of the interventionist. For a DRA/DRI procedure to be effective, the interventionist must be able to recognize when the learner is likely to engage in the target behavior and then teach the replacement behavior in that moment.

When one adult is responsible for many learners, a DRA/DRI procedure may be very difficult to implement effectively. If the replacement behavior can't be taught consistently before the target behavior occurs, then a DRA/DRI procedure may not be the most appropriate intervention for your specific situation.





DRA/DRI

Example of a Written Procedure

A Hard Times Board has been created with Jack to help teach him use more appropriate behavior to escape task demands.

• The board should be reviewed with him throughout his day (i.e. at least 2-3 times per day at the beginning) and can be included as a "work task" when he is at the table.

• When staff notice precursor behaviors (i.e. increased frustration, mild noncompliance), staff should show him the Hard Times Board, reviewing only what his choices are. "Do you need help or a break?"

• Initially, staff may need to prompt his choice. For example, staff can say "It looks like you need a break. Say 'I need a break.'" If he refuses to request either, continue with the tasks on his schedule.

• A specific space should be designated as his "break space."This should be located near his work table and should include some activities of mid-level preference such as books, music or soft fidget toys. Avoid providing access to highly reinforcing or aversive activities in this space.

• A timer should be used to limit the break to 3 minutes.

• At the end of the break, he should be instructed to return to complete the activity he had been working on. If the task appears too difficult, it can be modified; however, Jack should complete at least some portion of the task prior to moving on in his schedule or being allowed to take another break.

DIFFERENTIAL REINFORCEMENT OF HIGH/LOW RATES (DRH/DRL)

DIFFERENTIAL REINFORCEMENT

DRH/DRL

Differential reinforcement of high rates of behavior (DRH) and Differential Reinforcement of Low Rates of Behavior (DRL) are two sides of the same behavioral coin. Both interventions seek to change the rate of an already established behavior. The behavior is in the learner's repertoire, but the behavior is either occurring too frequently or not frequently enough.

Since reinforcement is delivered contingent on the behavior occurring at some predetermined rate, these interventions are not typically implemented when the terminal goal is to eliminate a behavior. While these procedures rarely intend to eliminate behavior, Turner, Green, and Braunling-McMorrow (1990) found that implementing a DRL procedure to reduce both verbal and physical behaviors resulted in near zero rates of responding. Keep this in mind for behaviors that you want to continue to see at a specified rate such as asking questions.

Although there is a less robust body of research including these interventions than other DR procedures, they are often used in schools and a variety of other environments to alter the frequency of a behavior. Schools often face many behaviors that may be appropriate at different rates.

Use DRH/DRL to change the frequency of behaviors such as:

- SELF-INJURIOUS BEHAVIOR
- PICA
- AGGRESSION
- THUMB SUCKING
- HYPERACTIVITY
- DISRUPTIVE BEHAVIOR

TYPES OF DRH/DRL

Austin and Bevan (2011) describe 3 basic types of DRL procedures that apply to DRH as well. Which one is most appropriate depends on your overall goal for behavior change as well as the time and resources available. The types are spaced responding, interval and full-session.

SPACED RESPONDING

Spaced responding DRH/DRL seeks to decrease or increase the interresponse time (IRT) as a means of increasing or reducing the overall rate of the behavior. To begin, you will need accurate IRT baseline data to determine your initial reinforcement criteria. Set your initial reinforcement criteria just above or below baseline data to ensure success. Take a look at this example:

Your baseline data reflect IRT of 6 min 23 seconds, 8 min 47 seconds, and 7 min 14 seconds. You choose to set your initial reinforcement criteria at 6 minutes for a DRL procedure to ensure that your learner contacts reinforcement. When your learner has an IRT greater than 6 minutes, he receives reinforcement. Gradually, you will increase the criteria so there is more time between responses.

INTERVAL

Interval DRH/DRL sets a minimum or maximum criteria per interval in order to access reinforcement. This allows for reinforcement to be delivered more frequently than during full-session DRH/DRL and is more appropriate for individuals who are not yet able to delay reinforcement. Here's an example:

Your baseline data reflect rate data of 6 instances/hour, 5 instances/hour, and 9 instances/hour. This is an average of 6.67 instances/hour. You want to increase the frequency of this behavior. You set your initial reinforcement criteria at 6 instances/hour to ensure your learner contacts reinforcement. When your learner engages in at least 6 instances of the behavior in an hour, she receives reinforcement. Gradually, you will increase the number of instances of behavior per hour to obtain reinforcement.

TYPES OF DRH/DRL

FULL-SESSION

Full-session DRH/DRL establishes a minimum or maximum criteria per session (i.e. day, class, etc.) in order to access reinforcement. This type of DRH/DRL offers an efficient intervention when 1:1 intervention is unavailable. Here's one more example:

Your baseline data reflect the following data: 10 instances/class, 8 instances/class and 13 instances/class, for an average of 10.33 instances/class. You set the initial reinforcement criteria at 9 instances/class for a DRL procedure to ensure your learner contacts reinforcement. When your learner engages in fewer than 9 instances of the behavior during the class, he receives reinforcement. Gradually, you will reduce the number of instances allowed to contact reinforcement.

How DRH/DRL Works

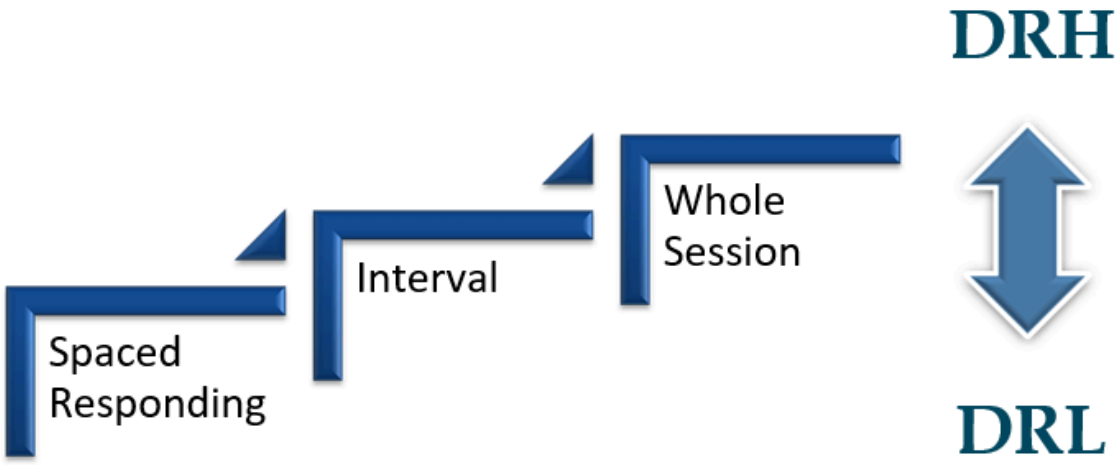
Differential reinforcement of high or low rates works by reinforcing behaviors that occur above or below a specified rate. By providing reinforcement for predetermined rates of behavior and gradually changing reinforcement criteria, you can begin to shape how frequently the behavior occurs.

SPACED RESPONDING:

To increase the frequency of a behavior using spaced responding, gradually decrease the IRT needed to contact reinforcement. To decrease the frequency of a behavior, gradually increase the IRT.

INTERVAL AND WHOLE SESSION:

To increase how often a behavior occurs, gradually increase the minimum number of responses required to receive reinforcement for the interval or session. To decrease how often the behavior occurs, gradually decrease the maximum number of responses needed to receive reinforcement.



DRH/DRL

Response to Target Behavior

Typically, when implementing DRH or DRL, the response to target behavior should be minimal. It's best not to draw a lot of attention to challenging behavior, even if you don't believe it is attention-maintained. It will be important to keep track of how often the target behavior occurs to know if the learner meets reinforcement criteria.

Over time, this procedure can turn into a self-management intervention and the learner can learn to track his behavior and identify if he has earned reinforcement.

There are several ways that interventionists keep track of whether the learner has met reinforcement criteria. Most often, it's beneficial to develop a visual system that let's the learner see his progress toward reinforcement.

Your visual should include how many times the behavior should occur and what the reinforcer will be. Take a look at some examples below:

- **Answer at least 5 questions**
- **Earn 5 minutes of reading**

- **Get out of your seat no more than 10 times**
- **Earn 5 extra minutes of recess**

Either system above could be used to count up or down depending on what works best for the learner. For example, you could start with 5 check marks and then erase one as the learner asks a question to show how many more questions he has to ask to earn reinforcement. You could start with 10 tally marks and erase 1 each time the learner gets out of his seat to show how many more times he's allowed to get up and still earn reinforcement. These interventions offer a lot of flexibility, making them ideal for group environments such as school.

DRH/DRL

Implementation

Implementing a DRH or DRL procedure requires some advanced planning. When writing your implementation plan, you must decide:

1. What the terminal goal for the target behavior is
2. What the initial criteria for reinforcement will be
3. What the reinforcer will be
4. How you will respond o challenging behavior
5. The plan to gradually change criteria over time
6. The plan to transition to self-management

One of the biggest advantages to DRH and DRL is the ability to transition to a self-management intervention. When choosing reinforcers, consider whether you plan to transition to self-management. If you want the learner to take over the intervention, you must make sure the reinforcer is something she can access on her own.

Implementing DRH and DRL requires less technical skill than many of the other DR procedures. The interventionist must be able to accurately identify if the behavior occurred and respond accordingly.

To this end, the behavioral definition of the target behavior is critical to the success of your intervention. Your definition must be crystal clear otherwise, the learner will either receive reinforcement that hasn't been earned or will not receive reinforcement when it has been earned. This greatly reduces the effectiveness of the intervention.

When to Use DRH/DRL

When looking to shape behavior, DRH and DRL offer a valuable option. When well-planned, these interventions provide reinforcement regularly without overwhelming the interventionist.

Prior to selecting DRH or DRL for your intervention, consider factors such as:

•The skill of the interventionist
• Reinforcers available to the learner
• How frequently the learner requires reinforcement
•Time available to the interventionist
•Information available in the research
• If self-management will ultimately be appropriate
• Other competing contingencies

Although these interventions are useful in a variety of situations, they won't apply to every situation. Because of the nature of the intervention, you will provide reinforcement when the behavior occurs.

This makes the intervention inappropriate for many potentially dangerous behaviors. Behaviors such as aggression and self-injury may be better served by different intervention such as differential reinforcement of other behavior (DRO).

Use DRH/DRL:	Avoid DRH/DRL:
• You are looking for a self-management strategy • The behavior is not dangerous • The behavior is appropriate at some rate • The interventionist can attend to the child's behavior sufficiently to count each occurrence of the behavior, at least at first	• The interventionist has many other responsibilities and can't devote time to watching for every occurrence of the behavior • The child requires exceptionally high rates of reinforcement • The behavior is not appropriate at any rate

DRH/DRL

Example of a Written Procedure

Differential Reinforcement of Low Rates:

• Differential reinforcement of low rates will be used to reduce the number of times Trevor gets out of his seat during math block.
• Trevor will eventually be taught to track his own behavior so it's important that staff model erasing a tally mark from the dry erase board each time he gets out of his seat.
• Reinforcement will be earned on the schedule listed below.

1. Offer Trevor a choice of reinforcers from a menu including:
   • Reading
   • Drawing
   • Legos
   • Music
2. Make the number of tally marks on the dry erase board based on the prescribed step below
3. Each time Trevor gets out of his seat during math block, erase one of the tally marks
4. If Trevor has tally marks left at the end of math block, he has earned his reinforcer for the time prescribed below.

Step	DRL Criteria	R+ Interval
1	8 times	2 minutes
2	7 times	3 minutes
3	6 times	4 minutes
4	5 times	5 minutes

Criteria to increase step: *Two consecutive days with fewer than 4 incidents of target behavior.*

Criteria to decrease step: *Four consecutive days with more than 6 incidents of target behavior.*

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