Chapter 5
Operant Behavior and Measurement

Topics Covered Within This Chapter

Topics
Defining Behavior
Operational Definitions
Selecting Measurement System
Interobserver Agreement

Defining Behavior

What is behavior? This is the most basic question that defines the area of interest for our field. Behavior analysts have a very broad definition of behavior which is anything an organism does (Pierce & Cheney, 2017). This includes both overt responses (e.g., jumping) and covert responses (e.g., thinking). In Table 5.1, we present a list of examples of responses that meet the definition of behavior. The specific examples of responses that apply to your supervisee will be dependent upon their clients.

It is imperative to stress to your supervisees the difference between the way behavior analysts define behavior and how it is defined colloquially. Becoming a behavior analyst requires us to change the lens with which we view the world. Supervisees must intentionally work to alter the way they describe and interpret behavior. Skinner highlights this point when describing behavior as a subject matter.

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Table 5.1 Examples of behavior

Overt	Covert
Drawing	Thinking
Typing	Feeling
Eating	Perceiving
Talking	Remembering
Singing	Sensing

> We all know thousands of facts about behavior. Actually there is no subject matter with which we could be better acquainted, for we are always in the presence of at least one behaving organism. But this familiarity is something of a disadvantage, for it means that we have probably jumped to conclusions which will not be supported by the cautious methods of science. Even though we have observed behavior for many years, we are not necessarily able, without help, to express useful uniformities or lawful relations. (pg. 14, Skinner, 1953)

Operational Definitions

The first step in moving toward a science of behavior is developing operational definitions. An observational definition should be specific and include examples and nonexamples. The test for a good operational definition is whether it results in accurate recording of the behavior. In Table 5.2, we provide several examples of

Table 5.2 Examples of operational definitions

Behaver	Behavior	Definition
Avy, a Mastiff	Jumping	Any instance in which Avy rises on her hind two legs, and forcefully lands her front two legs on a human. Examples: Jumping on visitors who did not request for her to do so. Nonexamples: Instances in which Avy's owners request for her to jump up to greet them. Instances in which Avy places one of her front legs on a seated individual.
Greg, an office employee	Recycling paper	Any instance in which Greg places acceptable office paper in the designated recycling bin. Each individual piece paper is counted unless the paper is bound such as a packet which is recorded as one paper. Acceptable office paper includes copy paper, card stock, index cards, and note size paper. Unacceptable paper includes paper towels, paper with food waste, and laminated paper.
Alexis, a child with feeding issues	Packing	Any instance in which Alexis holds food larger than a pea in her mouth 30 seconds after accepting the food.
Julian, a child with a developmental disability	Crying	Any occurrence of vocalization (sounds or words) above a normal conversational level with or without tears for at least 3 seconds. Recording will begin after 3 seconds and end after 3 seconds of the behavior being absent. Nonexamples include singing in the car or cheering at a baseball game.

operational definitions. Here are some questions to discuss with your supervisee when evaluating observational definitions.

1. Is there enough information such that someone without any history with the client could record instances or bouts of the behavior?
2. Is it clear what constitutes one instance or bout of the behavior?
3. Are the parameters of the behavior evident (i.e., at what point does the response meet the definition and at what point does it not).

Selecting Measurement System

Once your supervisees have mastered the art of developing observational definitions, they will need to determine which data collection is most appropriate for the behavior they are recording and the context in which the behavior is being recorded. This chapter will cover frequency, duration, latency, percent correct or percentage of opportunities, whole and partial interval, and momentary time sampling. We have created a flow chart (Appendix A) for selecting a measurement system that can be used with your supervisee to guide this discussion. This is by no means an exhaustive guide; it is simply a tool to use as your supervisees are in the initial stages of learning to be a behavior analyst. Your supervisees will undoubtedly be exposed to additional measurement systems and sharpen their skills for selecting appropriate measures as they continue through their training. We believe this guide meets a common need exhibited by supervisees who have just begun accruing hours. They often select data collection methods based on what they have done in the past rather than what is most appropriate for the situation. Our hope is that practicing selection using the guide will help supervisees avoid this tendency. For a more descriptive and precise measurement decision-making guide, see LeBlanc et al. (2016).

The first distinction between measurement systems is whether they are continuous or discontinuous. Continuous measurement means that all instances of the target behavior are recorded. Continuous measurement is ideal; however, some settings/situations/responses are not conducive to this type of data collection. Discontinuous measures are ideal for situations in which the recorder cannot feasibly record every instance of the behavior or the target behavior is a compilation of multiple responses that can be difficult to record or determine the exact onset or offset of the behavior. A special consideration for discontinuous measures (i.e., partial interval, whole interval, and momentary time sampling) is the length of the interval as shorter intervals allow for more accurate data collection (Table 5.3).

The second distinction to emphasize is the difference between free-operant responses and responses that are limited by the presence of a separate stimulus. The field of behavior analysis was built on measuring free-operant responses; however, this distinction is often not highlighted during training for those accruing hours. In his seminal text on measurement, Sidman writes on the topic of free-operant responses "…the experimental organism is free to respond at any time…the lever is

Table 5.3 Description of measurement systems

Measurement system	Continuous/ discontinuous	Free operant/ trial-based	Important feature of the measurement
Frequency	Continuous	Free operant	Instances/time
Duration	Continuous	Free operant	Length of time of event
Latency	Continuous	Trial-based	Length of time between stimulus and initiation of response
Per opportunity/ percent correct	Continuous	Trial-based	Correspondence between stimulus and response
Whole interval	Discontinuous		
Partial interval	Discontinuous		
Momentary time sampling	Discontinuous		

never withdrawn from the experimental space to prevent the subject from responding at times that would be inconvenient for the investigator's theory. The only restrictions placed upon the subject's recorded behavior are those inherent in the laws of behavior. This is called a "free-responding situation" (Sidman, 1960, p. 409). Free-operant responding includes responses that can occur at any point, such as the lever press described by Sidman. In contrast, trial-based data collection includes instances in which the response is limited based on the presence or absence of a specific stimulus/situation. For example, if your supervisee is recording vocal responses made by their client following initiations made by a peer, the number of vocal responses will be controlled by the number of initiations made by the peer. That is, a vocal response can only occur following an initiation made by the peer. Trial-based data collection is common within our field; however, the importance of free-operant responding should never be disregarded.

The final step is identifying the important dimension or feature of the target behavior. This can be determined by asking three questions. Is it important to know how often the behavior is occurring? Is it important to know the amount of time in which the behavior is occurring? Is it important to know the amount of time between a stimulus and the initiation of the behavior?

Interobserver Agreement (IOA)

After concluding your discussion of definitions and data collection methods with your supervisees, it is important to review the basics of IOA. IOA is the extent to which data collected by two independent observers align. The typical recommendation for IOA collection is at least 20% of sessions for each phase (e.g., 20% of baseline sessions and 20% of treatment sessions; Kennedy, 2005). Acceptable levels of IOA are considered to be 80% or better agreement. IOA is not only important for researchers, rather it should be routinely recorded in all settings in which data are collected. Cooper et al. (2020) present three reasons why IOA data are invaluable. First, these data are

important for training individuals to collect data accurately. That is, new clinicians should record data along with someone who has already been collecting data to demonstrate mastery prior to serving as the primary data collector. Second, having a secondary data collector can help safeguard against observer drift or any other unintended human bias. Finally, high agreement between data collectors increases the believability of the data we present. When displaying data to present a case for continued investment from the client and/or funding from insurance companies, the enhanced believability or trustworthiness of the data supported by IOA is crucial.

Group Supervision Meeting

Below is a plan for activities to incorporate into a 1-hour meeting with a small group of supervisees.

Group Supervision Meeting Agenda

Time	Activity
0:00–20:00	Operational Definitions
20:00–35:00	Measurement Systems
35:00–45:00	Data Sheets
45:00–55:00	Video Practice
55:00–60:00	Knowledge Check

Materials Needed

- Appendix B: *Operational Definitions*: *Examples and Nonexamples*, 1 copy per supervisee
- Appendix C: *Data Collection Sheets*, 1 copy per supervisee (may want to use data sheets specific to field experience placement instead)
- Appendix D: *Calculating IOA Practice*, 1 copy per supervisee

Reading Assignments

At least 1 week prior to the group supervision meeting, assign your supervisees to read about the subject. Below is a list of recommended assigned readings.

- LeBlanc et al. (2016)
- Meany-Daboul et al. (2007)
- Rapp et al. (2008)

Operational Definitions

Begin by discussing operational definitions. Explain that clinicians must first define the behavior of interest in a way that is observable and measurable. An observable and measurable behavior definition is referred to as an *operational definition* because anyone who observes, measures, or discusses that behavior will operate under that definition.

Explain to supervisees that an operational definition should have the following characteristics. For each characteristic, describe the characteristic and ask supervisees to explain why this is a critical characteristic of an operational definition:

1. Objective: The definition only describes observable characteristics of the behavior. The definition does not infer mental states or intentions of the individual (e.g., "intended to harm").
   - Supervisees should identify that an objective definition facilitates consistency between anyone measuring or discussing the behavior.
2. Measurable: The definition allows one to count the number of times a behavior occurred over a period of time.
   - Supervisees should identify that measurement of behavior is a foundational component of behavior analysis; it is the means to identify behavior change. In order to measure behavior, supervisees recognize that the behavior definition must be defined in a way that allows for measurement.
3. Clear: The definition is explicit and easy to read.
   - Supervisees should explain that clear and easy to read definitions will be easier to commit to memory; therefore, easier to use when measuring behavior.
4. Complete: The definition allows for one to easily determine what behavior topographies are and are not included, which allows an observer to easily determine if an observed behavior does or does not meet the definition.
   - Supervisees should explain that complete definitions leave no need for individual interpretation or judgment. Further, they recognize that if a definition was incomplete, it would compromise the validity and reliability of measurement.
5. Concise: The definition uses as few as words as possible while still meeting the aforementioned characteristics.
   - Supervisees should identify that concise definitions are easier to read, commit to memory, and use. Definitions that are excessively wordy are laborious to apply when observing behavior.

Distribute *Operational Definition: Examples and Nonexamples* (Appendix B) to your supervisees. Instruct them to determine if each description of challenging behavior constitutes an operational definition or not. If not, have them revise the

description so that it is an operational definition. Inform your supervisees that you will allot 5 minutes to work on this activity, and they may choose to work independently or in pairs. When they complete the activity, resume to the large group and share their answers. Praise correct responses and correct errors.

Measurement Systems

After a supervisee has operationally defined a behavior of interest, the supervisee must then select the method of measuring that behavior. Measurement systems can be categorized in many ways, but for the purpose of this activity, they are organized as continuous and discontinuous methods. Begin by explaining to supervisees that continuous methods measure every occurrence of a behavior. A measurement system is considered continuous because the measurement and recording of behavior occur continuously throughout the observation period. On the other hand, discontinuous methods, also referred to as *time sampling* methods, measure and record behavior only during specific intervals within the observation period. Before introducing the specific continuous and discontinuous measurement, have supervisee identify some strengths and weaknesses of each method (see Table 5.4).

Table 5.4 Strengths and weaknesses of continuous and discontinuous measurement systems

Continuous		Discontinuous	
Strengths	Weaknesses	Strengths	Weaknesses
Accurate	Require constant attention to single behavior	Easy to conduct in applied settings	Provide an estimate of behavior

Continuous Measurement Systems

Review with supervisees the following continuous methods for measuring the occurrences of behavior. For each method, ask supervisees to identify specific topographies of behavior that may be well-suited for each method of measurement and describe their justification. Encourage supervisees to think about their actual clients' behaviors of interest rather than general examples of behavior topographies. In other words, it is best for the supervisee to visualize a specific behavior they will be responsible for measuring. Also encourage supervisees to provide examples of both desired and undesired behaviors that could be measured with each method.

1. Frequency: The number of times a behavior occurs. Other terms used to describe this measurement system are *count* and *frequency count*.
    - Supervisees should identify behaviors with a clear beginning and ending are well-suited to frequency measurements.

- Examples of desired behaviors that supervisees may identify include mands for a preferred item, bites of food consumed, and homework problems completed.
- Examples of undesired behavior that supervisees may identify include kicks to furniture and vocalizing profanity or curse words.

2. Rate: The number of times a behavior occurs per unit of time. Rate is calculated by dividing the frequency count by the duration of the observation period.

   - Supervisees should identify behaviors with a clear beginning and ending are well-suited to rate.
   - Examples of desired behaviors that supervisees may identify include mands for a preferred item per hour, bites of food consumed per 30-minute lunch.
   - Examples of undesired behavior that supervisees may identify include kicks to furniture per 2-hour therapy session and curse words vocalized per hour.

3. Duration: The elapsed time from beginning to the end of a response. Duration can be reported cumulatively across a session by summing the duration of responses across the observation session. Duration can also be reported as mean duration per occurrence by averaging the duration of each occurrence of behavior recorded.

   - Supervisees should identify behaviors with a clear beginning and ending, and those that occur for extended amounts of time are well-suited to duration.
   - Examples of desired behaviors that supervisees may identify include pretend play, reading, and staying in one's seat.
   - Examples of undesired behavior that supervisees may identify include tantrums and crying.

4. Latency: The elapsed time from the signal to begin a response to the onset of that response.

   - Supervisees should identify behaviors with a clear signal to begin and a clear onset of the response are well-suited to latency measurement.
   - An example of desired behaviors that supervisees may identify includes latency between asked to clean up and the onset of cleaning up toys.
   - An example of an undesired behavior that supervisees may identify includes latency between being told to put away a preferred item and the onset of a tantrum.

5. Percent Correct/Percent of Opportunities: The percent of total responses in which a client made a correct response. To calculate percent correct, simply divide the number of correct responses by the total number of responses and multiply by 100%. The percent of incorrect responses per opportunities can be calculated in a similar manner, although such data are rarely more useful than reporting percent correct and it is recommended to report percent correct in most cases. A similar approach is used to measure percent of opportunities. Percent of opportunities is obtained by dividing the number of responses by the number of

opportunities to response and multiplying by 100%. Percent opportunities reflect the proportion of behaviors relative to the number of opportunities to engage in that behavior.

- Supervisees should identify behaviors that occur within a set of opportunities. Typically, percent correct is only used to measure desired behaviors.
- Examples of desired behaviors measured via percent correct that supervisees may identify include percent of words read correctly or percent of numerals tacted correctly.
- Examples of desired behaviors measured via percent of opportunities that supervisees may identify include percent of opportunities a client responded to a question and percent of opportunities a client washed his hands after using the restroom.
- Examples of undesired behaviors measured via percent of opportunities that supervisees may identify include percent of opportunities a client threw work materials provided to her and percent of opportunities a student eloped from the teacher when walking to the bus after school.

Discontinuous Measurement Systems

As you did with the continuous measurement systems, review with supervisees the following discontinuous methods. Next, ask supervisees to identify situations in which this measurement system may be well-suited and explain their justification.

1. Partial Interval Recording: The observer divides an observation session into equal intervals (e.g., 10-second intervals). The observer records if the behavior occurs during any part of each interval. Data are reported as percent of intervals.

    - Supervisees should identify that situations in which an overestimate of the target behavior is acceptable are well-suited for partial interval recording. Supervisees may also note that partial-interval recording is ideal for behaviors without a clear beginning and ending and for observers who are responsible for observing multiple clients simultaneously or multitasking during the observation session.

2. Whole Interval Recording: The observer divides an observation session into equal intervals. Intervals should be brief (e.g., 5 seconds) because the observer records if the behavior occurs throughout the entire interval. Data are reported as percent of intervals.

    - Supervisees should identify that situations in which an underestimate of the target behavior is acceptable are well-suited for whole-interval recording. Supervisees may also note that whole-interval recording is also ideal for behaviors without a clear beginning and ending and for observers who are responsible for observing multiple clients simultaneously or multitasking during the observation session.

3. Momentary Time Sampling: The observer divides an observation session into equal intervals records if the behavior occurs at the moment the interval ends. Like the previous discontinuous measurement systems, data are reported as percent of intervals.

    - Supervisees should identify that situations in which an overestimate or under estimate of the target behavior is acceptable are well-suited for momentary time sampling. Like other discontinuous measurement systems, supervisees may also note that is ideal when the observer must multitask during the observation session.

To obtain practice selecting a data collection method to the behavior of interest, have your supervisees retrieve *Operational Definitions: Examples and Nonexample* (Appendix B). Assign your supervisee into pairs. Instruct the pairs to review each definition and determine which measurement system(s) would be a good fit for each behavior. Distribute *Data Collection Decision-Making Guide* (Appendix A) to use for this process. For most behaviors, multiple measurement systems may be suitable. In those cases, they should discuss what factors should be considered when selecting among several measurement systems. When the pairs complete their activity, resume to the group and discuss their measurement system selections and justifications.

Data Sheets

The last portion of your group meeting will involve introducing your supervisees to the specific data collection materials you wish for them to use. In some settings, these materials may be prescribed for supervisees by their field experience placements. In other settings, supervisees may have he leniency to amend existing data collection documents or even develop their own. We provide you with data collection documents; however, we encourage you to introduce supervisees to the specific materials they will use in their settings if such materials will be prescribed for them. Distribute *Data Collection Sheets* (Appendix C) or data sheets associated with the field experience placement, and review how to use each document.

Interobserver Agreement

Begin by asking your supervisees the following questions to facilitate the discussion of interobserver agreement.

1. What is reliability?
2. How is reliability different from validity and accuracy?

- Supervises should identify that validity refers to if the measurement system captures the phenomena of interest and accuracy refers to the how well measurement system captured the actual behavior observed.

3. How can you improve reliability of measurement with your clients?
   - Supervises should identify that well-designed measurement system and proper training of the use of that measurement system should improve reliability of behavior measurement.

Distribute *Calculating IOA Practice* (Appendix D) to your supervisees. One-by-one, review with supervisees each method to calculate IOA. Begin by explaining the IOA calculation method and then demonstrating calculating IOA for the first sets of data together, modeling for supervisees how to use the calculation. Allow the supervisees to calculate the second sets of data independently, but have them stop after calculating this set and share their results to be sure they are calculating correctly. If they calculated the second set correctly, allow them to calculate the remaining sets independently and check answers as they complete their calculations. If they make an error in calculating the second set, use subsequent sets for more modeling and feedback. This activity only includes a small sample of methods to calculate IOA. You may wish to replace or add to these methods IOA calculation methods that are more frequently used in your supervisees' settings.

Video Practice

Spend the last 15 minutes of your group supervision combining all of the practices skills. We recommend you find a few online videos that include behaviors that are likely to be measured at your supervisee's field experience placement. For each video, follow these steps.

1. Play the video without collecting data. Ask supervisees to simply observe the target behavior.
2. After watching the video, develop an operational definition for the target behavior and select an appropriate measurement system.
3. Provide all supervisees with the appropriate data sheet. Play the video again. Have supervisees independently record data. You may need to spread supervisees across the room so that their recording is not influenced by the visible behavior of other supervisees.
4. As a whole group, ask supervisees to identify an appropriate method for calculating IOA. Once the method is selected, pair supervisees together in order to calculate IOA.
5. As a whole group, share IOA scores. For those with IOA lower than 80%, discuss what could be improved about the measurement experience to improve IOA.
6. Optional: If you have enough time, use two or more measurement systems to measure the same behavior. Encourage students to use at least one discontinuous

measurement system to experience how such methods over- or overestimate the behavior. Discuss the pros and cons of each measurement system used.

Knowledge Check

1. What are the five characteristics of an operational definition?
2. What is continuous measurement? What are continuous measurement systems? What are the advantages and disadvantages of continuous measurement?
3. What is discontinuous measurement? What are discontinuous measurement systems? What are the advantages and disadvantages of discontinuous measurement?
4. What is latency?
5. Describe how to collect data using a percent of opportunities technique.

Homework for Individual Supervision without a Client

1. Identify five client behaviors that are associated with the client's goals (i.e., those targeted for skill acquisition or behavior reduction).

Individual Supervision Meeting Without a Client

Below is a plan for activities to incorporate into a 30-minute meeting with an individual supervisee.

Individual Supervision Meeting Without a Client Agenda

Time	Activity
0:00–05:00	Operational Definition Activity
05:00–15:00	Selecting Data Collection
15:00–30:00	Client-Directed Activities

Materials Needed

- Appendix A: *Data Collection Decision-Making Guide*, 1 copy
- Appendix E: *Selecting Data Collection Vignettes for Supervisees*, 1 copy
- Appendix F: *Selecting Data Collection Vignettes Answer Sheet*, 1 copy

Operational Definition Activity

Select one or two of the operational definitions written by your supervisee. Engage in the behavior according to the definition and ask the supervisee whether the response you engaged in matched the topography that they were envisioning. For example, if the supervisee wrote an operational definition for *sharing* as a client giving a toy to another person. While pretending to be the client, you could give an item to the supervisee in a rough manner (not forceful enough to cause discomfort) or pick up an item that you did not previously possess and give it to the supervisee without relinquishing the item that you did possess. This will highlight that the definition lacked clarity because the way in which the client gives the item was not specified nor was it specified that the item should be one that was possessed by the client rather than a different nonpreferred item. This activity should lead to a discussion of the importance of specificity and clarity with operational definitions.

Selecting Data Collection

Distribute *Data Collection Decision-Making Guide* (Appendix A) and *Selecting Data Collection Vignettes* (Appendix E) to your supervisee. You may also wish to have a copy of *Selecting Data Collection Vignettes Answer Sheet* (Appendix F) on hand. Use the vignettes (or ones you develop) with the decision-making guide to select a measurement system with your supervisee. We walk through the questions for the first vignette. Repeat this process for each vignette to ensure your supervisee has plenty of practice opportunities.

Client-Directed Activities

Now that your supervisee is familiar with writing operational definitions and selecting measurement systems, they must demonstrate these skills in relation to the clients with whom they work. The supervisee should present the two behaviors they would like to target with their client. Together, you and your supervisee should develop operational definitions for these responses. Provide the opportunity for your supervisee to try to complete this task as independently as possible, but with your guidance and feedback. Remember, your supervisee must behave to be shaped, meaning they must contact the contingencies to learn how to be an effective behavior analyst. Once the operational definitions are finalized, you and your supervisee should select measurement systems for each response using the decision-making guide.

Homework for Individual Supervision without a Client

1. Develop a data sheet for each of the two target behaviors.
2. At least 48 hours prior to your next meeting, provide your supervisor with the data sheets.

Individual Supervision Meeting with a Client

Below is a plan for activities to incorporate into a 1-hour supervision session in which you observe your supervisee with a client.

Individual Supervision Meeting with a Client Agenda

Time	Activity
0:00–5:00	Homework Review
5:00–45:00	Observe and Measure Selected Behaviors
45:00–60:00	Performance Feedback

Materials Needed

- Supervisee-developed data sheets, 2 copies of each
- Clipboard
- Pen/pencil

Homework Review

Prior to your meeting with your supervisee, they should have completed their homework: (a) selecting two behaviors of interest, (b) operationally defining those behaviors, (c) selecting at least two methods to measure those behaviors, and (d) preparing two copies of each data sheet. They should have provided you with the copies of the data sheet 48 hours prior to this meeting. Use this time to provide performance feedback on these completed tasks. Next, ask your supervisee to train you to use the methods of measurement selected. Together, plan what portion of the client's session you will conduct each measurement. Be sure to identify signals to one another about when to start and stop each measurement system so that low IOA cannot be attributed to misaligned observation start times.

Observe and Measure Selected Behaviors

Join your supervisee's session in person or via videoconference in order to observe and measure the selected behavior simultaneously. Spend the first half of your observation observing the first behavior and the second half observing the second behavior. Communicate to your supervisee which method you are utilizing and when to start and stop measurement. During this time, do your best to collect data independently of your supervisee. You can do this by positioning yourself so that you cannot see each other's data sheet. Attempt to minimize your physical movement when recording a behavior so that such movement does not signal to your supervisee to also record a behavior that the supervisee may otherwise have not recorded.

Performance Feedback

After you observe your supervisee, provide them with your data sheets and ask your supervisee to calculate IOA. Observe how your supervisee calculates IOA in order to confirm accuracy of the calculation. If IOA fell below 100% for either measurement, which is to be expected in most cases, discuss with your supervisees why you may have recorded the same behavior differently. Perhaps the operational definition or measurement system could be improved to address inadequate IOA. After discussing steps to take to improve the measurement approach, which will ultimately improve IOA, provide your supervisee with performance feedback. Identify specific behaviors in which the supervisee engaged that resulted in successful measurement. Also provide specific feedback as to how your supervisee could improve their performance in measuring behavior. When providing corrective feedback, include a justification as to why a behavior needs to change. If time permits, you may offer to model and/or role-play to improve behaviors in need of improvement. Finally, end this session with the opportunity for your supervisee to ask questions.

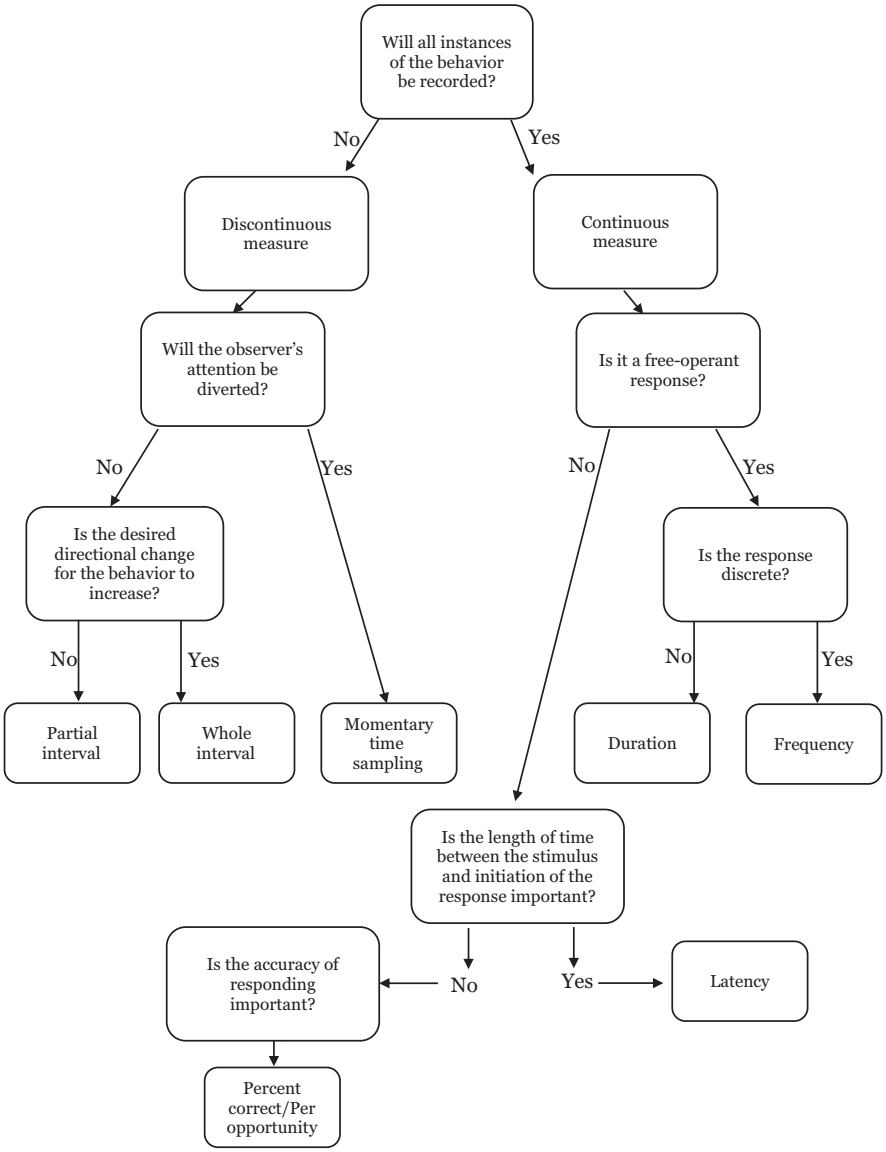
Mastery Criteria

In order to progress from this lesson, your supervisee must accurately collect data on two different client behaviors with at least 80% agreement. If this is not met, a second individual meeting without a client with intensive role-play and feedback should be scheduled followed by another opportunity to meet the mastery criterion.

Future Growth

- ☐ Observe your supervisee collecting data on a different target behavior. Measure IOA.
- ☐ Observer your supervisee collecting data using a different measurement system. Measure IOA.
- ☐ Observe your supervisee teach a client's caregiver or another service provider (e.g., teacher) to collect data.

Appendix A: Data Collection Decision-Making Guide



Appendix B: *Operational Definitions: Examples and Nonexamples*

Instructions: For each behavior, determine if the definition is operational. If not, revise the definition so that it is operational.

1. Multiplication Facts: When shown a flash card of a multiplication problem with a single digit multiplied by a single digit (e.g., "3 × 2 ="), Charlotte vocalizes the correct numeral (e.g., "6").

   Is this operational: Yes No
   If not, please revise the definition so that it is observable and measurable: _____
   _____
   _____

2. Elopement: Juniper's body is 3 feet or more from her assigned seat.

   Is this operational: Yes No
   If not, please revise the definition so that it is observable and measurable: _____
   _____
   _____

3. Hands to Self: In the classroom, Marco keeps his hand to himself.

   Is this operational: Yes No
   If not, please revise the definition so that it is observable and measurable: _____
   _____
   _____

4. Hand Flapping: Luke moves one or both hands with no intent to use them functionally.

   Is this operational: Yes No
   If not, please revise the definition so that it is observable and measurable: _____
   _____
   _____

5. Happiness: Zoe is happy at school.

   Is this operational: Yes No
   If not, please revise the definition so that it is observable and measurable: _____
   _____
   _____

6. Tacting Colors: When presented with a colored flashcard and asked, "What color?" Jana vocalizes the correct color name.

   Is this operational: Yes No
   If not, please revise the definition so that it is observable and measurable: _____
   _____
   _____

7. Requests: Greyson requests his favorite leisure items.

   Is this operational: Yes No
   If not, please revise the definition so that it is observable and measurable: _____
   _____
   _____

8. Responding to questions: When asked a question, Tanner provides a thorough response.

   Is this operational: Yes No
   If not, please revise the definition so that it is observable and measurable_____
   _____
   _____

9. Elopement: When the expectation to be in the classroom is implicitly or explicitly communicated, any portion of Sydney's body crosses or has crossed the threshold of the classroom door.

   Is this operational: Yes No
   If not, please revise the definition so that it is observable and measurable: _____
   _____
   _____

10. Curse Words: Jaxson vocalizes a curse word at a typical indoor voice volume.

    Is this operational: Yes No
    If not, please revise the definition so that it is observable and measurable: _____
    _____
    _____

Appendix C: Data Collection Sheets

Sample frequency count data sheet.

Client: _____

Observer One: _____ Observer Two: _____

Behavior: _____

Instructions: Enter date, time observation began, and time observation ended. Tally each behavior observed. If desired, utilize frequency count and observation duration to convert to rate.

Date	Observation Start Time	Observation End Time	Frequency Count Tally

Sample duration data sheet.

Client: _____

Observer One: _____ Observer Two: _____

Behavior: _____

Instructions: Enter the time the behavior started and the time the behavior started. Use this to calculate the total duration of the behavior in the final column. Use multiple entries per observation period to calculate total duration across the observation session or multiple entries to calculate the average duration per occurrence.

Date	Behavior Start Time	Behavior End Time	Duration

Sample latency data sheet.

Client: _____

Observer One: _____ Observer Two: _____

Behavior: _____

Instructions: Enter the time the signal cuing the behavior to begin was displayed and the time the behavior actually began. Use this to calculate the latency in the final column.

Date	Time of Signal for Behavior	Time Behavior Began	Latency

Sample percent correct data sheet.

Client: _____

Date: _____ Time: _____

Observer One: _____ Observer Two: _____

Behavior: _____

Instructions: For each trial, circle if the client performed the behavior correctly or not. Use the final column for additional anecdotal notes, as needed. Calculate percent correct on bottom row.

Trial	Performed Correctly?	Notes
1	Yes No	
2	Yes No	
3	Yes No	
4	Yes No	
5	Yes No	
6	Yes No	
7	Yes No	
8	Yes No	
9	Yes No	
10	Yes No	
11	Yes No	
12	Yes No	
13	Yes No	
14	Yes No	
15	Yes No	
16	Yes No	
17	Yes No	
18	Yes No	
19	Yes No	
20	Yes No	
Percent Correct:		

Sample percent of opportunities data sheet.

Client: _____

Date: _____ Time: _____

Observer One: _____ Observer Two: _____

Behavior: _____

Instructions: For each trial, circle if the client performed the behavior correctly or not. Use the final column for additional anecdotal notes, as needed. Calculate percent correct on bottom row.

Opportunity	**Behavior Emitted?**	**Notes**
1	Yes No	
2	Yes No	
3	Yes No	
4	Yes No	
5	Yes No	
6	Yes No	
7	Yes No	
8	Yes No	
9	Yes No	
10	Yes No	
11	Yes No	
12	Yes No	
13	Yes No	
14	Yes No	
15	Yes No	
16	Yes No	
17	Yes No	
18	Yes No	
19	Yes No	
20	Yes No	
Percent of Opportunities:		

Sample data sheet for discontinuous data collection: partial interval recording, whole interval recording, or momentary time sampling. Note that example is for an 8-minute observation using 10-second intervals. This data sheet can be edited for varying duration of observations and varying interval length.

Client: _____

Date: _____ Time: _____

Observer One: _____ Observer Two: _____

Behavior: _____

Partial-Interval Recording Instructions: For each interval, circle if the behavior occurred during any part of the interval. Calculate percent intervals on the bottom row.

Whole-Interval Recording Instructions: For each interval, circle if the behavior occurred during the entire interval. Calculate percent intervals on the bottom row.

Momentary Time Sampling Instructions: For each interval, circle if the behavior occurred during the last second of the interval. Calculate percent intervals on the bottom row.

	0:00–0:10	0:11–0:20	0:21–0:30	0:31–0:40	0:41–0:50	0:51–0:60
0:00–1:00	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No
1:01–2:00	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No
2:01–3:00	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No
3:01–4:00	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No
4:01–5:00	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No
5:01–6:00	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No
6:01–7:00	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No
701–8:00	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No

Percent of Intervals: _____

Appendix D: Calculating IOA Practice

Total Count IOA

$$\frac{\text{Smaller Frequency Count}}{\text{Larger Frequency Count}} \times 100$$

Use this method when behavior was measured with frequency count.

Practice Data Sets:

- Data Set One: Observer One measured 14 mands and Observer Two measured 12 mands.
- Data Set Two: Observer One measured 28 cans placed in the recycling bin and Observer Two measured 26 cans.
- Data Set Three: Observer One measured 4 kicks to the furniture and Observer Two measured 5 kicks.
- Data Set Four: Observer One measured 5 towels folded while doing laundry and Observer Two measured 5 towels folded.
- Data Set Five: Observer One measured 43 cans placed on the shelves at the client's job at the grocery store and Observer Two measured 38 cans.

Total Duration IOA

$$\frac{\text{Shorter Duration}}{\text{Longer Duration}} \times 100$$

Use this method when behavior was measured with duration or latency.

Practice Data Sets:

- Data Set One: Observer One measured 36 minutes of in-seat behavior and Observer Two measured 37.5 minutes.
- Data Set Two: Observer One measured 12.25 minutes of walking and Observer Two measured 11.75 minutes.
- Data Set Three: Observer One measured 2.5 minutes of crying and Observer Two measured 2.5 minutes of crying.
- Data Set Four: Observer One measured 6.5 minutes of mopping at the client's job and Observer Two measured 6.25 minutes.
- Data Set Five: Observer One measured 32.75 minutes of head placed down on the desk during work time and Observer Two measured 30.5 minutes.

Interval-by-Interval IOA

$$\frac{\#\text{ of Intervals with Agreement}}{\text{Total }\#\text{ of Intervals}} \times 100$$

Use this method when behavior was measured with a discontinuous measurement system, percent correct, or percent of opportunity measurement techniques.

Practice Data Sets One:
Sample momentary time sampling data sheet.

Client: Mason

Date: May 13 Time: 1:15–1:20 pm

Observer One: Emily Observer Two: Jose

Behavior: In seat

	0:00–0:10	0:11–0:20	0:21–0:30	0:31–0:40	0:41–0:50	0:51–0:60
0:00–1:00	✔				✔	
1:01–2:00	✔		✔			
2:01–3:00				✔		✔
3:01–4:00						✔
4:01–5:00			✔			

Client: Mason

Date: May 13 Time: 1:15–1:20 pm

Observer One: Emily Observer Two: Jose

Behavior: In seat

	0:00–0:10	0:11–0:20	0:21–0:30	0:31–0:40	0:41–0:50	0:51–0:60
0:00–1:00	✔	✔			✔	
1:01–2:00			✔	✔		
2:01–3:00	✔					✔
3:01–4:00						✔
4:01–5:00			✔			

Practice Data Set Two:
Sample partial interval recording data sheet.

Client: Damon

Date: May 14 Time: 10:25–10:10 am

Observer One: Victoria Observer Two: Brent

Behavior: Completing work at desk

	0:00–0:10	0:11–0:20	0:21–0:30	0:31–0:40	0:41–0:50	0:51–0:60
0:00–1:00				✔	✔	
1:01–2:00	✔	✔	✔	✔	✔	
2:01–3:00	✔	✔	✔	✔		✔
3:01–4:00		✔				✔
4:01–5:00		✔	✔	✔		✔

Client: Damon

Date: May 14 Time: 10:25–10:10 am

Observer One: Victoria Observer Two: Brent

Behavior: Completing work at desk

	0:00–0:10	0:11–0:20	0:21–0:30	0:31–0:40	0:41–0:50	0:51–0:60
0:00–1:00	✔	✔		✔		
1:01–2:00	✔	✔	✔	✔	✔	
2:01–3:00	✔	✔	✔	✔		✔
3:01–4:00		✔				✔
4:01–5:00		✔	✔			

Practice Data Set Three:
Sample whole interval recording data sheet.

Client: Olivia

Date: October 19 Time: 2:30–2:35 pm

Observer One: Denise Observer Two: Kenny

Behavior: Crying

	0:00–0:10	0:11–0:20	0:21–0:30	0:31–0:40	0:41–0:50	0:51–0:60
0:00–1:00		✔				✔
1:01–2:00	✔	✔				✔
2:01–3:00	✔	✔				✔
3:01–4:00	✔	✔				✔
4:01–5:00	✔	✔				

Client: Olivia

Date: October 19 Time: 2:30–2:35 pm

Observer One: Denise Observer Two: Kenny

Behavior: Crying

	0:00–0:10	0:11–0:20	0:21–0:30	0:31–0:40	0:41–0:50	0:51–0:60
0:00–1:00	✔	✔	✔			✔
1:01–2:00	✔	✔				✔
2:01–3:00	✔	✔				✔
3:01–4:00	✔	✔				✔
4:01–5:00	✔	✔				

Practice Data Set Four:
Sample percent of opportunities data sheet.

Client: Dylan
Date: March 3 Time: 1:00–2:00 pm
Observer One: Yumiko Observer Two: Julia
Behavior: Responding appropriately to question during job interview

Opportunity 1	X	Opportunity 6	✔
Opportunity 2	X	Opportunity 7	✔
Opportunity 3	✔	Opportunity 8	✔
Opportunity 4	✔	Opportunity 9	✔
Opportunity 5	✔	Opportunity 10	X

Client: Dylan
Date: March 3 Time: 1:00–2:00 pm
Observer One: Yumiko Observer Two: Julia
Behavior: Responding appropriately to question during job interview

Opportunity 1	X	Opportunity 6	✔
Opportunity 2	✔	Opportunity 7	✔
Opportunity 3	✔	Opportunity 8	✔
Opportunity 4	✔	Opportunity 9	✔
Opportunity 5	✔	Opportunity 10	X

Practice Data Set Five:
Sample percent of opportunities data sheet.

Client: Abby

Date: September 30 Time: 9:00–9:20 am

Observer One: Daniel Observer Two: Tyrone

Behavior: Vocalizing correct answer to multiplication fact presented on flashcard

Flashcard 1	✔	Flashcard 6	✔
Flashcard 2	✔	Flashcard 7	X
Flashcard 3	✔	Flashcard 8	✔
Flashcard 4	✔	Flashcard 9	✔
Flashcard 5	✔	Flashcard 10	✔

Client: Abby

Date: September 30 Time: 9:00–9:20 am

Observer One: Daniel Observer Two: Tyrone

Behavior: Vocalizing correct answer to multiplication fact presented on flashcard

Flashcard 1	✔	Flashcard 6	✔
Flashcard 2	✔	Flashcard 7	X
Flashcard 3	✔	Flashcard 8	✔
Flashcard 4	✔	Flashcard 9	✔
Flashcard 5	✔	Flashcard 10	✔

Appendix E: *Selecting Data Collection Vignettes*

1. Aki is conducting a parent training with Jeffery. Jeffery has expressed that he wants his son to follow the instruction "clean up." After gathering some additional information, Aki determines that Jeffery's son does clean up his toys after his father provides the instruction "clean up," but it takes him a long time to start cleaning.
2. Ms. Aguirre is a teacher in a first-grade classroom. She has a student who is engaging in disruptive behavior in the form of throwing toys during free play. She is the only teacher for a class of 30 students. During the free play time, students are scattered across the classroom engaging in a variety of activities.
3. Jaylen has a client who engages in aggressive behavior in the form of hitting. Jaylen works with the client one-on-one and is worried that his client will be kicked out of his classroom if the behavior continues to occur. There is often a 30-second interval between each instance of the behavior.
4. Rylee is providing consultation services for a school district. She is observing a student in classroom who engages in frequent negative vocalizations in the form of crying and screaming. Rylee would like for the paraprofessional to collect data on the negative vocalizations during the times in which Rylee is unavailable. The paraprofessional is assigned to the target student but is required to multitask during specific activities.
5. Kyle flops to the ground and screams and cries (i.e., tantrum behavior) during public outings with his mother. The behavior analyst has request for the mother to collect data on these bouts of behavior.
6. Luis is conducting a small group activity with three clients. The activity is arranged such that Luis and three clients are sitting at a horseshoe table and Luis can easily observe all three clients. For one of the clients, Luis plans to develop an intervention targeting on-task behavior. Luis plans to collect data on the client's behavior while implementing teaching trials.
7. Jasmine is teaching her client to emit the response "car" every time Jasmine holds up a picture of a car and presents the instruction "what is it."

Appendix F: Selecting Data Collection Vignettes

Supervisor Answer Sheet

1. Aki is conducting a parent training with Jeffery. Jeffery has expressed that he wants his son to follow the instruction "clean up." After gathering some additional information, Aki determines that Jeffery's son does clean up his toys after his father provides the instruction "clean up," but it takes him a long time to start cleaning.

   Let us practice walking through the decision-making guide.

   1. Will all instances of the behavior be recorded?

      (a) Yes, Jeffery observes his son's behavior after he presents the instruction.

   2. Is it a free-operant response?

      (a) No, the behavior only occurs after the instruction is provided.

   3. Is the length of time between the stimulus and initiation of the response important?

      (a) Yes, the goal is to decrease the lag time between the instruction and the child initiating the cleaning task.

   Best measurement technique: Latency

2. Ms. Aguirre is a teacher in a first-grade classroom. She has a student who is engaging in disruptive behavior in the form of throwing toys during free play. She is the only teacher for a class of 30 students. During the free play time, students are scattered across the classroom engaging in a variety of activities.

   Best measurement technique: Momentary time sampling

3. Jaylen has a client who engages in aggressive behavior in the form of hitting. Jaylen works with the client one-on-one and is worried that his client will be kicked out of his classroom if the behavior continues to occur. There is often a 30-second interval between each instance of the behavior.

   Best measurement technique: Frequency

4. Rylee is providing consultation services for a school district. She is observing a student in classroom who engages in frequent negative vocalizations in the form of crying and screaming. Rylee would like for the paraprofessional to collect data on the negative vocalizations during the times in which Rylee is unavailable. The paraprofessional is assigned to the target student but is required to multitask during specific activities.

   Best measurement technique: Partial interval

5. Kyle flops to the ground and screams and cries (i.e., tantrum behavior) during public outings with his mother. The behavior analyst has request for the mother to collect data on these bouts of behavior.
   Best measurement technique: Duration

6. Luis is conducting a small group activity with three clients. The activity is arranged such that Luis and three clients are sitting at a horseshoe table and Luis can easily observe all three clients. For one of the clients, Luis plans to develop an intervention targeting on-task behavior. Luis plans to collect data on the client's behavior while implementing teaching trials.
   Best measurement technique: Whole interval

7. Jasmine is teaching her client to emit the response "car" every time Jasmine holds up a picture of a car and presents the instruction "what is it."
   Best measurement technique: Per opportunity

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