Dancing with Your Data: Novel Approaches to Data Collection and Analysis to Drive Meaningful Clinical Decisions

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### Data Sheet: Frequency

**Directions:** Complete the following data collection sheet to determine how frequently a learner is engaging in a particular behavior.

<table>
<thead>
<tr>
<th>Date</th>
<th>Setting/Activity</th>
<th>Length of observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/5</td>
<td>Music</td>
<td>15 min</td>
</tr>
<tr>
<td>10/6</td>
<td>Math</td>
<td>15 min</td>
</tr>
<tr>
<td>10/7</td>
<td>Recess</td>
<td>15 min</td>
</tr>
</tbody>
</table>

### A-B-C (Antecedent-Behavior-Consequence) Data Sheet

**Operational Definitions:**
- Antecedent: any stimulus that precedes the student's behavior.
- Behavior: the student's response to the antecedent.
- Consequence: the stimulus that results from the student's behavior.

**Antecedent:**
- (check all that apply)
  - viel
  - Hall
  - Teacher

**Behavior:** (check all that apply)
- viel
- Hall
- Teacher

**Consequence:**
- (check all that apply)
  - viel
  - Hall
  - Teacher

**Attention:**
- (check all that apply)
  - viel
  - Hall
  - Teacher

**Response to the Antecedent:**
- (check all that apply)
  - viel
  - Hall
  - Teacher
“Numbers have an important story to tell. They rely on you to give them a clear and convincing voice”

- Stephen Few
Our roots: Why record data?

- A hallmark of our science is the precise measurement of observable behavior (Baer, Wolf, & Risley, 1968)
- Allows for the evaluation of the impact of interventions on the behavior of interest
- Removes subjectivity
- We are most likely to make the most efficient and effective decisions for those we serve when using data to drive these decisions.
Barriers in data collection

- We put in place cumbersome methods that decrease meaningful interactions with our clients
- We take data but we don’t visually inspect it or come in contact with it regularly
- Decisions are not made based on data analyses
- Our data does not provide us the right information to make meaningful clinical decisions
- Our data do not highlight small, yet meaningful changes in operant behavior
Digging deeper: What can we do?

- Challenge ourselves to employ different methods for capturing operant behavior
- Analyze different dimensions of behavior when progress stalls or when an understanding of the functional properties are unclear
- Understand the empirical basis behind the ways different types of data capture the operant
What is latency?

- The elapsed time between the onset of a stimulus and the initiation of a response (Cooper, Heron, & Heward, 2007)
- Often included in operational definitions, but considered more in terms of “processing time”
- Small changes in latency may be indicative of the strength of the relationship between the antecedent and the response, and is an important consideration across operant learning
Why latency?

• Simple, relatively straightforward, and may be highly acceptable to consumers and observers alike (Kahng et al., 2010)
• A predictive measure of subsequent responding and has high correspondence to other continuous measures (Thomason-Sassi et al., 2011)
• Provides information about idiosyncratic variables related to response strength
  o Stimulus control (Touchette, 1971)
  o Aversiveness (Call, Pabico, & Lomas, 2009; Laprime, Axe, Allen, & Maguire, 2013; Kaplan, Jackson, & Sparer, 1964)
  o Fluency (Kubina & Wolfe, 2005)
  o Resistance to extinction (Mace et al., 1988; Mace & Belfiore, 1990)
  o General motivation (Kettering, 2008)
• Imperative for operant behavior to contact reinforcement in naturally occurring situations
Latency in real life

• Greetings
• Responding to potentially dangerous stimuli
• Engaging in a conversation
• Answering a phone
• .... and so on
Propose a model for using alternate measurement to understand operant behavior within functional analyses, identification of precursors, and within discrete trial instruction (DTI)

Employ an understanding of the role latency can play in each of these areas

Set the stage for further research, clinical analysis, and excitement about the work we do!
Latency Measures in Functional Analyses
Latency has a role in the analysis of the functional properties of behavior.

Measurement: Methods have historically included interval recording, frequency, rate (Hanley 2012; Iwata, Dorsey, Slifer, Bauman, & Richman, 1994).

Ways we use latency (Thomason-Sassi et al., 2011):
- Latency to 1st response in combination with other measures
- Latency functional analysis
Latency to the first response

- Latency analysis can be utilized within more standard functional analysis designs
- Employed by measuring the latency to the first response within the condition
- Latency to first response has been compared to session data and has demonstrated the following—(Laprice, 2013; Thomason-Sassi et al., 2011)
  - Predict outcomes found in functional analysis
  - Have a high degree of correspondence with response rate
  - Provide idiosyncratic information that may not emerge in standard functional analysis measures
• 9-year-old male diagnosed with an autism spectrum disorder
• Referred due to self-injury in the form of self-biting
• Had historically had a behavior assessment which suggested that self-biting was multiply controlled
• Behavior intervention had focused on DRA + extinction
• Functional Analysis: demand, control, attention, tangible
  o 5-min sessions
  o 10s partial interval recording and Latency to the 1st response in seconds
  o Repeated implementation of the condition specific antecedents
Clinical analysis

• Vinny:
  o Target behavior functioned to access automatic reinforcement and escape from demands
  o Given the role demands played in behavior, it was imperative to address this clinically
  o What do we do now that we know this:
    • Focus on FCT and differential reinforcement
    • Abolish the CMO-R during instruction
    • Differentially reinforce adaptive behaviors
    • Identify competing responses
    • Establish stimulus control of behavior
Latency Functional Analysis
Latency FA

- Termination of the session following the first instance of target behavior
- Latency to response in seconds for each session
- Results in:
  - Shorter time exposed to assessment conditions
  - Reduced number of responses that occur
  - Minimization of dangerous challenging behavior
  - Inclusion of conditions and/or behaviors that may not be amenable to repeated presentation of experimental conditions (i.e., transitions, elopement)
• 5-year old female with an autism spectrum disorder
• Referred for two classes of challenging behavior
  o Low-intensity: Yelling, verbal protesting, whining
  o High-intensity: Elopement, hiding under tables, aggression
• Specific questions around the role of transitions and denied access
• Latency based FA with 6 conditions: Denied Access, Transition-in, Transition-out, Denied access + Transition-in, Denied access + Transition-out, Control
  o 5 minute sessions (maximum)
  o Latency in seconds to 1st response (level 1 or level 2 behavior)
  o Termination after the occurrence of behavior
Clinical analysis

• **Ellie:**
  - Target behavior functioned to gain access to tangibles
  - We did not see any Level 2 behavior
  - Transitions were NOT the primary function, but were likely correlated with denied access situations
  - **What do we do now that we know this:**
    - Teach tolerance to denied access (Accepting “No” and Waiting)
    - Unpair transitions and denied access
    - Differentially reinforce adaptive behaviors (FCR’s etc.)
Latency in Response Classes
Precursor analysis

• **Response classes**: those behavior which have the same function and occur under the same environmental conditions

• **Precursor behaviors**: behaviors which are part of the same response class, specifically, those that reliably precede other more intense target behaviors

• **Identification of precursors allows us to do the following**:  
  o Assess behavior safely (i.e., functional analysis)  
  o Intervene sooner (i.e., catch and respond to behavior escalation)  
  o Differentially reinforcer less intense behaviors

• **How latency helps us**:  
  o Accurately identify precursors  
  o Confirm the relationship between precursors and other target behaviors
The identification of precursors

- Use descriptive assessment to identify potential precursor/target behavior and test those within the functional analysis.
- Employ a standard FA and combine with an analysis of latency to 1st response.
- **Questions we want to answer:**
  - Are the identified precursors part of the same response class?
  - Do the precursors reliably precede the target behaviors? (i.e., shorter latency)
  - Do precursors occur more frequently during the assessment?
Calvin

• 10-year-old male who resided in a psychiatric residential treatment facility for assessment and stabilization
• Diagnosed with autism spectrum disorder, PTSD, and ADHD
• Descriptive assessment had identified 2 potential groups of behaviors
• Functional analysis: control, demand, demand + denied access, low attention + demand to stay, low attention + demand to stay with item
  o 5-min sessions
  o 10s partial interval recording and Latency to the 1st response in seconds
  o Repeated implementation of the condition specific antecedents
Clinical analysis

• Hypothesized precursors and unsafe confirmed as response class
• Less intense behaviors confirmed as precursors due to latency analysis
• Role of escape from demands to items/activities or information
• If given something to do Calvin did not engage in either class of behavior
• By reinforcing precursors we rarely saw unsafe behaviors!
• What do we do?
  • Teach Calvin to advocate for himself (what to do when bored, needing breaks etc.) and structure down time proactively
  • Teacher leisure skills and Increase resiliency to participate in demands
  • Mediate transitions from access to demands
  • Reinforce precursors- catch the escalation cycle early!
Latency in Skill Acquisition
Latency in DTI

- Instruction provided through the presentation of an SD, response prompt, student response, and consequence
  - Percentage of compliance or percentage correct (Ardoin, et al., 1999; Bullock & Normand, 2006; Mace et al., 1997)
  - Rate of occurrence (Dawson, et al., 2003; Horner et al., 1991)
- Latency to response may or may not be included in operational definition of accurate response
- What latency to responding can contribute to measurement in DTI:
  - Is progress being made that is not captured by percent correct?
  - Are responses accurate and quick enough to be reinforced?
  - Is instruction aversive? How do we abolishing said aversiveness?
Latency, aversiveness, and high-p

- Response latency frequently utilized with high-p request sequence when assessing “momentum” of compliance
- High-p request sequence may abolish the CMO-R and subsequently increase latency to responding
- Latency and high-p not evaluated within the consistent framework of DTI
- DTI is an important place to evaluate latency due to the high levels of problem behavior often observed in this context (Carbone et al., 2010)
  - Contributes to an understanding of aversiveness of instruction (CMO-R)
  - Guides development of interventions to abolish the CMO-R
  - Questions about the degree to which latency measure correspond to other measures in adaptive skill development
Method of analysis

Method for application and analysis:
- Sessions set up with DTI framework
- Pre-assessment: Function of interfering behavior, demand assessment, preference assessments, FCT to replace problem behavior
- Low-P Request Sequence: 10 trials comprised of academic demands
- High-P Request Sequence: 10 trials as defined in low-p request sequence, interspersed with 3-5 high-p requests
- Reinforcement for compliance with high or low-p requests
- Measurement
  - Number of trials and latency to compliance
  - Number of trials and latency communication responses
- Within and across condition analysis of changes in compliance and latency to compliance

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James

- 6-year-old male diagnosed with ASD
- Complex medical history
- Problem behavior related to demands and denied access
- Referred for “tantrum behavior” (aggression, refusal, bolting, crying, rumination)
- History of responding to demands but with long or maximum latencies
- Low-P requests: counting blocks, receptive ID, matching objects to pictures, tracing letter of name
- High-P requests: echoics and motor imitation
Number of Trials with Compliance

Mean Latency (s) to First Compliance

Sessions

All Low-P Requests

Hi-P Request Sequence

All Low-P Requests

Hi-P Request Sequence

Number of trials with compliance

Latency to compliance

(Session Terminated)

(Session Terminated)

Sessions

James

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Number of Trials with Compliance

Mean Latency (s) to First Compliance

Sessions

All Low-P Requests
Hi-P Request Sequence

All Low-P Requests
Hi-P Request Sequence

Number of trials with compliance

Latency to compliance

Sessions

James
Number of Trials with Communication Response

Mean Latency (s) to First Communication Response

Sessions

All Low-P Requests
Hi-P Request Sequence
All Low-P Requests
Hi-P Request Sequence

Number of trials with communication response
Latency to communication response

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Summary of results

**Latency to Compliance**

- **LP 1**: 30
- **HP 1**: 25
- **LP 2**: 20
- **HP 2**: 15

**Number of Trials with Compliance**

- **AVG Latency to Compliance Across Condition**
- **AVG Number of Trials with Compliance Across Condition**

**Latency to Communication**

- **LP 1**: 10
- **HP 1**: 15
- **LP 2**: 20
- **HP 2**: 25

**Number of Trials with Comm**

- **AVG Latency to Communication Response Across Condition**
- **AVG Number of Trials with Communication Response Across Condition**

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Clinical analysis

• Initially, DTI was aversive for James, (frequency break requests at short latencies and low compliance at maximum latencies)
  o Small changes in latency to break requests were evident
  o High-p requests -> increased compliance of responses, yet latency to responding varied (i.e., 2s to 10s)
  o Over time we saw more consistent changes in latency to responding
• DTI for James should be modified to include methods to abolish the CMO-R (i.e., high-p request sequence or other methods)
• Latency should continue to be measured to determine if short latencies maintain across instruction
• Compliance AND latency should be defined within operational definitions of skill mastery
Why I love latency?

- It is **EASY** to capture
- It provides **MEANINGFUL** information
- The conceptual analysis is **COMPLETE** and **PRECISE**
- Changes in latency of responding have **REAL LIFE, SOCIALLY SIGNIFICANT** implications
- It drives **CLINICAL** decisions that are more likely to **EFFECTIVE** for the clients we serve
Find a data measure YOU love

• Re-evaluate the methods you use to measure responding across the different areas your practice
• Don’t get stuck- change it up
• Analyze, Analyze, Analyze!!!
• Consider if you are getting the information you need to drive meaningful clinical decisions
• Remember, data is only what we make of it, it is our job to give a voice and life to that data
Thank you!

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References


