

## DHH Program Development and Evaluation: Connecting the Dots



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## Today's Schedule

- 9:30-10:00 Foundations of Program Development and Evaluation for Children and Adolescents who are Deaf and Hard of Hearing.
- 10:05-12:15 Aggregating Data for Program Development
- Break for Lunch
- 1:00-2:30 Interpreting Data and Monitoring Progress

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⇒ Behavior is \_\_\_\_\_.

⇒ Behavior is \_\_\_\_\_ and \_\_\_\_\_.

⇒ Behavior is \_\_\_\_\_.  
Why does Susan behave in this way?

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- Describe Susan in detail ... What data are available?
- What do we know about what she has learned?
- What do we need to know?
- Have we used all the data generation methods at our disposal?
- Do we know all we need to know to make the best possible data based decisions?

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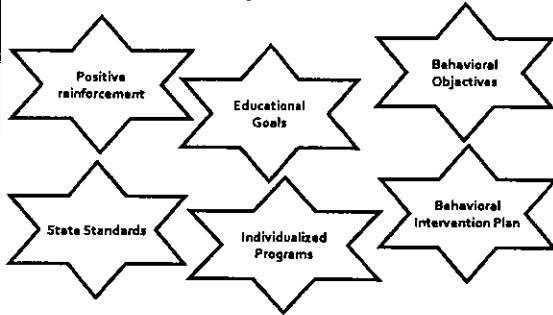
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**The vocabulary we share ...**



...FBA, BIP, DHH ... and many more too ...

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- Use \_\_\_\_\_ of data sources to get to know the child.
- Compile these data using \_\_\_\_\_ based on behavioral theory.
- Develop programs \_\_\_\_\_ of the children and adolescents we care about.
- **What do we know about Susan?**
- ... This is a real child who is seeking our \_\_\_\_\_ and best \_\_\_\_\_.

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- We get to know children's educational needs using a **variety of data sources**.
- We use our **shared vocabulary** - knowledge and skills.
- We develop **quality programs** that meet the educational needs of each individual child and adolescent.



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- ➡ We know that Susan's behavior is learned.
- ➡ We observe and measure his behaviors.
- ➡ We want to understand what his behavior is communicating.

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10:05 -11:00:  
**Aggregating  
Data: Connecting  
the Dots**

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### Data for Program Development: What are we doing?

- To aggregate – What does Mr. Webster say?
  - to gather into or considered as a whole
  - made of different parts
  - gathered into a whole of mass
  - taken all together as a whole

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### Why Aggregate Data?

Find out what the child can do in order to do:

- Program evaluation – up to this point
- Prioritize skills and needs
- Plan programs
- Implement programs
- Generate new data
- Program evaluation following implementation

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### Take Away Points: for Program Development

- 1. Getting to know Susan \_\_\_\_\_
- 2. Getting to know \_\_\_\_\_
- 3. Knowing \_\_\_\_\_
- 2. We need data from a variety of sources.
- 3. Functional assessment gives us a tool for focused \_\_\_\_\_.

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## of Data Collection

- Observe \_\_\_\_\_ academic and behavior tasks.
- Observe in \_\_\_\_\_ contexts.
- Observe \_\_\_\_\_ - the environment, instruction, and student behavior.
- Observe both \_\_\_\_\_ and \_\_\_\_\_.

13

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## What data do \_\_\_\_\_ to generate?

- Data on the child – What are the presenting academic and social behaviors?
- Data on the environment – antecedents to the behavior?
- What are the consequences of the behaviors?

## \_\_\_\_\_ Analysis

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## Getting to Know the Environment

### The Environment as

\_\_\_\_\_

In what way does the environment set the stage for what is going on in the classroom?

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**Aspects of the Environment**

*The \_\_\_\_\_ Environment*

*The \_\_\_\_\_ Environment*

*The \_\_\_\_\_ Environment*

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**Aspects of the \_\_\_\_\_ Environment  
to Consider**

- Lighting*
- Seating*
- Acoustics*
- Distractions*
- Temperature*
- General atmosphere*

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**Aspects of the \_\_\_\_\_ Environment**

- Access to Language of Peers and Teachers*
- Materials*
- Manipulatives*
- Curriculum*
- Activities*
- Instructional Demands*
- Accommodations*
- Modifications*

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**Aspects of the \_\_\_\_\_ Environment**

- Child's language level
- Teacher-student interactions
- Peer- student interactions
- Disruptions
- Behavioral interventions
- Peer interactions
- General atmosphere

19

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**the Environment**

- Informal Environment Assessment Instrument
- M:\SafeNet Sentinel\Reg  
F\_files\PAULA\Environment Assessment Survey  
DHH.doc

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**Data from a Variety of Sources**

- What evidence do you expect to see in Susan's \_\_\_\_\_?
  - Work skills
  - Language skills
  - Social skills
  - Functional skills
  - Self-awareness
  - Family perspectives
  - etc. etc. etc.

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## Methods for \_\_\_\_\_ Data

- \_\_\_\_\_ – work samples, portfolios, etc.
- \_\_\_\_\_ – child, teacher, therapists, family, siblings etc.
- \_\_\_\_\_ of the child/adolescent
  - Event recording      Duration recording
  - Interval recording      Latency recording
  - Time sampling

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## Why do \_\_\_\_\_ behavioral analysis?

- The planned \_\_\_\_\_ of a functional behavioral analysis includes:
- A clear and detailed behavioral description
  - Prediction of the behavior
  - Documentation of the function of the behavior
  - Effective interventions

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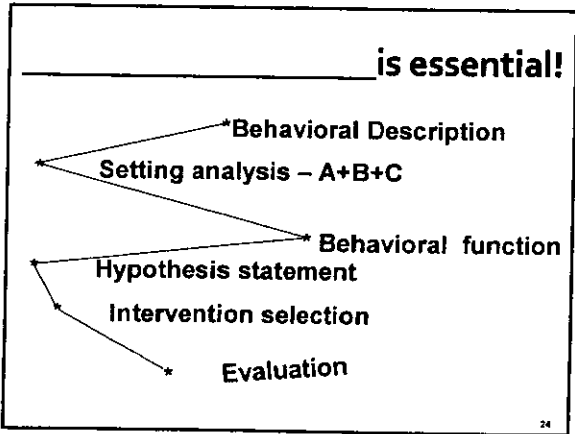
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**Step 1: Behavioral Description: Can you \_\_\_\_\_?**

- Write
- Orally read
- Talk hit
- Talk-out
- Orally say
- Verbally state
- Walk
- Rudeness
- Understand
- Participate
- Comprehend
- Not progressing
- Impulsive
- Distractible
- Unmotivated

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**Behavioral Description**

Behavior Expression Frequency Duration Magnitude

Hits	Hits	8-10	2-3	Causes
	ears	times	mins.	redness
	with	<small>Behavior Description</small>		and
	open	day		bruises
	hands			

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**Step 2: Identify \_\_\_\_\_**

What events and circumstances bring about the behavior?  
 What is going on before the behavior occurs?  
 What follows the behavior? What happens after the behavior occurs?  
 Analyze the \_\_\_\_\_ connection.

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**Step 3: What is the \_\_\_\_\_ of the behavior?**

**What is the behavior \_\_\_\_\_ us?**

- Obtain desirable events
  - Internal stimulation such as, rocking etc.
  - External stimulation such as, attention or objects and activities.
- Avoid/escape undesirable events
  - Internal stimulation such as, hunger, skin irritation etc.
  - External stimulation such as, attention, tasks, and events...

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**Step 4: Develop a \_\_\_\_\_ Statement**

**Definition:** A statement that describes \_\_\_\_\_ between the behavior and the events and/or circumstances in the environment.

- Example: Susan tears her papers when she writes answers to less than 20% of the questions.
- John hits his ears with open hands when ...

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**Step 5: Develop \_\_\_\_\_ intervention**

**Clear hypotheses statements \_\_\_\_\_ effective interventions.**

Hypotheses-based interventions frequently involve:

- \_\_\_\_\_ of context, learning tasks, assignment specifications etc.
- \_\_\_\_\_ new and desirable behaviors, such as, "instead of tearing my paper I will ..."

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**Step 6: \_\_\_\_\_ of the Plan**

- Is this plan working? Has the behavior changed? What do my data say?
- Do I need to adjust my plan?
- Do I need to make additional adjustments in the context?
- Do I need to teach the student additional new/alternative behaviors?

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**Summary of \_\_\_\_\_ Data**

- 1. We get to know the child.
- 2. We get to know the environment.
- 3. We find out what needs to be known.
- 4. We generate data from a variety of sources.
- 5. We plan, implement, and evaluate instruction.
- 6. We conduct functional assessment for focused behavioral assessment and analysis.

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**1:00-2:30 Analyzing and Interpreting Data**

- Paying \_\_\_\_\_ to the data.
- \_\_\_\_\_ to what the data are telling us.
- Making data based \_\_\_\_\_.

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**\_\_\_\_\_ Data: What are we doing?**

- Interpreting: What does Mr. Webster say?
  - To explain the meaning of
  - To translate
  - To have or show one's own understanding of the meaning of
  - To bring out the meaning of

34

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**Analyzing and Interpreting Data –**

- Be careful of the \_\_\_\_\_ you draw.
- The wisdom of the \_\_\_\_\_ approach.
- The wisdom of at least \_\_\_\_\_ data points.

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**Data analysis and interpretation**

**This takes \_\_\_\_\_!**

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**\_\_\_\_\_ for Analyzing and Interpreting Data**

- To \_\_\_\_\_ the status of the students' learning.
- To \_\_\_\_\_ students' progress.
- To determine intervention effectiveness.
- To provide feedback to teachers, parents and others.
- To \_\_\_\_\_ your teaching efforts.
- To demonstrate account\_\_\_\_\_.

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**Data Analysis: \_\_\_\_\_ to \_\_\_\_\_ the data**

- ➔ Analysis and interpretation of quantitative data: What are the \_\_\_\_\_ telling us?
- ➔ Analysis and interpretation of qualitative data: What are the \_\_\_\_\_ telling us? Themes? What ways do data cluster conceptually?

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**Explaining the \_\_\_\_\_ of ...**

- A \_\_\_\_\_ is worth a thousand words.
- Connecting the \_\_\_\_\_ is child's play and more.
- \_\_\_\_\_ communicate.
- The same set of data can be graphed more than \_\_\_\_\_ way.

39

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## The Legend: \_\_\_\_\_ for data

### What goes into the legend?

- Day \_\_\_\_\_ Month \_\_\_\_\_ Year \_\_\_\_\_
- Student's name: \_\_\_\_\_
- Setting: \_\_\_\_\_
- Observer's name: \_\_\_\_\_
- Target behavior: \_\_\_\_\_
- Observation method: \_\_\_\_\_

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## Data with and without a \_\_\_\_\_:

- Interpret these data
- [Excel Demonstration without legend.xls](#)
- Now, let us interpret these data
- [Excel Data with legend.xls](#)

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## Analyzing and Interpreting Types of \_\_\_\_\_ Data

- Permanent Products
- Direct Observations
  - Event recording
  - Interval recording
  - Time sampling
  - Duration recording
  - Latency recording



42

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## Analyzing and Interpreting Types of Data - Words

Written descriptions of data from:

- Anecdotal Records
- Permanent Products
- Interviews
- Letters
- Essays



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## Guidelines for \_\_\_\_\_ Reports

- Describe the setting as you initially see it; describe the individual and the behavior in which he/she is engaged.
- Clearly differentiate between fact and your interpretation of what is being observed.
- Record everything the student says and does and to whom or to what.
- Describe everything said and done to the student and by whom.

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## Event Recording

Event Recording *involves recording the number of times a behavior occurs. The \_\_\_\_\_ is the stimulus for recording, i.e. # of hand raises, # of words written, # of words spoken ... discreet behaviors.*

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Student: \_\_\_\_\_

Observer: \_\_\_\_\_

Behavior: \_\_\_\_\_

Date	Time	Instances of Occurrence	Total Occurrences
3/15	10:00 - 10:15	7th 7th 7th 7th III	23
3/16	10:00 - 10:15	7th 7th 7th III	18

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### Monitoring Progress and Documenting Improvement

- Is Susan we making \_\_\_\_\_?
- Are we noting the progress Susan is making?



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### Time Sampling

... involves \_\_\_\_\_ whether a behavior occurred during specific intervals, such as, every five minutes, 10 or 20 minutes ...

*An example of a use of time sampling – a teacher may observe a student who walks around the classroom without permission during 3X10 minute intervals ...*

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**Time Sampling**

Student: \_\_\_\_\_ Behavior: \_\_\_\_\_  
 Date: \_\_\_\_\_ Time Start: \_\_\_\_\_  
 Observer: \_\_\_\_\_ Time Stop: \_\_\_\_\_

	10'	20'	30'	40'	50'	60'
2 Hour	X	X	O	X	X	O
1 Hour	O	O	X	X	O	X

O = nonoccurrence  
 X = occurrence

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**Interval Recording**

*... involves recording whether a behavior occurred during intervals of a very specific \_\_\_\_\_ time period i.e. every four seconds, 10 or 20 seconds ...*

*Examples of uses for interval recording include – orally spelling upon request, eyes on paper or task, thumb sucking etc ...*

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**Coding Form for Multiple Students**

	10'	20'	30'	40'	50'	60'
Tony						
Al						
Ellen						
Austin						
Mary						

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## Duration Data

Observing the \_\_\_\_\_ of time a behavior occurs, how long a student stays in his/her seat – *you may calculate average duration or total duration.*

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## Latency Data

Latency recording involves observing how long it takes a student to begin a behavior once its performance has been \_\_\_\_\_ ... *measuring the length of time between the presentation of the antecedent and the initiation of the behavior, example, "Please hang up your coat."*

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Basic Formats for Latency and Duration Recording Data Sheets

Student: \_\_\_\_\_  
 Observer: \_\_\_\_\_  
 Behavior: \_\_\_\_\_  
 Operationalization of behavior: \_\_\_\_\_  
 Initiation: \_\_\_\_\_

Student: \_\_\_\_\_  
 Observer: \_\_\_\_\_  
 Behavior: \_\_\_\_\_  
 Behavior initiation: \_\_\_\_\_  
 Behavior termination: \_\_\_\_\_

Date	Time	Latency	Date	Time	Duration
	Delivery of Sd	Response initiation		Response initiation	Response termination

54

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## Graphing Data – Visualizing Data

- Again, a picture is worth a thousand words!
- [Susan's Original Data.xls](#)
- [Susan's graphed Data.xls](#)
- [Excel Data with legend.xls](#)



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## Many Concluding Thoughts

- The education and welfare of the child or adolescent remains our central focus.
- Behavioral observation and measurement leads you on your way.
- Consider the many both formal and informal approaches to data generation.
- Data based decision making leads the way for program development and evaluation.

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## Today in a nutshell!

Behavior is \_\_\_\_\_.  
Students are communicating to us.  
What are they \_\_\_\_\_?  
What is their behavior telling us?  
What do we need to do to \_\_\_\_\_ what  
they are telling us.

<http://www.youtube.com/watch?v=3TChnCMIH24>

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## Thank you so much!

- Thank you for the honor of being here with you today.
- All the best to you as you continue your work.
- I will be glad to be a resource for you or do what I can to find what you need.
- You can reach me at:

E. Paula Crowley, Ph.D.  
Illinois State University,  
Normal, IL 61790-5910

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## Getting to Know Susan

Susan is six years old and in kindergarten. Susan was a full-term baby and weighted 6lb. 1oz. at birth. She lives at home with her parents and two brothers - a very loving, attentive and supportive family.

Susan was diagnosed with a moderate hearing loss at 500Hz and 2000Hz. Most of the time, she wears two Phonak Maxx 211 behind-the-ear hearing aids. Susan was diagnosed with Down syndrome at seven weeks old when she was hospitalized for surgery to repair a hole in the middle of her heart. Following surgery she developed feeding issues which resulted in the need for supplemental feedings through a nasoduodenal tube. She remained on the ventilator for six weeks. She also experienced a collapse of her right lung. She received a gastrostomy tube to maintain her nutrition. When she was six months a swallow study indicated no restrictions for oral feeding.

Physically Susan presents facial symmetry with normal alignment of the mandible. The muscle tone of her cheeks and lips is low. Her lips are observed to be open at rest. A mild line of tissue is noted on her upper lip. Her tongue is symmetrical with tongue protrusion noted in midline position. Intraoral structures appear to be within normal limits. No drooling was noted. Susan puts her fingers in her mouth for calming and when she is sleepy.

As a young child Susan was diagnosed with gastroesophageal reflux, candida esophagitis, and aspiration pneumonia. She experiences chronic upper respiratory infections. Her hearing concerns continue. Tubes placed in her ears improved her hearing significantly. She wears her hearing aids intermittently. A total communication approach is being used to facilitate speech and language development.

She uses both English and sign language to communicate. Her expressive language skills indicate the 23 month age range. She is using 50 signs and at least 10-15 words. She can also sign two to three word phrases. She is using the pronoun "me" accurately. Her receptive communication score indicates a significant delay but has shown significant gains. Her current receptive language score indicates a 21-22 month age range. She is associating spoken words with familiar objects, she responds to "out", "on", and "in".

Susan's overall cognitive score indicates a 19-month age equivalence. She demonstrates eagerness to explore the environment and investigate her surroundings. She feels and explores objects. She uncovered a hidden toy successfully. Susan pulls at objects to obtain them. She searches for removed objects and reaches around a barrier to obtain toys. She placed a circle, a square and a triangle in a foamboard. She responds to "one" and "one more" correctly.

She was eligible to receive Early Intervention services due to her diagnosis which needed medical attention, and she has a 30% delay in one or more areas of development. Areas recommended for intervention included cognitive development, physical development, language, speech and communication development, and hearing and vision. As she grows older, she appears to be angry, frustrated and generally upset very easily. Her parents and teachers are currently puzzled by her level of anger and frustration.

### Verb Choices for Behavioral Description

E. Paula Crowley

Please mark DOB (directly observable behavior) AB (ambiguous behavior) or NDOB (not directly observable behavior) to indicate which of the words listed below are action verbs referring to directly observable and measurable behaviors.

Behaviors	DOB	AB	NDOB
1. To be curious			
2. To write			
3. To walk			
4. To create			
5. To draw			
6. To find			
7. To see			
8. To think			
9. To wonder			
10. To apply			
11. To add			
12. To label			
13. To discriminate			
14. To cover with a card			
15. To read orally			
16. To infer			
17. To locate			
18. To count orally			
19. To place			
20. To point to			
21. To group			
22. To feel			
23. To demonstrate			
24. To understand			
25. To reject			

Total: \_\_\_\_\_ out of 25

## Reinforcer Survey

Student Name \_\_\_\_\_

Date: \_\_\_\_\_

1. If I had \$10.00 I would \_\_\_\_\_
2. My favorite foods are \_\_\_\_\_
3. My favorite game is \_\_\_\_\_
4. My favorite thing to do when I have free time is \_\_\_\_\_  
\_\_\_\_\_
5. My favorite place is \_\_\_\_\_
6. When I go home I like to \_\_\_\_\_
7. Week-ends are special because I can \_\_\_\_\_
8. My favorite sport is \_\_\_\_\_
9. When I grow up I would like to \_\_\_\_\_
10. My favorite book is \_\_\_\_\_
11. My favorite color is \_\_\_\_\_
12. If I could travel to wherever I want I would go to \_\_\_\_\_
13. My favorite animal is \_\_\_\_\_
14. A pet I would like is \_\_\_\_\_
15. If I could have any pet I want, I could choose a \_\_\_\_\_
16. My favorite subject in school is \_\_\_\_\_
17. My favorite candy is \_\_\_\_\_
18. A dream I have is to learn how to \_\_\_\_\_
19. If I had \$100.00 I would \_\_\_\_\_
20. If I could have anything I want, I would choose \_\_\_\_\_
21. Any other thing you want to tell me about: \_\_\_\_\_

Is teacher instruction centered near the children?	Yes	1	2	3	4	5	No	Comment:
Are there guidelines in place for students' play/work?	Yes	1	2	3	4	5	No	Comment
Is there an atmosphere of excitement and a positive attitude toward playing/learning in the classroom?	Yes	1	2	3	4	5	No	Comment:
Is there time given for the students to ask questions or clarify the assignment?	Yes	1	2	3	4	5	No	Comment
Does the teacher use positive behavioral supports?	Yes	1	2	3	4	5	No	Comment:
Are there clear behavioral expectations of the students?	Yes	1	2	3	4	5	No	Comment:
Are there visual cues about the daily schedule or expectations?	Yes	1	2	3	4	5	No	Comment:
Are there cues for transition times?	Yes	1	2	3	4	5	No	Comment:
Is there time given for the students to ask questions or clarify the assignment?	Yes	1	2	3	4	5	No	Comment:



Using the information from the above observations, summarize your observations and cite greatest areas of concern:

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# BEHAVIOR CHANGE IN A STUDENT WITH A DUAL DIAGNOSIS OF DEAFNESS AND PERVASIVE DEVELOPMENTAL DISORDER: A CASE STUDY

**T**

HE BROAD TERM *pervasive developmental disorder* (PPD) describes a set of symptoms that occur along a continuum of severity; these symptoms are often referred to as *autism spectrum disorders* (ASDs). Little is known about the incidence and prevalence of ASDs among students who are deaf or hard of hearing (DHH). Teachers of DHH students, who must work with individuals with dual diagnoses, are at a loss for guidance from the literature. The authors review the literature on ASDs (also referred to as PDD) within the DHH population, provide results of a single-subject study to reduce PDD-type behaviors in a child with hearing loss, and argue that teachers of students who are DHH must learn about practices associated with applied behavior analysis as an tool for intervening therapeutically with children with dual diagnoses of hearing loss plus an ASD.

**SUSAN R. EASTERBROOKS AND  
C. MICHELE HANDLEY**

EASTERBROOKS IS A PROFESSOR IN THE DEPARTMENT OF EDUCATIONAL PSYCHOLOGY AND SPECIAL EDUCATION AT GEORGIA STATE UNIVERSITY, ATLANTA. HANDLEY IS A DOCTORAL STUDENT IN THE SCHOOL OF EDUCATION, UNIVERSITY OF NORTHERN COLORADO, GREELEY.

*Pervasive developmental disorder* (PPD) is a broad term used to describe a set of symptoms that occur along a continuum of severity; these symptoms are often referred to as *autism spectrum disorders*, or ASDs (American Psychiatric Association, 1994). In the present article, we use the abbreviation *ASD/PDD* to indicate that both terms are used to mean the same thing.

Kanner (1943) was the first to describe a group of children who demonstrated aloofness, poor eye contact, and severe language deficits. The term infantile autism first appeared as a diagnostic label in the third edition of the *Diagnostic and Statistical Manual of Mental Disor-*

*ders* (hereafter *DSM-III*; American Psychiatric Association, 1980). In subsequent years, the definition and criteria for diagnosis of infantile autism have been modified. The definition now includes milder and more common forms of the disorder. In 1990, autism was included as a disability category in the Individuals With Disabilities Education Act, and a definition was provided:

A developmental disability significantly affecting verbal and non-verbal communication and social interaction, generally evident before age 3 that adversely affects a child's educational performance. Other characteristics often associated with autism are

engagement in repetitive activities and stereotyped movement, resistance to environmental change or change in daily routine, and unusual responses to sensory experiences. (Individuals With Disabilities Education Act of 1990, § 300.7(c)(i))

Little is known about the incidence and prevalence of ASD/PDD among the population of students who are deaf or hard of hearing. In its annual survey of children and youth with hearing loss, the Gallaudet Research Institute (GRI) has reported the incidence and prevalence of additional disorders among the deaf and hard of hearing school-aged population; however, no such data on ASD/PDD are included in the survey (Gallaudet Research Institute, 2003). Wolf-Schein (1998) described difficulties associated with obtaining an appropriate assessment of students with deaf-blindness and autism, and concluded that many students with both disorders are mislabeled as having mental retardation. Not only is there poor information regarding incidence and prevalence; the research defining "best practices" is equally limited. Most of the literature we reviewed provided comparisons between children with autism and children with hearing loss (e.g., Murdoch, 1996; Peterson & Siegal, 1997), or consisted of chapters in books in which one chapter pertained to students with autism and another chapter to students with hearing loss (e.g., Slade & Wolf, 1994).

The purpose of the present article is to provide definitions of the disorders within the autism spectrum, to review the literature on ASD/PDD in students who are deaf or hard of hearing, and to present the results of a single-case study of behavior change in a student with hearing loss diagnosed with "PDD-not otherwise specified" (PDD-NOS). Given the variations in

this low-incidence population, single-case research may be the most effective means of infusing data into the knowledge base.

### Pervasive Developmental Disorder

The newest criteria for diagnosis of PDD, also referred to as ASD, are published in *DSM-IV* (American Psychiatric Association, 1994) and *The Classification of Child and Adolescent Mental Diagnoses in Primary Care: Diagnostic and Statistical Manual for Primary Care (DSM-PC)*, *Child and Adolescent Version* (American Academy of Pediatrics, 1996). These criteria differ from those in *DSM-III* in that the term *qualitative* has been added to reflect the recent view that a range of qualitative abnormalities exists. Five distinct categories of PDD exist across the autism spectrum: autistic disorder, pervasive developmental disorders—not otherwise specified (PDD-NOS), Asperger syndrome, Rett syndrome, and childhood disintegrative disorder. Characteristics identified in *DSM-IV* and generally associated with PPD are

1. poor social interaction skills, including but not limited to withdrawn behaviors or unsocial behaviors
2. problems using language to communicate
3. stereotypical, repetitive patterns of behavior, interests, and activities (p. 65)

A description of diagnostic indicators that lead to differential diagnosis can be obtained by viewing the diagnostic categories for each of the five PPD subtypes, which can be found on the Web site of the National Information Center for Children and Youth With Disabilities (NICHCY): <http://www.nichcy.org/pubs/factsheet/20.txt.htm#define>.

### Interventions

Children with ASD/PDD are usually treated with either behavioral therapy, pharmacological therapy, or a combination of both (Dalklorf, 1995; Prizant & Rydell, 1993). Behavioral therapy involves specific interventions to address identified behaviors. These include one-on-one speech therapy, communication therapy that often includes the use of picture communication systems, and modeling to teach social, self-help, and other skills. Pharmacological therapy is generally included when the child has concomitant medical problems such as seizures, self-injurious behaviors, or digestive difficulties.

Many claims have been made over the years regarding behavioral therapies and medical therapies. The NICHCY Web site provides a list of some treatments that have waxed and waned in popularity over the years. Also, at <http://www.autism-biomed.org/unproven.htm>, the Autism Biomedical Information Network provides a list of medical treatments that have been tried but remain unproven.

### Pervasive Developmental Disorder and Deafness

Only meager data exist on the incidence, prevalence, and etiologies of ASD/PDD among the deaf and hard of hearing population. Although schools for the deaf have reported the existence of special programs for children with autism (e.g., Utah School for the Deaf and Blind, 1987), national data are not available. GRI has reported data on deaf and hard of hearing students with low vision, blindness, learning disabilities, mental retardation, emotional disorders, attention deficit hyperactivity disorder, cerebral palsy, and "other conditions" (Gallaudet Research Institute, 2003, p. 7). The "other conditions" category accounts for 12.7% of the deaf and hard

of hearing population studied, and students with ASD/PDD may, in turn, account for part of that percentage. GRI has also reported problems with functional behaviors that may be associated with ASD/PDD, in such areas as thinking and reasoning (in 34.7% of the studied population), receptive communication (52.5%), and expressive communication (53.2%). There is no way to gauge the incidence and prevalence of ASD/PDD among the deaf and hard of hearing population from these data, and attempts to interpret the GRI data for this purpose would be purely speculative.

ASDs are difficult to diagnose in the presence of hearing loss because communication disorders are inherent in both hearing loss and disorders within the autism spectrum. However, ASDs do appear to be discernible in the population of students who are deaf or hard of hearing. Some syndromes, such as cytomegalovirus, have been reported to be related to a dual diagnosis of deafness and autism (Yamashita, Fujimoto, & Nakajima, 2003). Roper, Arnold, & Montiero (2003) administered parts of an autism screening instrument to 13 students with dual diagnoses of deafness and autism, and to two comparison groups: hearing students with autism and deaf students with learning disabilities. Roper and colleagues found no differences in the characteristic associated with autism between the deaf and hearing study participants with autism, although members of the group with a dual diagnosis of deafness and autism were diagnosed later than those who could hear. Further, the students with a dual label of deafness and learning disabilities did not demonstrate traits associated with the autistic group. This led the researchers to conclude that autism can be diagnosed in students with hearing loss.

Information on the characteristics

of children with the dual diagnosis of autism and hearing loss is limited. Most sources report comparisons between deaf students and students with autism on a variety of traits. For example, Peterson and Siegal (1997) compared the notions regarding theory of mind that were held by individuals with normal hearing to those of individuals with autism or deafness, and concluded that conversational constraints in early development influence the development of theory of mind. But they made no reference to students who were dually labeled.

Additional considerations in intervention with children who have the dual label of deafness and autism pertain to the characteristic traits of poor eye contact and tactile defensiveness. Most students who are deaf or hard of hearing depend heavily on their visual skills for assistance in communication (Chamberlain, Morford, & Mayberry, 2000). Visual communication requires attending and eye contact. Typically, people with ASD/PDD avoid both of these. Tactile contact is also an important source of information for the child with hearing loss, especially the developing child (Koester, Brooks, & Traci, 2000). Tactile defensiveness and oversensitivity to stimuli may prevent the fitting and use of hearing aids. The risk of damage and injury is increased in the presence of self-stimulating or injurious behaviors.

### Method

We conducted a single-subject study of a young child who was dually diagnosed with deafness and pervasive developmental disorder—not otherwise specified (PDD-NOS). Data used to identify the child were those found in his individualized education program (IEP). Current challenges to the field requiring data-driven interventions are difficult to meet regarding children with this dual label because tra-

ditional methodologies for data collection require large numbers of subjects. This necessitates two approaches: either a review of population data from national databases (Meadow-Orlans, 2001) or single-subject research (Alberto & Troutman, 2003). Since existing national databases on students with hearing loss do not disaggregate information pertaining to deaf and hard of hearing students with ASD/PDD, single-subject research becomes an important tool. Our working hypothesis was that using the procedures of applied behavior analysis (ABA) with individual subjects with deafness and ASD/PDD would prove to be an effective practice.

### Subject

Andy (pseudonym) was a 6-year-old Caucasian male whose degenerative hearing loss had been diagnosed at age 2 years. His family had received intervention through a statewide parent-infant program for a brief period before he entered a special-needs preschool class in his school system. Andy was enrolled in his county's special-needs kindergarten at age 3 years and was still receiving services at the time of the present study. He began using bilateral hearing aids upon being diagnosed, and underwent cochlear implant surgery at age 4 years.

Andy consistently used his implant and appeared to be committed to its use; however, his speech and listening skills had not improved after 2 years of therapy. Using the SPICE Curriculum (Stanford Program on International and Cross-Cultural Education, <http://spice.stanford.edu/>), the local school system provided him 2.5 hours of one-to-one speech therapy per week. An additional three times a week, he received 1 hour of private therapy from a speech-language therapist who specialized in language development in children with cochlear

implants. Sign language was added to Andy's school program after his hearing diminished by 20dB bilaterally shortly after he began preschool, and was continued for the first year after implantation.

Sign support and services of the teacher of the deaf were discontinued when Andy entered kindergarten; however, all speech therapy was continued. Upon his promotion to first grade, it was noted that he had not made significant educational gains and was in need of immediate remediation. He began receiving language arts instruction in a resource setting with a teacher of the deaf, which included targeted speech and auditory instruction. Upon beginning this revised program, he was unable to communicate beyond basic needs using any language, signed or verbal. His educational progress increased markedly in this setting in both language arts and speech intelligibility, but he continued to struggle in the general education classroom, where he received no sign support. The behaviors that are characteristic of PDD-NOS that were identified in preschool continued in this setting. Specialized services were incrementally increased throughout the school year.

It was while Andy was in first grade that the behaviors associated with PDD-NOS became especially evident and problematic. His ability to communicate was improving, yet his pragmatic skills were not. For example, he would readily share experiences but would repeat the same story, verbatim, multiple times. If someone tried to interrupt him, he would move away from the person and continue the recitation to himself. In the rare instances when his repetitions were terminated early, he would not hesitate to tell the same story to the same person at a later time, picking up where he had left off. He was unable to fol-

low instructions within the general education setting because of his ritualistic and self-stimulating behaviors, in addition to his lack of language.

Andy was relying on sign language for meaningful communication at the time of the present study. His IEP committee, which consisted of his regular education teacher, teacher of the deaf, speech-language pathologist, school psychologist, and parents, identified specific behaviors of concern and agreed that they were consistent with a pattern of PDD-NOS. Among other concerns, the IEP committee noted that Andy

- had always engaged in self-stimulating behaviors
- was orally and tactically defensive
- was not able to adjust to unexpected deviations in routine
- tended to obsess over objects, being in line, and ritually repeated himself
- learned rote material with little repetition, but could not generalize
- was easily distracted and unable to divide his attention
- did not engage in shared communication, even during play

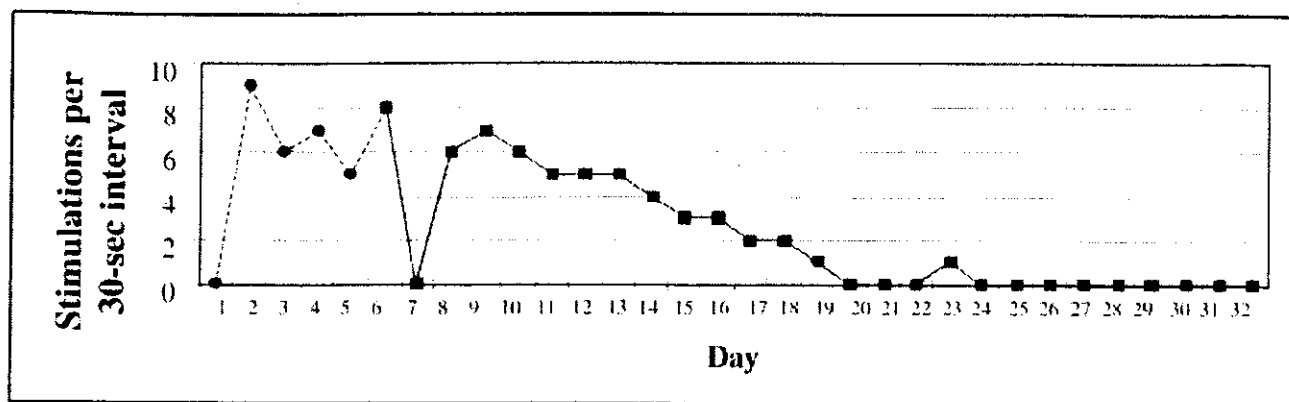
Because these behaviors were an obstacle to Andy's instruction and socialization, the teacher/researcher (the second author of the present article) sought a procedure that would allow her to minimize certain behaviors while providing sufficient documentation to warrant the use of these procedures. She chose to engage in a single-subject study utilizing baseline data followed by a prompt to reduce the behavior. Andy was mainstreamed in a first-grade class at the time of the study, and because his behavior was noticeable to the other students, he became the target of their teasing. Since Andy's self-stimulating behavior

was of greatest concern, particularly in that it was an obvious obstacle to his ability to develop socially, the teacher/researcher chose to attempt to reduce this behavior.

### Procedures

The procedures of applied behavior analysis (i.e., applied behavior single-subject design) as outlined by Alberto and Troutman (2003) were followed in both data collection and analysis. First, the dependent variable was specifically defined as *crossing arms and squeezing*. Data were collected at 30-minute intervals during small-group instruction in language arts. This instruction occurred every morning in a pullout setting with other students with hearing loss. The behavior was judged to be relatively stable after 5 days; therefore, the independent variable was introduced. Initially, the independent variable entailed having the teacher/researcher touch Andy's arms and tell him to put his arms down. By the seventh day of implementation of the independent variable, a decreasing trend was noted. Since the purpose of the intervention was to lessen stigma and attention to the behavior from the other students, at that time the independent variable was modified to a meaningful look at Andy's arms. In the course of classroom management, Andy had demonstrated that he highly valued the attention of the teacher/researcher. A particular behavior of the teacher/researcher to show approval was to wink and nod at the student. Though this positive reinforcement was semiprivate and nondescript, Andy responded very well to it, and consequently it was used for the duration of the study. The study was concluded after only one occurrence of the dependent variable over a 13-day period. Consequently, improvement was noted in Andy's inclusion in peer groups. One barrier to his ability to so-

**Figure 1**  
Tally of self-stimulating behavior prior to and after intervention.



Note. Round plot points indicate baseline data; square plot points indicate intervention data.

cialize appropriately had been successfully addressed.

The decline in self-stimulating behavior is charted in Figure 1.

## Results

In light of the pervasive and intense nature of Andy's PDD-NOS behaviors, it was not expected that he would respond so quickly to the intervention. Upon introduction of the original independent variable, Andy would attend fully to the directions of the teacher/researcher. His awareness of his own behavior became apparent very early and was the impetus for the modification of the independent variable. After the present study was completed, formal data were not collected again. Recurrences of the behavior were rare, and when Andy did engage in it, he self-corrected immediately and received the same positive reinforcement of winking with a head nod.

Andy's IEP committee decided that his needs went beyond what could be met within the general education setting, and he was placed full-time in the deaf and hard of hearing classroom the following year. With that decision, the teacher/researcher became Andy's teacher all day. After he returned to school following summer

vacation, it was noted that the self-stimulating behavior had reoccurred and was happening at a rate comparable to that shown in the baseline data. No formal data were collected; however, the independent variable was reintroduced. As in the original study, Andy responded immediately to the independent variable, and within days the occurrences were negligible. This development made it possible to address the other behaviors initially identified by the IEP committee. Again, no formal data were collected on these behaviors, but intervention was successful and most behaviors became totally extinct. Andy's progress was such that even the more challenging behaviors, such as oral and tactile defensiveness, decreased to a level that could be described as consistent with preferences exhibited by the general population. Occasionally he displayed a physical response to textures, such as vomiting in reaction to using his hand to clean out the inside of his Halloween pumpkin, but success still could be noted in that he willingly engaged in the activity.

## Discussion

Although this was a nontraditional definition of the topic, we hypothesized

that applied behavior analysis could serve as a "best practice" for teachers of the deaf who serve students with the dual disability of deafness and ASD/PDD. Since there are no research-based practices that have been identified for this population, and since each child's pattern of hearing loss and ASD/PDD is unique, the population is essentially defined as one individual.

Applied behavior analysis is a tool that teachers of the deaf need in order to provide appropriate intervention to students with the dual disabilities of deafness and ASD/PDD. In this case, the application of applied behavior analysis to behavior change in and of itself becomes a "best practice" in the face of nonexistent research-based practices. Applied behavior analysis is used successfully with populations with severe and multiple disabilities but has not been employed widely with children with sensory impairments. Andy demonstrated that applied behavior analysis can be effective with that population. Because interventions can be easily employed and documented with a single-subject design, it lends itself to easy integration into either the general education or special education setting. If a teacher were dealing with more than one

student exhibiting the same behavior, it might be harder to use this kind of approach.

As we have already stated, Andy's combination of characteristics was unique, even within the dual diagnosis of hearing loss and ASD/PDD, and one intervention may not be successful with all students. Because the goal of this kind of intervention is extinction of a behavior, duplication of the results with the same population, or student, is not possible. In order to more thoroughly identify the effectiveness of applied behavior analysis techniques with students with hearing loss and ASD/PDD, researchers need to conduct more studies with students with this unique combination of needs. It is essential that teachers of the deaf not only understand the other disabilities that often accompany hearing loss but thoroughly familiarize themselves with the methods of applied behavior analysis.

**Summary**

The present study presented a review of the available literature on the dual diagnosis of deafness and autism spectrum disorder/pervasive developmental disorder (ASD/PDD). In addition, we described the use of applied behavior analysis procedures to eliminate a socially disruptive behavior in a 6-year-old boy with a dual diagnosis of deafness and pervasive developmental disorder—not otherwise specified (PDD-NOS). Few data exist to provide teachers of the deaf with appropriate research-based practices for intervening with children who have this dual diagnosis. Behavior intervention strategies that positively affect students with a dual disability need to be investigated and identified so that teachers of the deaf can provide appropriate, research-based interventions. Until such information is available, the application of applied behavior analy-

sis procedures might be considered a "best practice" for teachers of students who are deaf or hard of hearing and who have the additional disability of ASD/PDD. Applied behavior analysis designs, by their nature, may lend themselves to successful interventions with students with a variety of disabilities.

**Resources**

The World Wide Web provides a number of resources of interest to researchers, practitioners, and families interested in learning more about children with hearing loss who are also diagnosed with ASD/PDD:

- National Institute of Child Health and Human Development: [www.nichd.nih.gov](http://www.nichd.nih.gov)
- Autism Biomedical Information Network (includes complete DSM-IV criteria): [www.autism-biomed.org](http://www.autism-biomed.org)
- Autism Society of Alabama: [www.autism-alabama.org](http://www.autism-alabama.org)
- Asperger's Disorder (DSM-IV Diagnostic Criteria): [http://web.syr.edu/~rjkopp/data/as\\_diag\\_list.html](http://web.syr.edu/~rjkopp/data/as_diag_list.html)
- Ray's Autism Page (personal accounts and links): <http://web.syr.edu/~rjkopp/autism.html>
- Autism/PDD Resources Network: <http://www.autism-pdd.net/>
- Governor's Council for Developmental Disabilities (Georgia): <http://www.ga-ddecouncil.org/pubs.htm>
- Autism Society of America: [www.autism-society.org](http://www.autism-society.org)
- National Information Center for Children and Youth With Disabilities: [www.nichcy.org/states/he.ga.htm](http://www.nichcy.org/states/he.ga.htm)

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