

The background of the slide features three large, overlapping circles in a medium blue color, set against a dark gray background. The circles are arranged horizontally, with the middle circle overlapping the other two. A white horizontal band runs across the center of the slide, containing the title text.

Interactive Computer Training for Graphing Embedded Phase Change Lines in Microsoft Excel

Kerry Shea, M.Ed, BCBA, LBA

Graphing in Education

- Evaluating student performance at the individual level
 - Skill Acquisition
 - Behavior Reduction Programs for Problem Behavior
- Allows for timely modification to an ineffective program
- Provides evidence to continue a successful program

Importance of Graphing and Data Analysis

Prevent Type I Errors

- When the intervention is not working, but you think it is (boy is not telling the truth)
- Consequence: student is accessing ineffective programming

Prevent Type II Errors

- When the intervention is working but you think it isn't (boy is telling the truth)
- Consequence: student is losing effective programming



Question

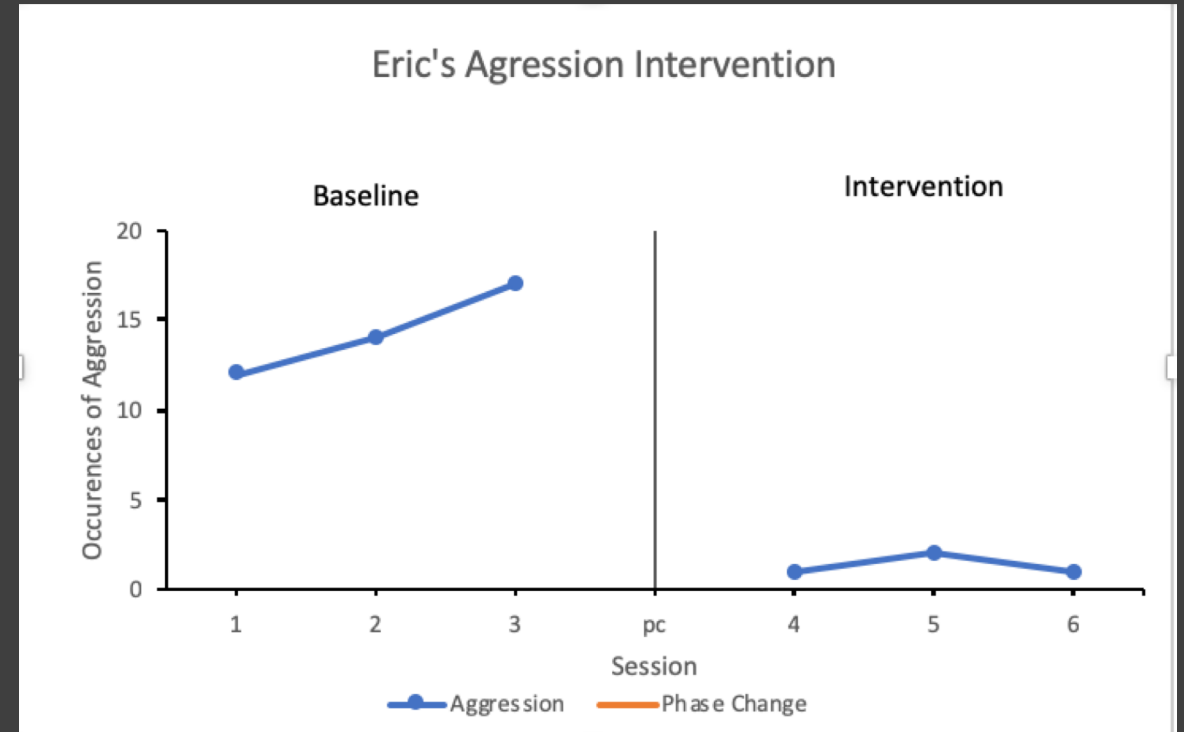
What change is needed to make it more likely that teachers and clinicians will graph data?

- Low-effort
- Low-time requirement
- Beneficial



Phase Change Lines

- Facilitate detecting a behavior change from one phase to the next



Literature on Graph Training

Carr & Burkholder (1998)

- First published excel training for behavior analysts

Dixon et al., (2009)

- Updated version

Kranak et al., (2018)

- BST live training

Deochand,
Costello,
Fuqua, (2015)

- Developed task analysis that simplifies phase change procedure

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Session ▼	Aggression ▼	Phase Change ▼														
2	1	12															
3	2	14															
4	3	17															
5	pc		20														
6	4	1															
7	5	2															
8	6	1															
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	

Prompt 1

Instructions: Make a graph representing the number of times Eric is aggression each session. You will have 20 minutes to complete as many graph elements as possible. You may not use the internet or other resources to help you create your graph.

When you are finished working on your graph, please alert the researcher who will assist you will uploading your graph.

Baseline:	aggression per session:	12, 14, 17
Intervention:	aggression per session:	1,2,1

Phase Changes

- Easy method
- Repeatable



How to train task analysis?

Computer-based instruction



- Reach wider audience
- Deliver training asynchronously

Evidence-based training components



- Instruction/Rationale
- Modeling
- Rehearsal
- Feedback

Evidence-based training components



- Instruction/Rationale
- Modeling
- Rehearsal
- Feedback

Interactive Computer Training



- Incorporates active learning components
- Including feedback using self-monitoring activities

Purpose

Develop and evaluate a computerized training program that will efficiently train professionals to create simple excel graphs quickly, without direct feedback from a trainer.



Research Questions

1. To what extent will participants graphing accuracy change following a self-directed computer training?
2. To what extent will participants maintain graphing scores two-weeks following post-training sessions?
3. How long will participants engage in training activities?



Methods

Participants

(n = 4)



Demographics

3 College Students (<30 yrs)

1 Professional (>30 yrs)

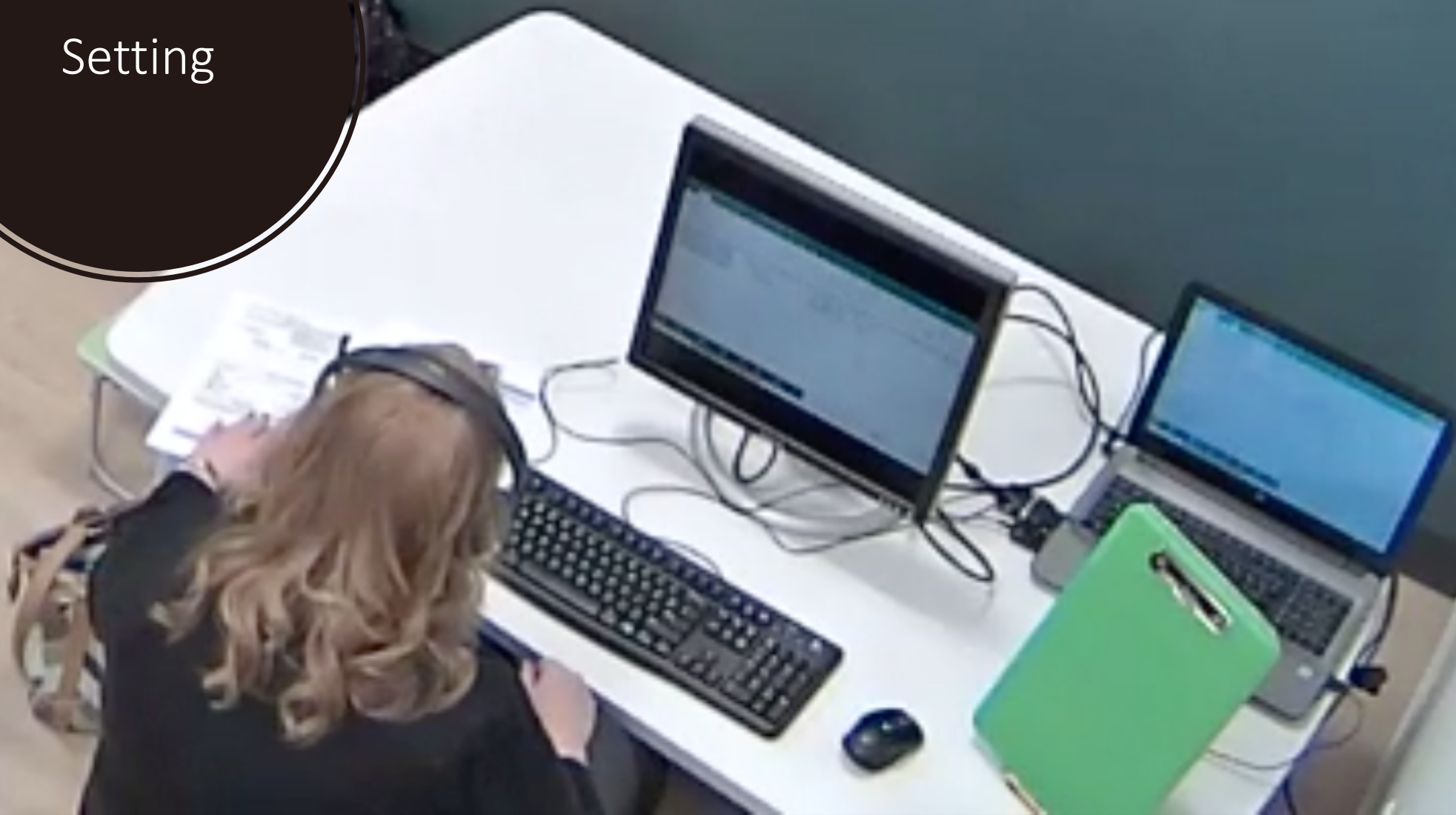


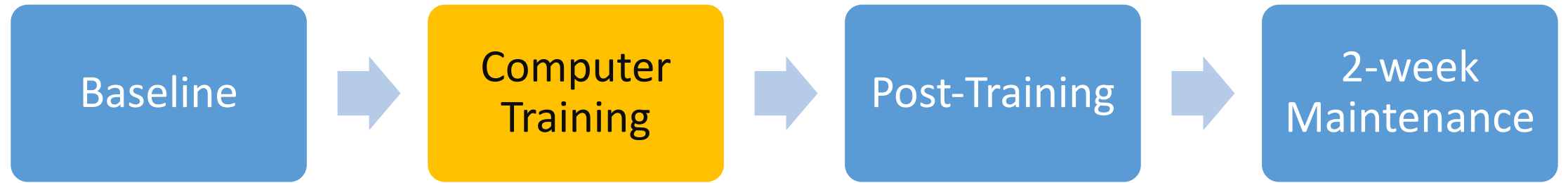
Profession

Education field

Graphing relevant in work

Setting





Study Conditions

Procedures

- [illegible]

<h3 style="text-align: center;">Prompt 1</h3>		
<p>Instructions: Make a graph representing the number of times Eric is aggression each session. You will have 20 minutes to complete as many graph elements as possible. You may not use the internet or other resources to help you create your graph.</p>		
<p>When you are finished working on your graph, please alert the researcher who will assist you will uploading your graph.</p>		
Baseline:	aggression per session:	12, 14, 17
Intervention:	aggression per session:	1,2,1

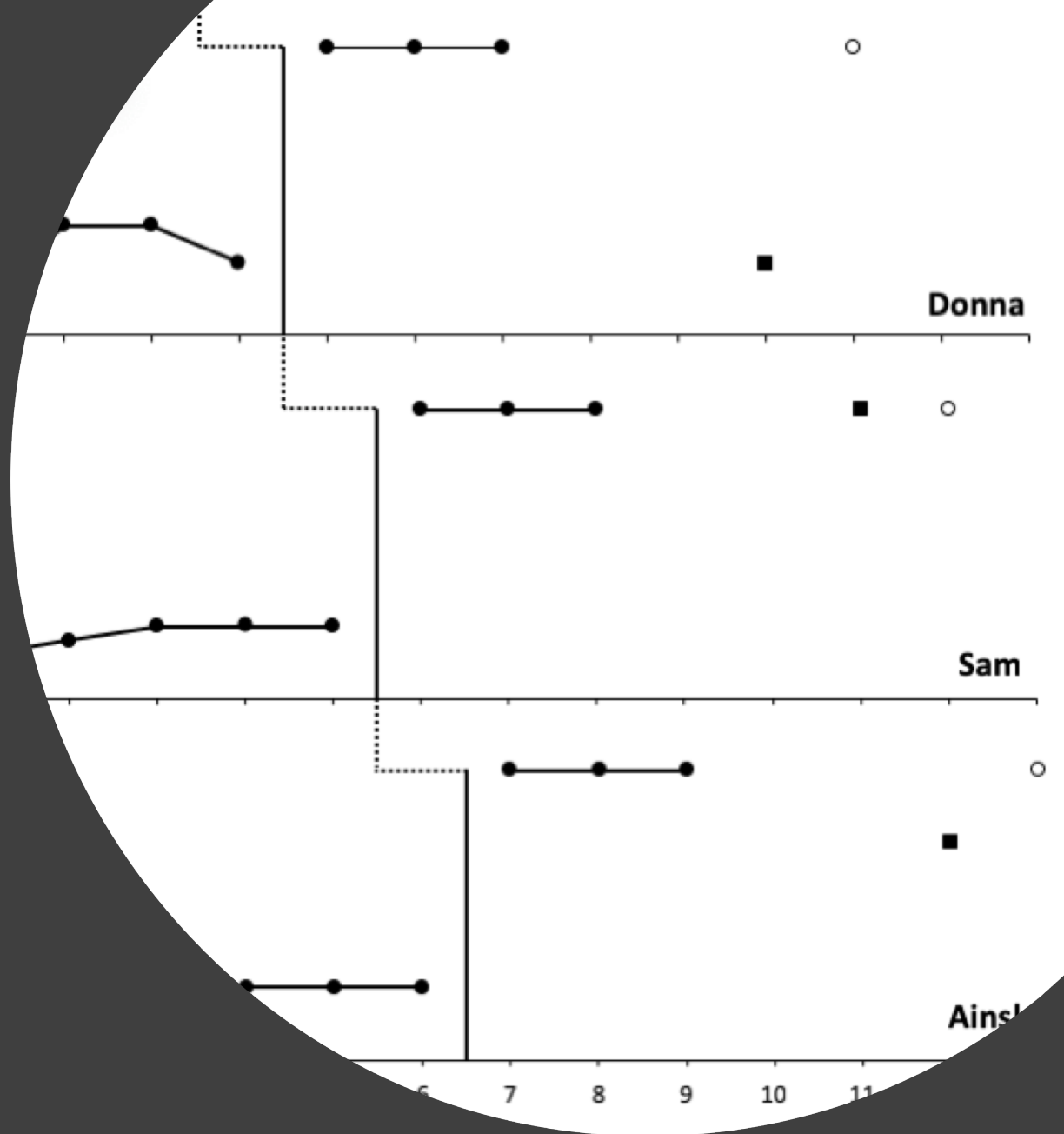
Study Design

Multiple-probe design across participants

Internal Validity

- Staggered baseline
- Repeated effect across legs
- Interobserver Agreement (In Process)

Procedural Integrity (In Process)



Training Content

Training Procedures

Self-Directed Learning

Training facilitator did not provide any guidance other than saying "Do your best and refer to your materials if you are stuck"

Implications of Self-Directed Learning

- If training is effective, any learner could access materials via online materials.

Training Content

Four modules

- 1.Labels
- 2.Phase Change
- 3.Insert Graph
- 4.Insert Data

Same structure

- Instruction and Rationale
- Video Model of Skill
- Opportunity to Practice (Rehearsal)
- Practice Test and Self-Check (Feedback)

Step 1: Format y-axis (vertical axis)

1 select y-axis, right-click, select format axis

2 under the tab that looks like a bar graph (2),
3 under axis options
4 find the maximum value space
5 enter the value that matches the phase change value

In this example, that value is 20.
(This should prevent your axis max value from changing automatically)

3-D Rotation...

Add Major Gridlines

Add Minor Gridlines

Format Axis...

Format Axis

Axis Options Text Options

Axis Options

Bounds

Minimum

0.0

Maximum

20.0

Format Axis

Axis Options Text Options

Axis Options

Bounds

Minimum

0.0

Maximum

20.0

Phase Change

20

Step 2: Add Error Bar

Click "Add chart element"

Click chart design tab

5 Format icon

Under Vertical Error Bar Tab

6 Format icon

7 Format icon

8 Fixed value matches value in table, and max value of y-axis

Format Error Bars

Vertical Error Bar

Direction

Both

Minus

Plus

No error bars

Error Amount

Fixed value

Percentage of maximum y-axis value

Automatic

Custom

Step 3: Delete Phase Change Marker

1 Select the phase change data point in the graph

2 Right-click, choose "Format data series"

3 Select the format marker icon

4 Under "Marker tab"

5 "Marker Options"

6 Choose

Chart Title

Delete

Reset to Match Style

Change Chart Type

Select Data...

3-D Rotation...

Add Data Labels

Add Trendline

Format Data Series...

Training Materials

Example of Self-Check in Module

The screenshot shows a presentation interface. On the left is a 'Table Of Contents' sidebar with a search icon. It lists slides with titles, durations, and checkboxes. The 'Practice 1 ...' slide is highlighted. The main slide area has a green background and contains the title 'Practice Test Instructions' and two paragraphs of text. A 'Next Slide' button is in the bottom right. A progress bar is at the bottom.

Slide Title	Duration	✓
Module In...	00:21	✓
Slide 1: M...	00:21	✓
Slide 1: M...	00:28	✓
Slide 1: M...	00:26	✓
Slide 2	00:30	✓
Slide 1: M...	00:37	✓
Introducto...	00:31	✓
Slide 3	00:29	✓
Add axis l...	00:29	✓
TA3Demo	01:34	✓
TA1Demo	01:19	✓
Slide : Ad...	00:33	✓
Practice 1 ...	00:30	
Practice 1 ...	00:30	✓
Practice 1 ...	00:30	

Practice Test Instructions

To test out of this module, you will need to complete these steps without errors within 6 minutes.

This practice test will give you an opportunity to check out your current skills.

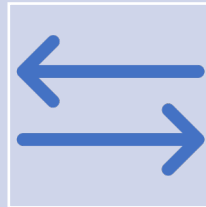
Next Slide

08:15 / 33:07 Minutes

Backward Chaining



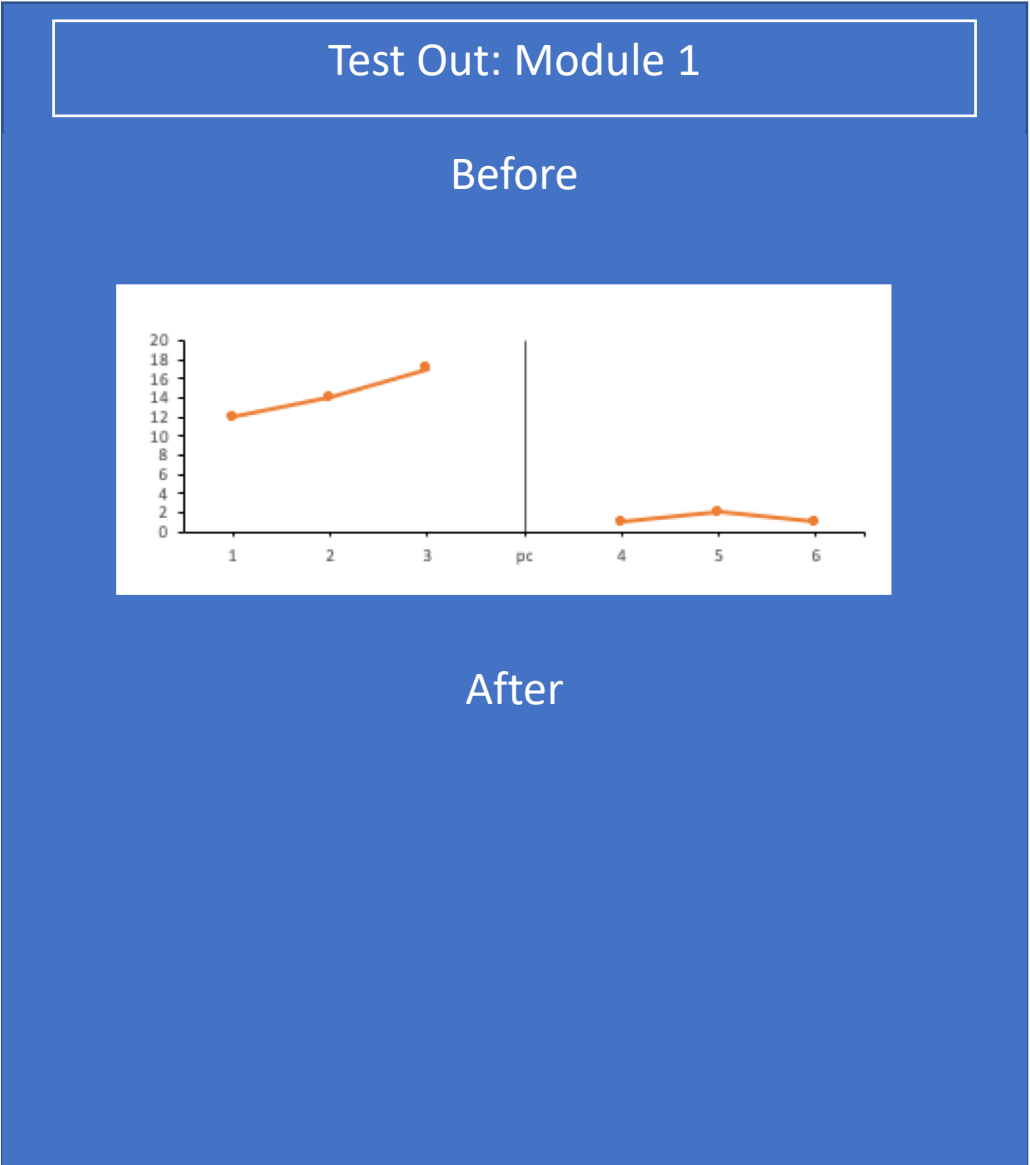
Teach final steps in task analysis first



Move backwards

Task Analyses (TA) Requirements to Test Out

	TA 4	TA 3	TA 2	TA 1	Complete
Module 1 - Labels					Finished

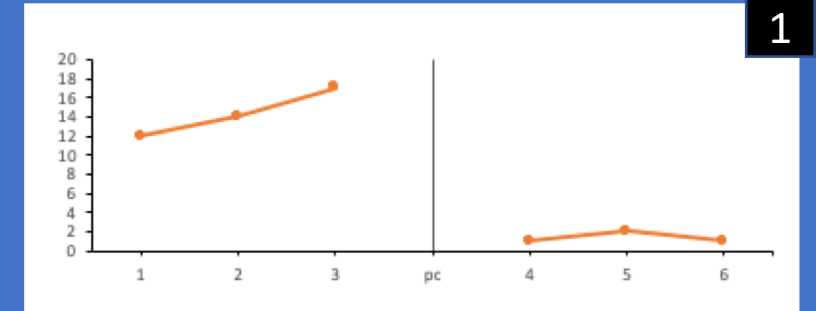


Task Analyses (TA) Requirements to Test Out

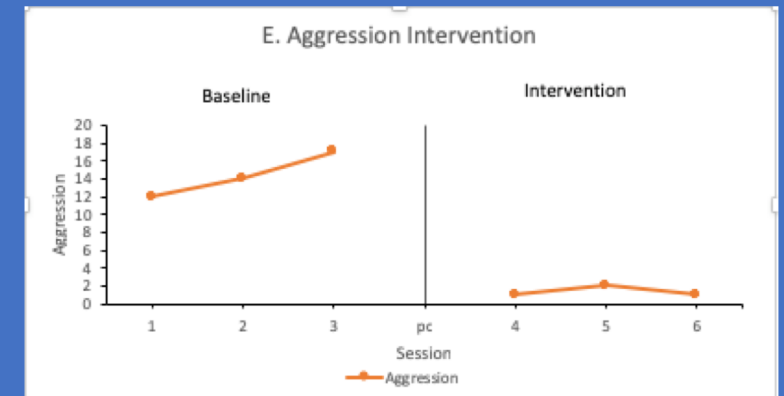
	TA 4	TA 3	TA 2	TA 1	Complete
Module 1 - Labels				X	Finished

Test Out: Module 1

Before



After

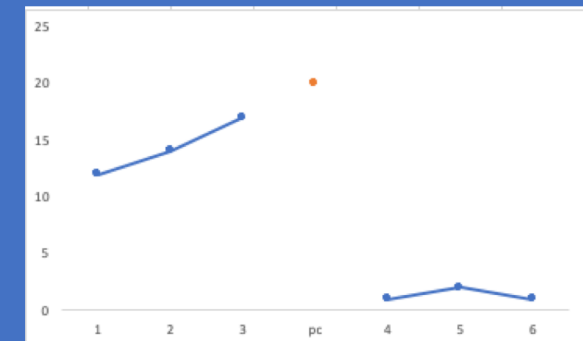


Task Analyses (TA) Requirements to Test Out

	TA 4	TA 3	TA 2	TA 1	Complete
Module 1 - Labels				X	Finished
Module 2- Phase Change					Finished

Test Out: Module 1

Before



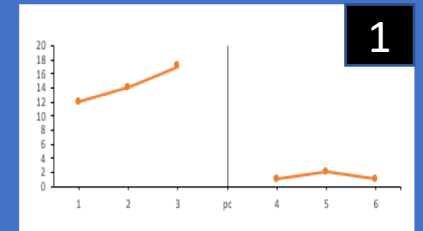
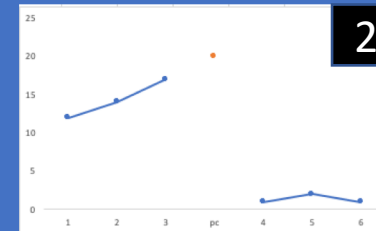
After

Task Analyses (TA) Requirements to Test Out

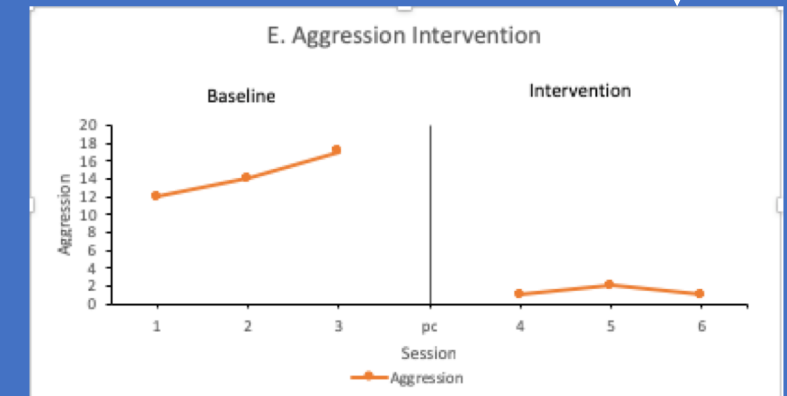
	TA 4	TA 3	TA 2	TA 1	Complete
Module 1 - Labels				X	Finished
Module 2- Phase Change			X	X	Finished

Test Out: Module 2

Before



After



Task Analyses (TA) Requirements to Test Out

	TA 4	TA 3	TA 2	TA 1	Complete
Module 1 - Labels				X	Finished
Module 2- Phase Change			X	X	Finished
Module 3 -Insert Graph					Finished Graph

Test Out: Module 3

Before

The screenshot shows a Google Sheet with a table in the top left corner. The table has three columns: 'Session', 'Aggression', and 'Phase Change'. The data rows are as follows:

Session	Aggression	Phase Change
1	12	
2	14	
3	17	
pc		20
4	1	
5	2	
6	1	

To the right of the table is a 'Prompt 1' box with the following text:

Prompt 1
 Instructions: Make a graph representing the number of times Eric is aggression each session. You will have 20 minutes to complete as many graph elements as possible. You may not use the internet or other resources to help you create your graph.
 When you are finished working on your graph, please alert the researcher who will assist you will uploading your graph.

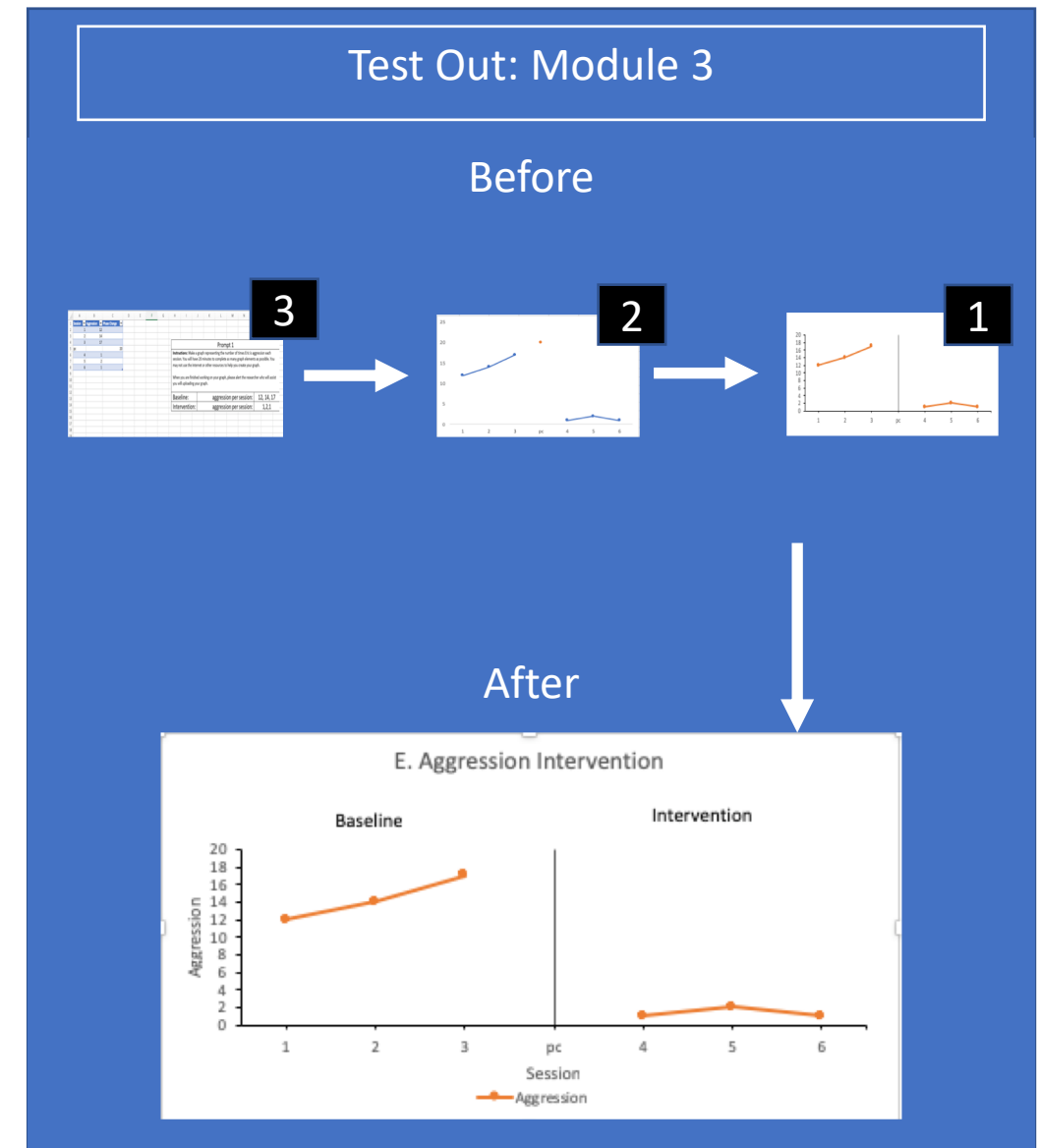
Below the instructions is a table with two rows:

Baseline:	aggression per session:	12, 14, 17
Intervention:	aggression per session:	1,2,1

After

Task Analyses (TA) Requirements to Test Out

	TA 4	TA 3	TA 2	TA 1	Complete
Module 1 - Labels				X	Finished
Module 2- Phase Change			X	X	Finished
Module 3 -Insert Graph		X	X	X	Finished Graph



Task Analyses (TA) Requirements to Test Out

	TA 4	TA 3	TA 2	TA 1	Complete
Module 1 - Labels				X	Finished
Module 2- Phase Change			X	X	Finished
Module 3 -Insert Graph		X	X	X	Finished Graph
Module 4- Insert Data					Finished Graph

Test Out: Module 1

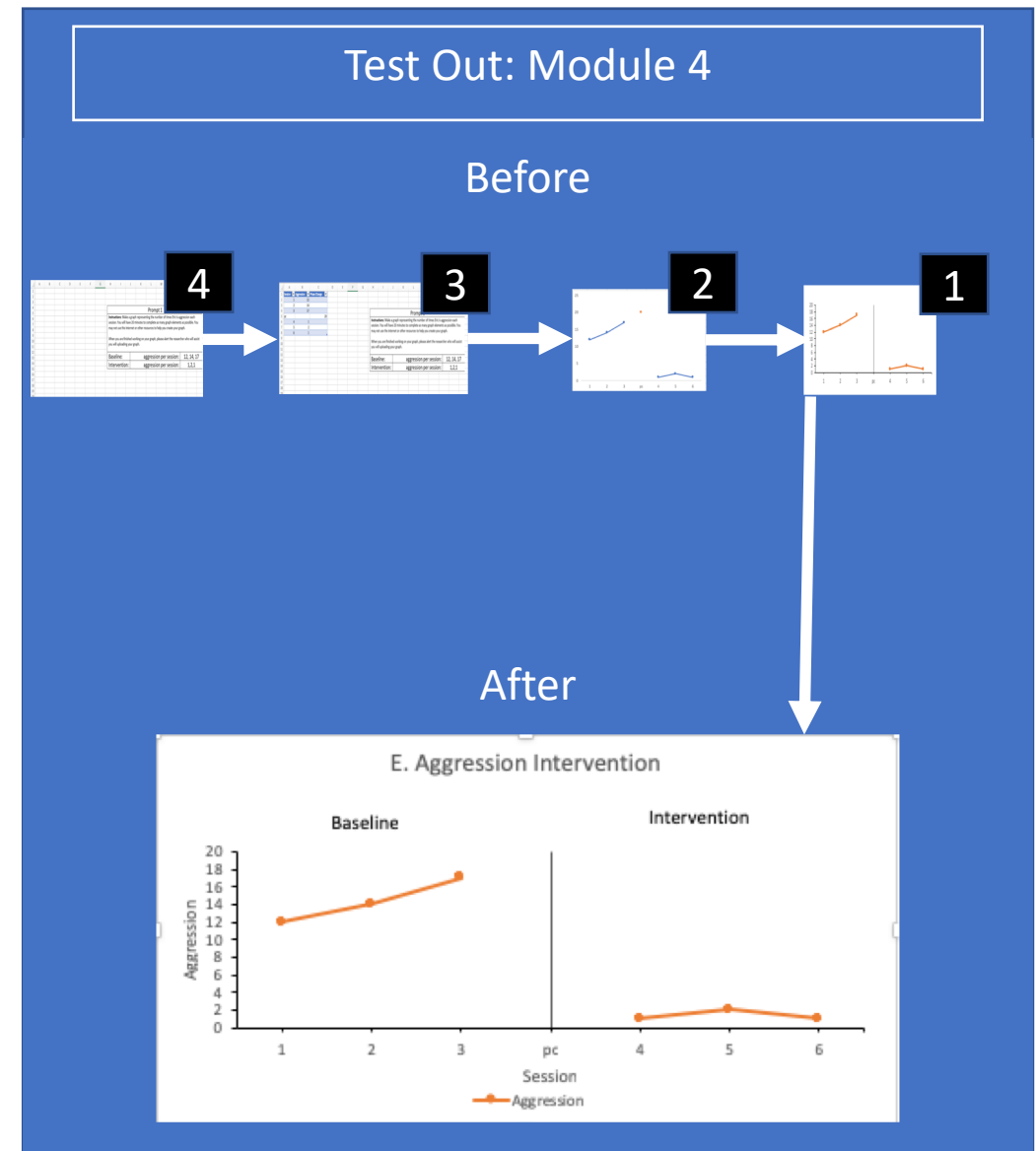
Before

Prompt 1									
Instructions: Make a graph representing the number of times Eric is aggression each session. You will have 20 minutes to complete as many graph elements as possible. You may not use the internet or other resources to help you create your graph.									
When you are finished working on your graph, please alert the researcher who will assist you will uploading your graph.									
Baseline:	aggression per session:		12, 14, 17						
Intervention:	aggression per session:		1,2,1						

After

Task Analyses (TA) Requirements to Test Out

	TA 4	TA 3	TA 2	TA 1	Complete
Module 1 - Labels				X	Finished
Module 2- Phase Change			X	X	Finished
Module 3 -Insert Graph		X	X	X	Finished Graph
Module 4- Insert Data	X	X	X	X	Finished Graph

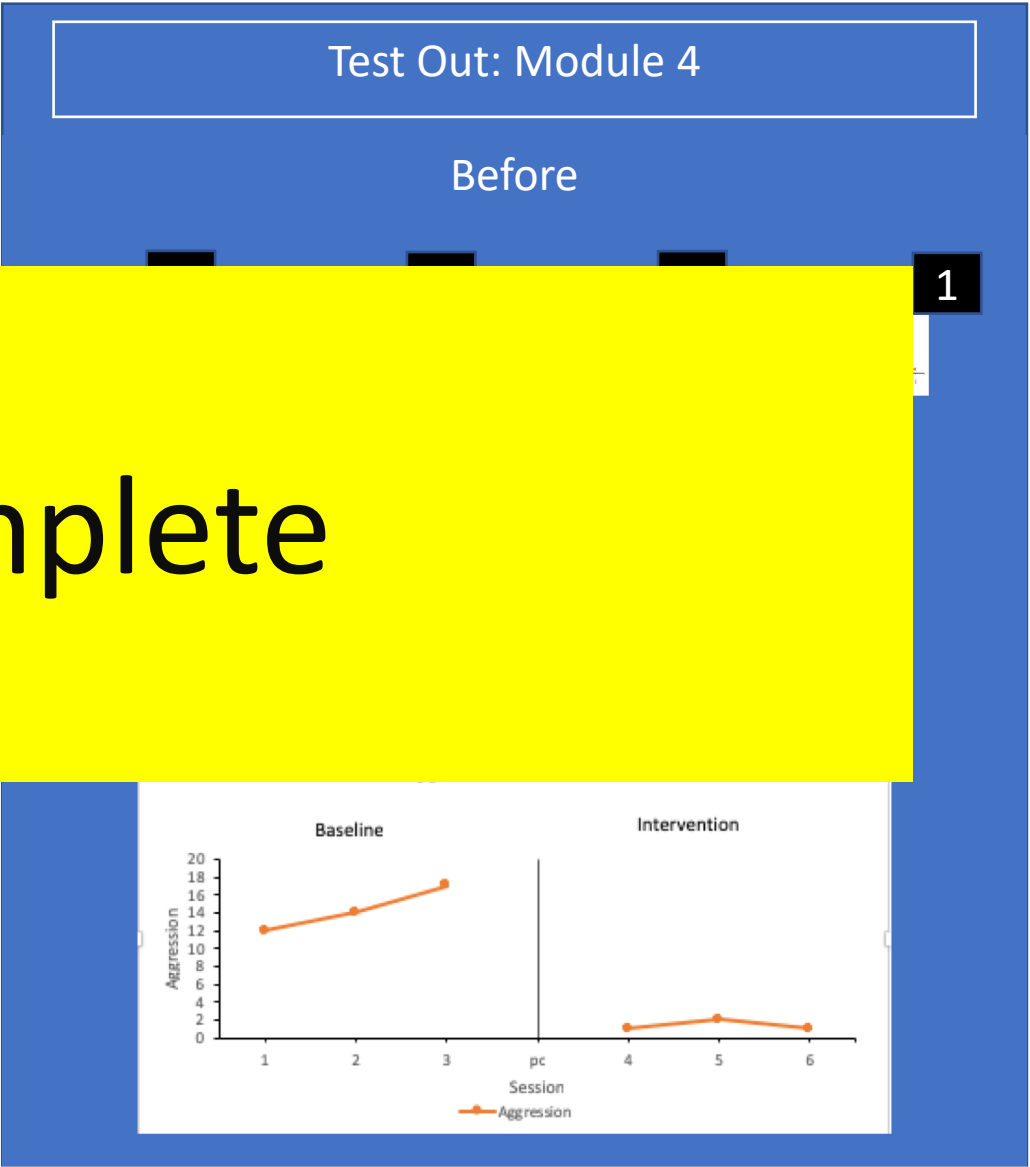


Task Analyses (TA) Requirements to Test Out

1

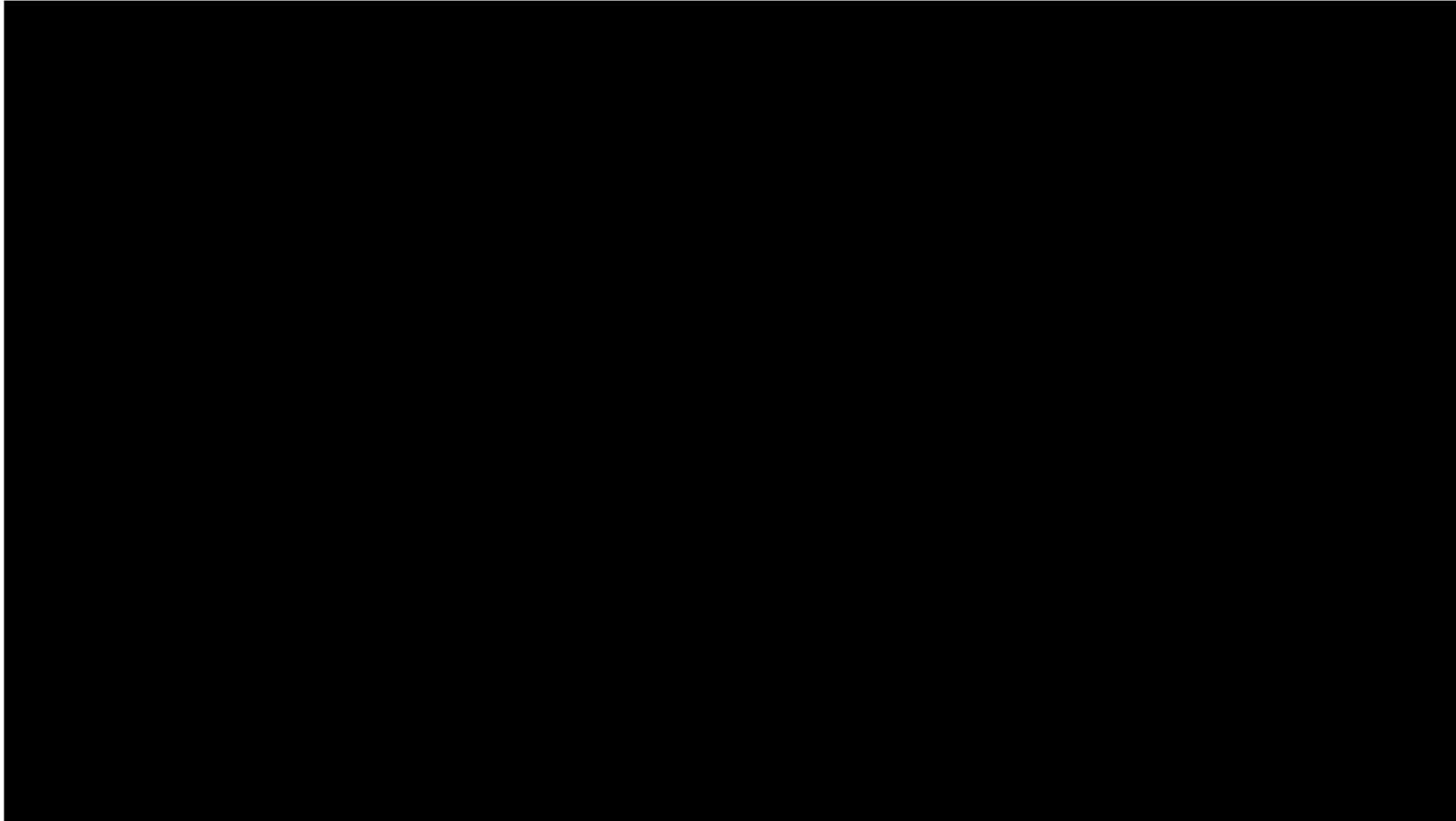
Training Complete

Module 3 -Insert Graph		X	X	X	Finished Graph
Module 4- Insert Data	X	X	X	X	Finished Graph



Results

Baseline and Post-Training Comparison



Orientation to graph

Y-axis

- Percentage of steps correct

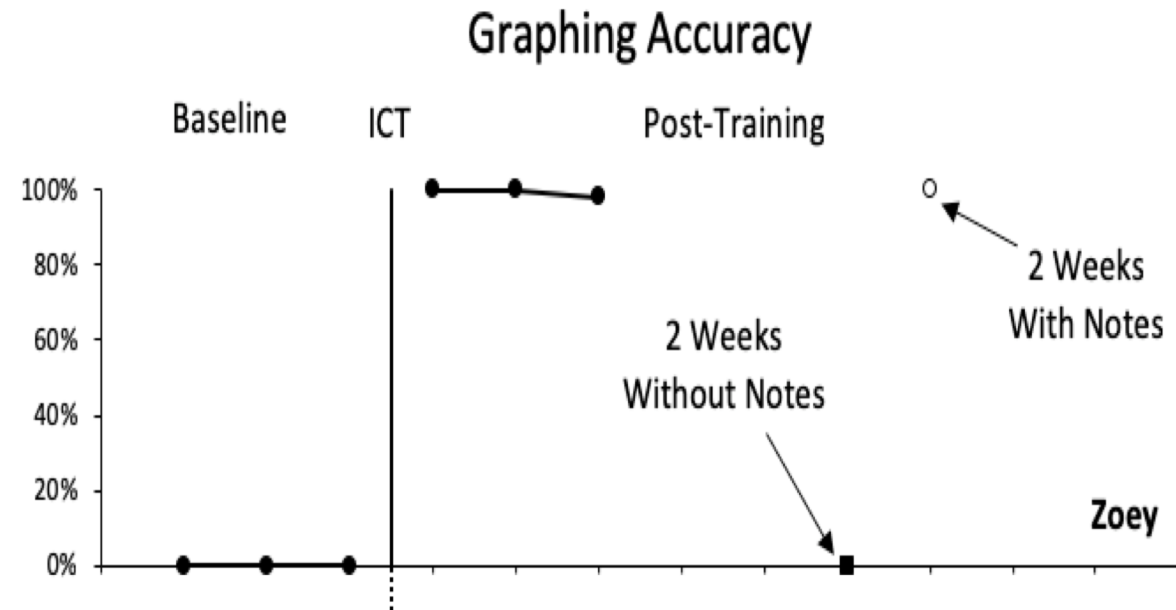
X-axis

- Sessions

Phase Labels

- Baseline
- ICT (computer training)
- Post-Training

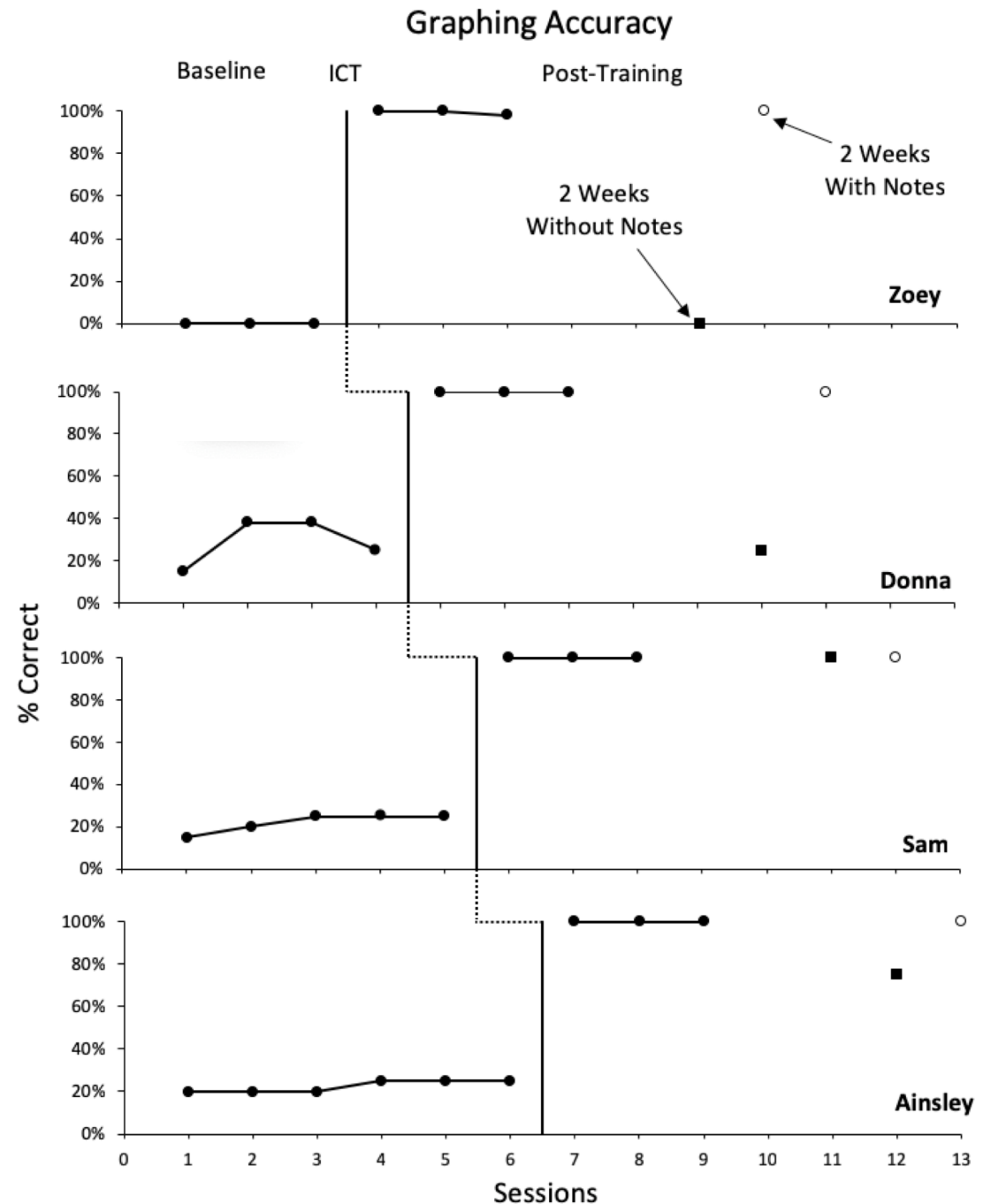
Do results replicate across participants?



Results

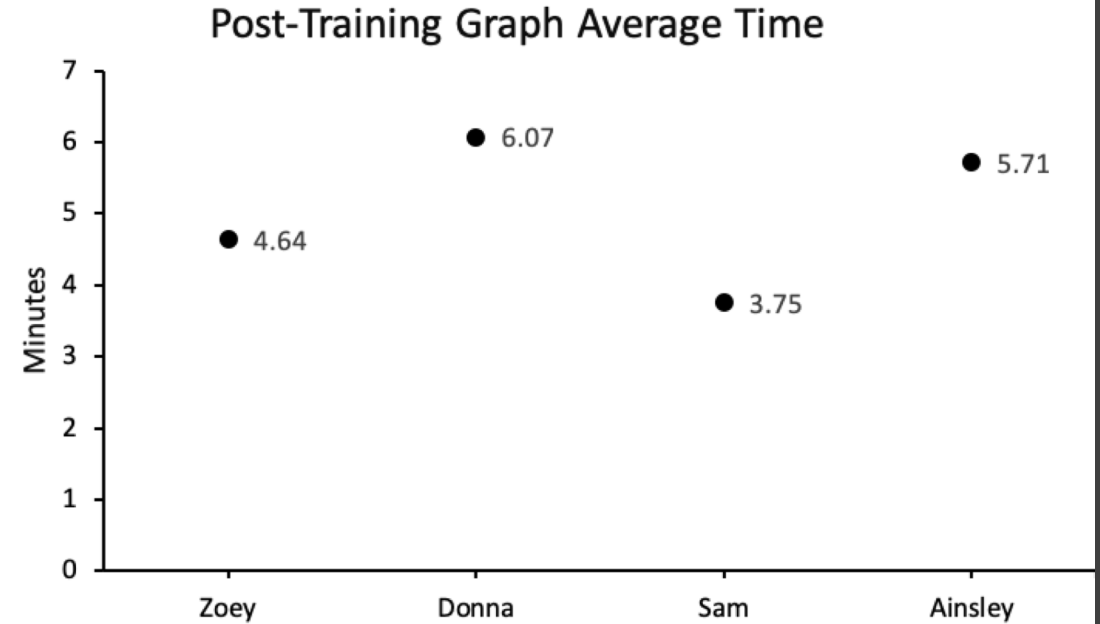
All participants score 98% or better on post-test graphs

- Improvement only after post-training
- Immediate increase
- Immediate change in level



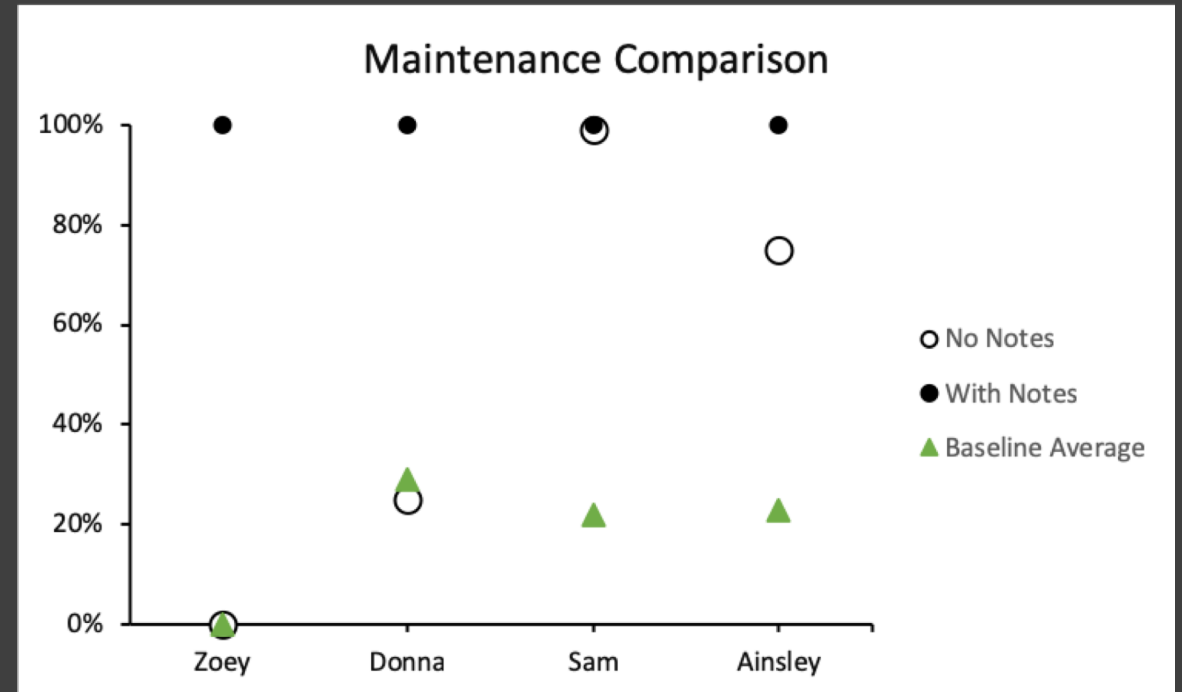
Graphing Speed

- All participants completed post-training graphs in under 8 minutes



Maintenance

- With notes, all participants scored 100%
- 2 participants scored better than baseline during maintenance
- Two participants returned to baseline responding



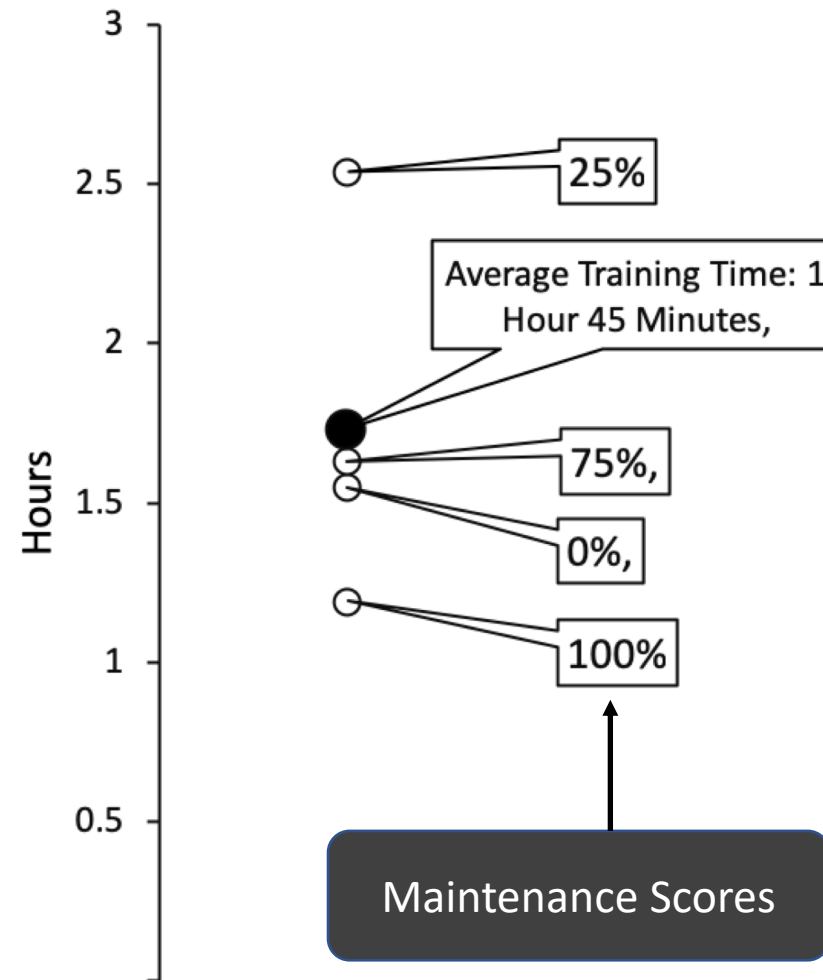
Average Duration:
1 hour 45 minutes

- Maybe participants who spent more time practicing during the training were able to maintain skills more than those who practiced less.

Training Duration

Average Duration:
1 hour 45 minutes

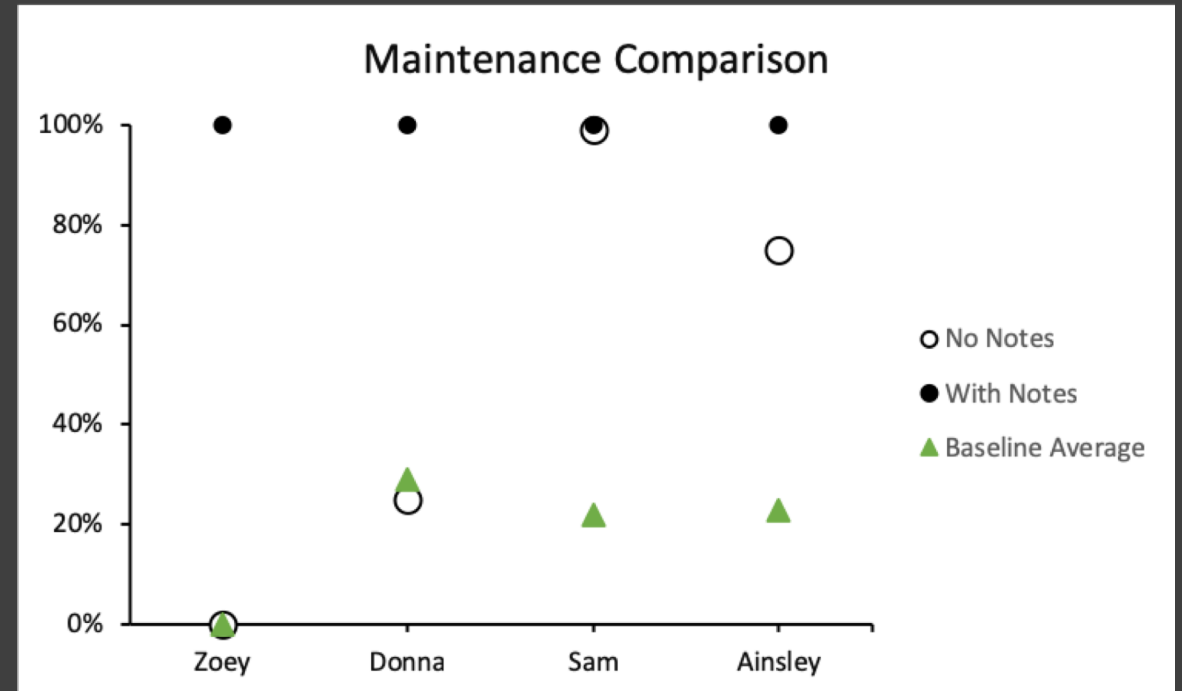
Time spent in training did not
correspond with maintenance
without notes scores.



Maintenance Implications

- Backward chaining may work better for learners who have some skills
- Forward chaining may work better for learners who are beginners

More research to identify optimal training format and length that produces skills that maintain.



Discussion

Data indicate that the self-directed training resulted in accurate graphing skills in a short amount of training time

Future Directions

forward chaining
procedures

generalization skills
across computer
types (PC vs. Mac)

intermediate
graphing targets

open online access
training and
evaluation study



Questions?