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

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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

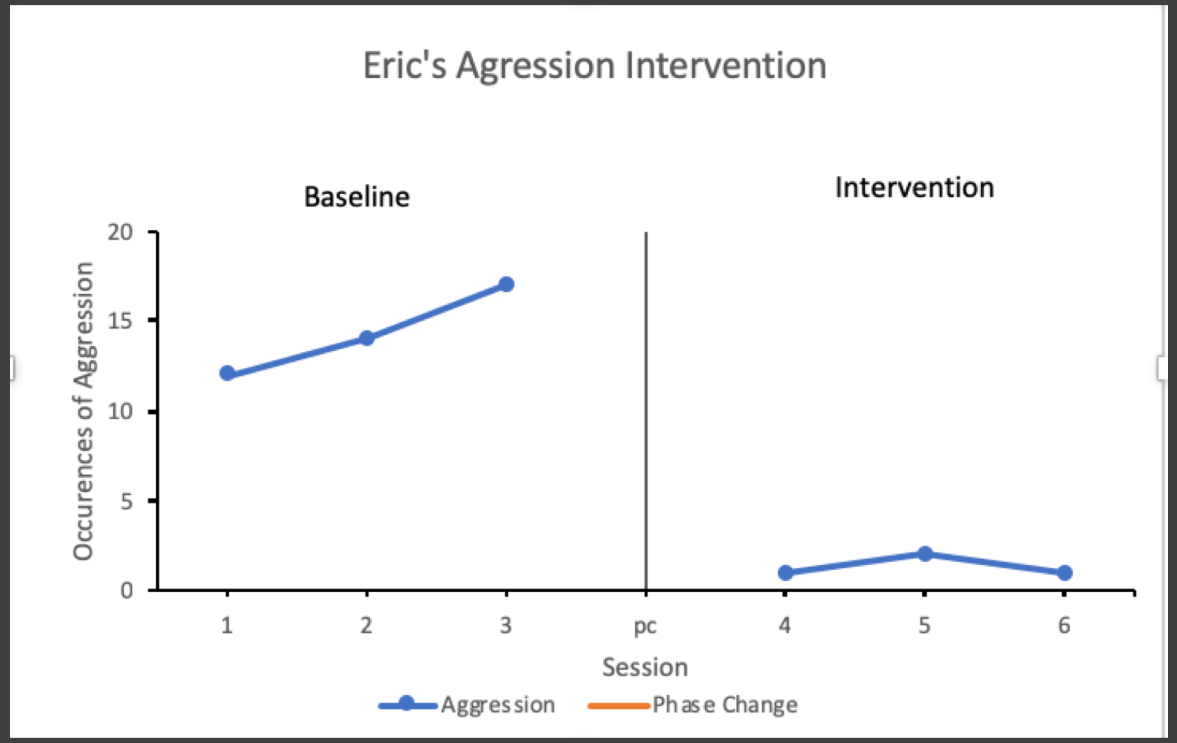
Question

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)

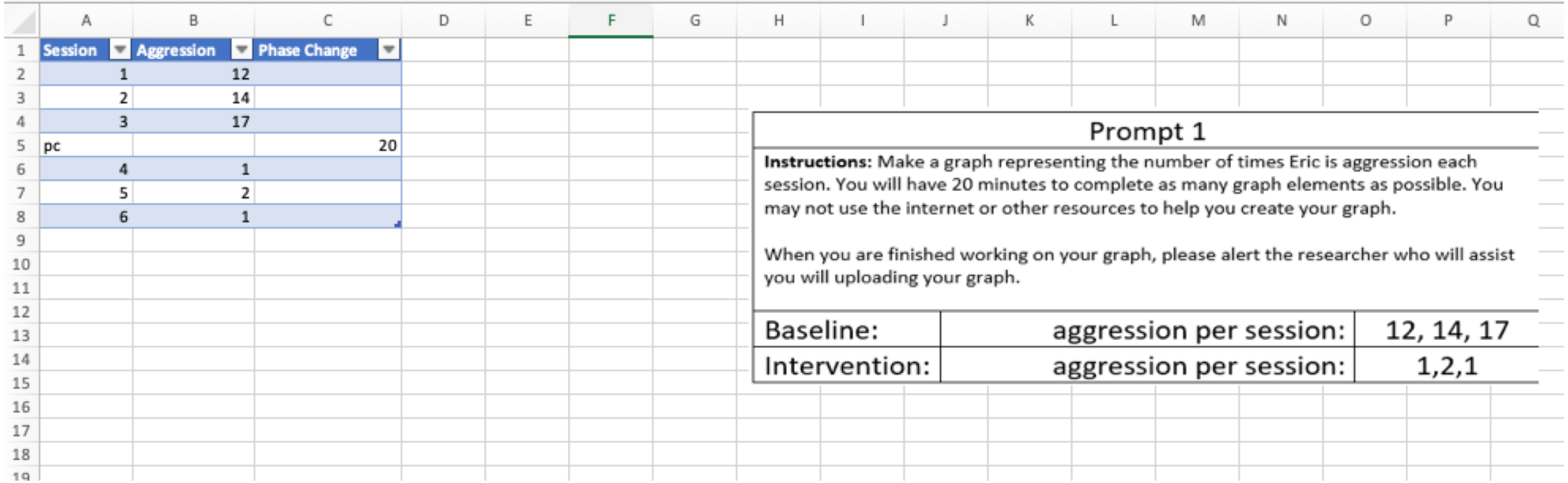
- Updated version

Kranak et al., (2018

- BST live training

Deochand, Costello, Fuqua, (2015)

- Developed task analysis that simplifies phase change procedure



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

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)

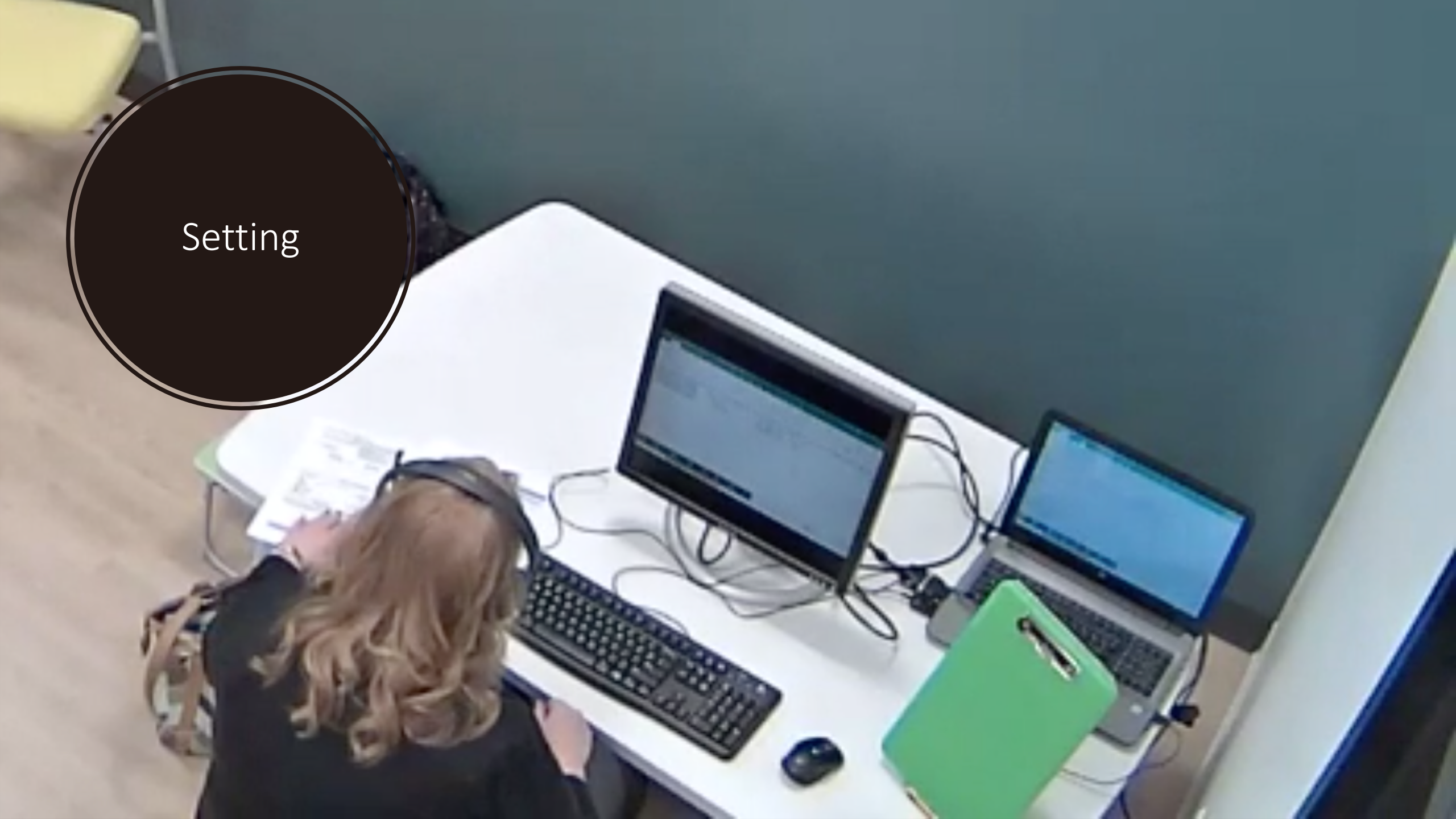
1 Professional (>30 yrs)

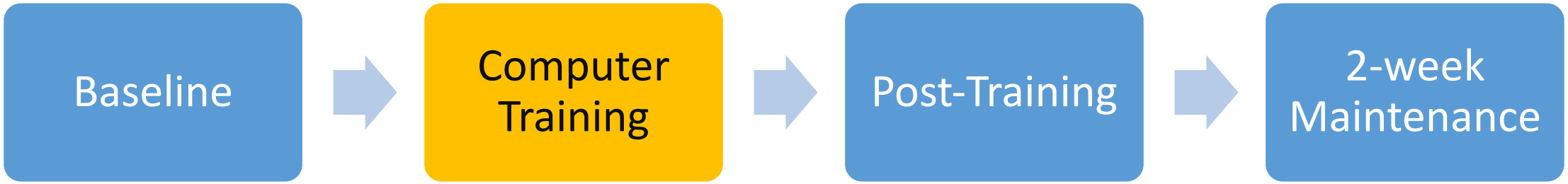
Profession

Education field

Graphing relevant in work

Setting



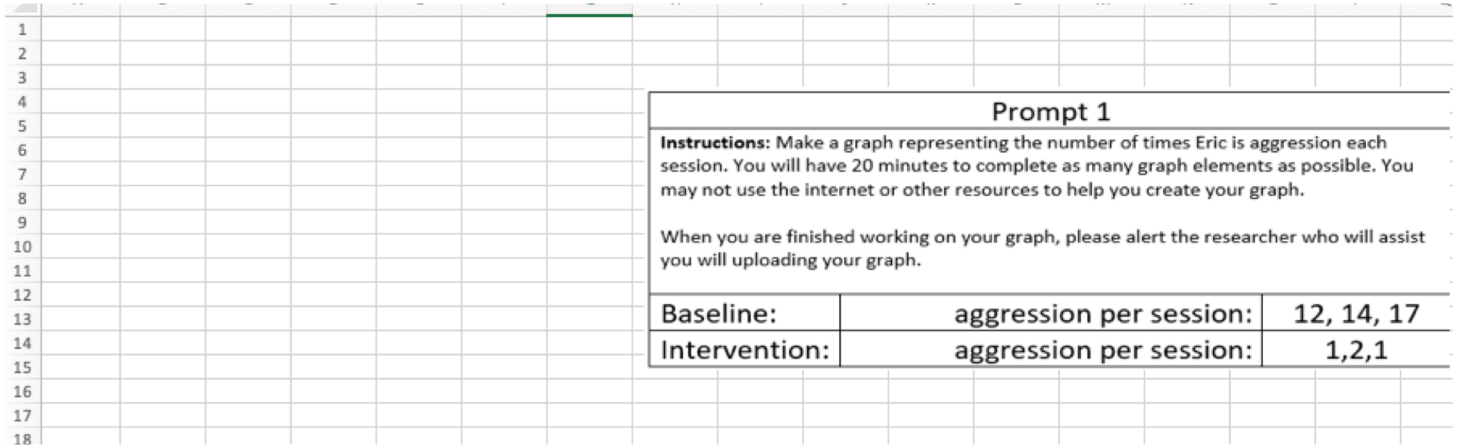


Study Conditions

Session

Procedures

- 20 minutes to create one graph from prompt
  - Participants could end session at any time
- Baseline
  - No access to notes
- Post-Training
  - Access to printed materials from training



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Baseline:	aggression per session:	12, 14, 17
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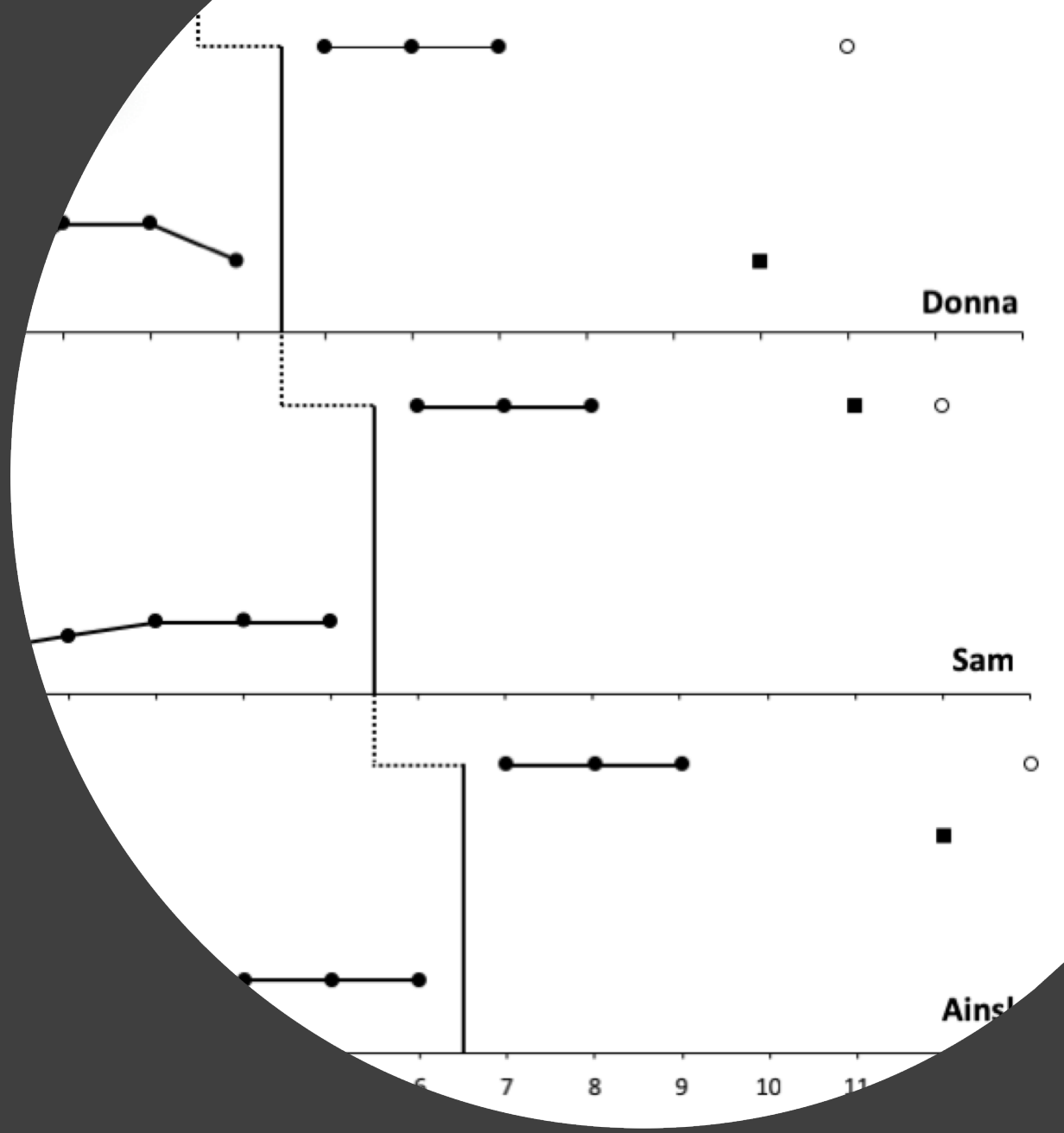
Study Design

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)

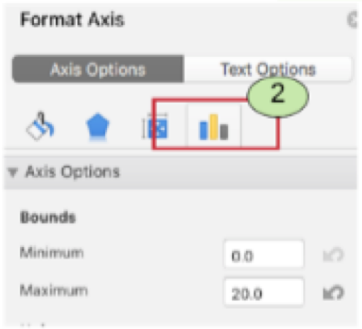
Training Materials

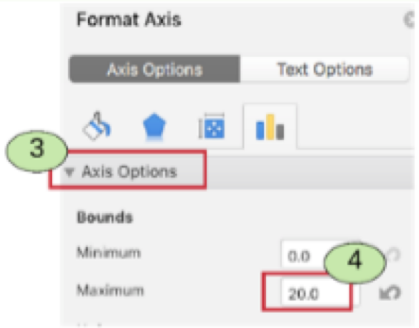
Step 1: Format y-axis (vertical axis)

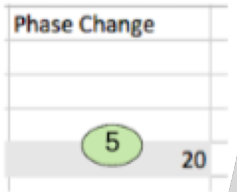
1 select y-axis, right-click, select format axis

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 matchs the phase change value

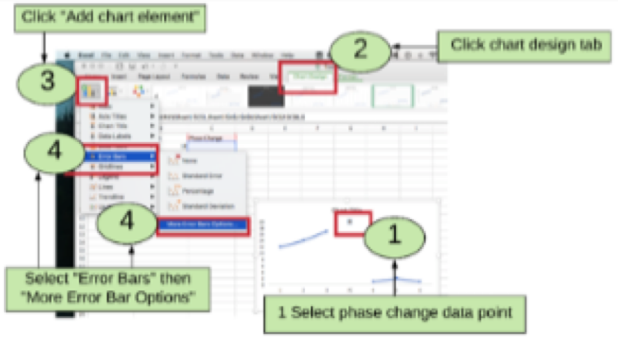
In this example, that value is 20.
(*This should prevent your axis max value from changing automatically)*

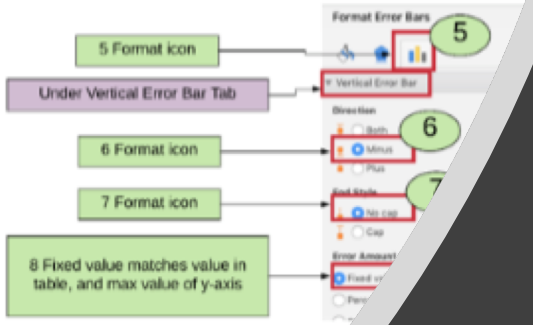






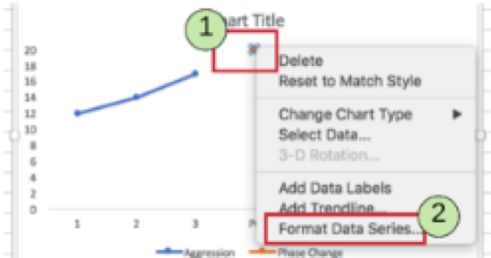
Step 2: Add Error Bar





Step 3: Delete Phase Change Marker

1 Select the phase change data point in the graph
2 Right-click, choose "Format data series"



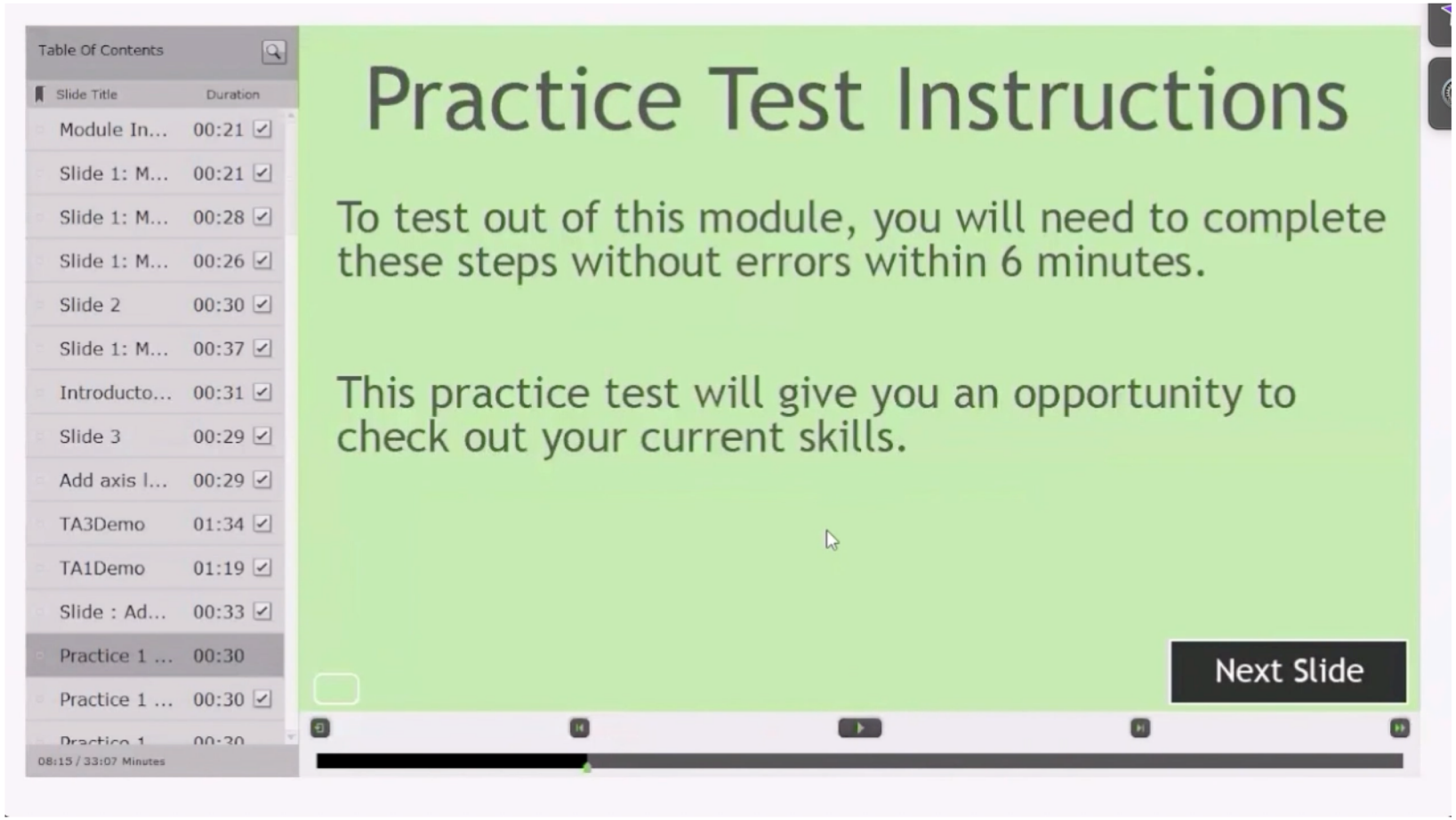
3 Select the format marker icon

4 Under "Marker tab"

5 "Marker Op

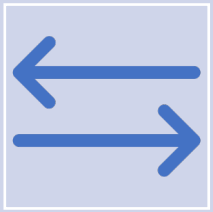
6 Cho

Example of Self-Check in Module



Backward Chaining

Teach final steps in task analysis first



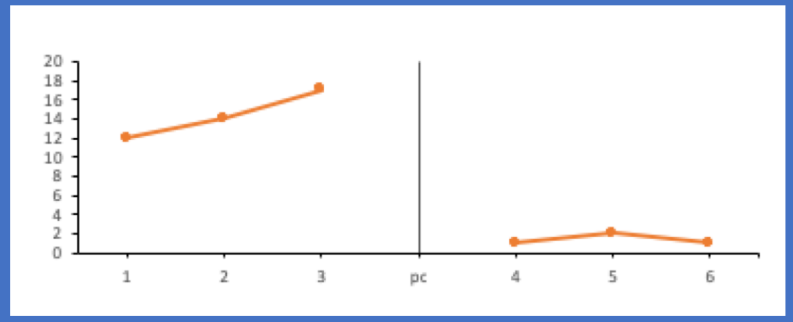
Move backwards

Task Analyses (TA) Requirements to Test Out

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

Test Out: Module 1

Before



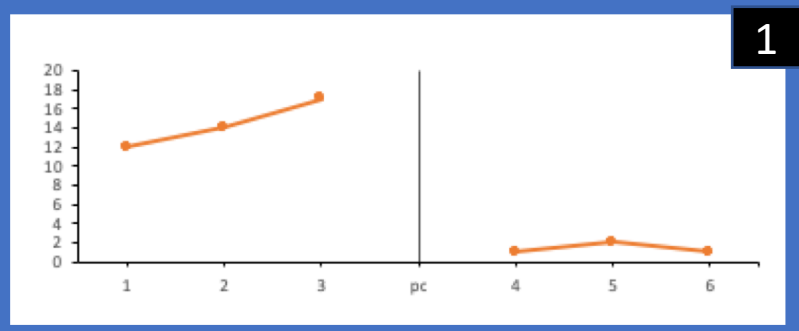
After

Task Analyses (TA) Requirements to Test Out

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

Test Out: Module 1

Before



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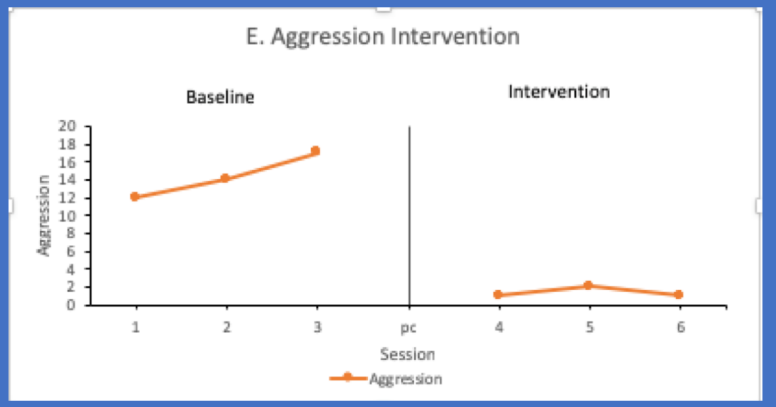

Task Analyses (TA) Requirements to Test Out

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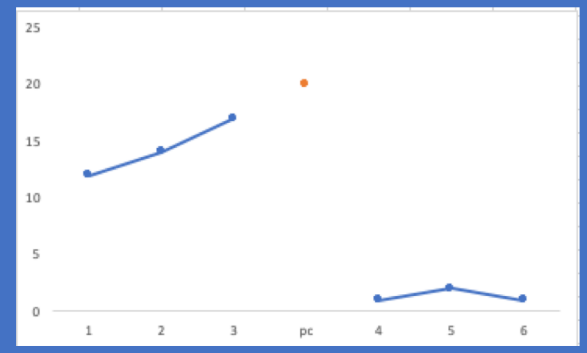
Module 2- Phase Change					Finished

Test Out: Module 1

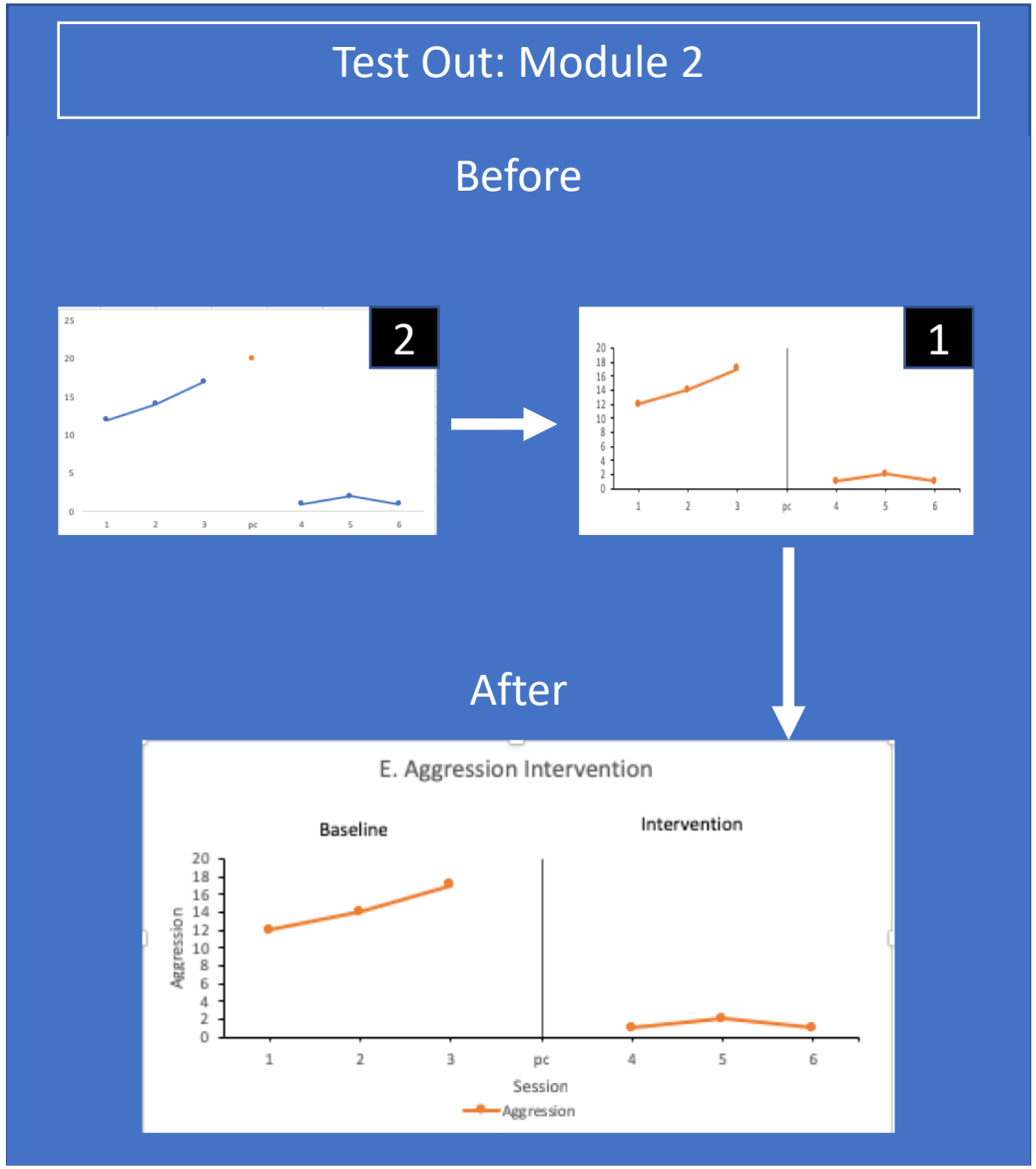
Before



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

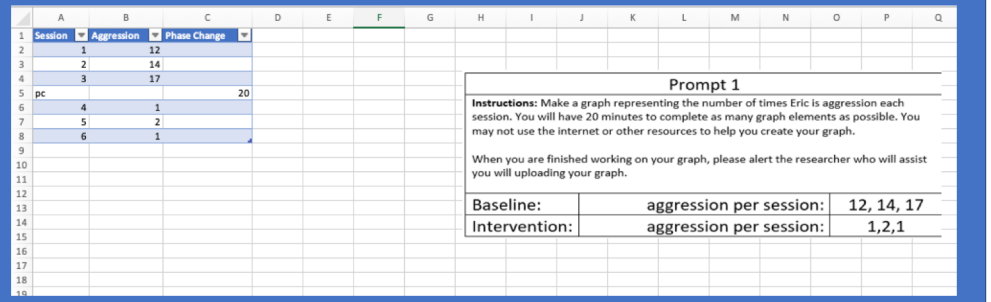


Task Analyses (TA) Requirements to Test Out

	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



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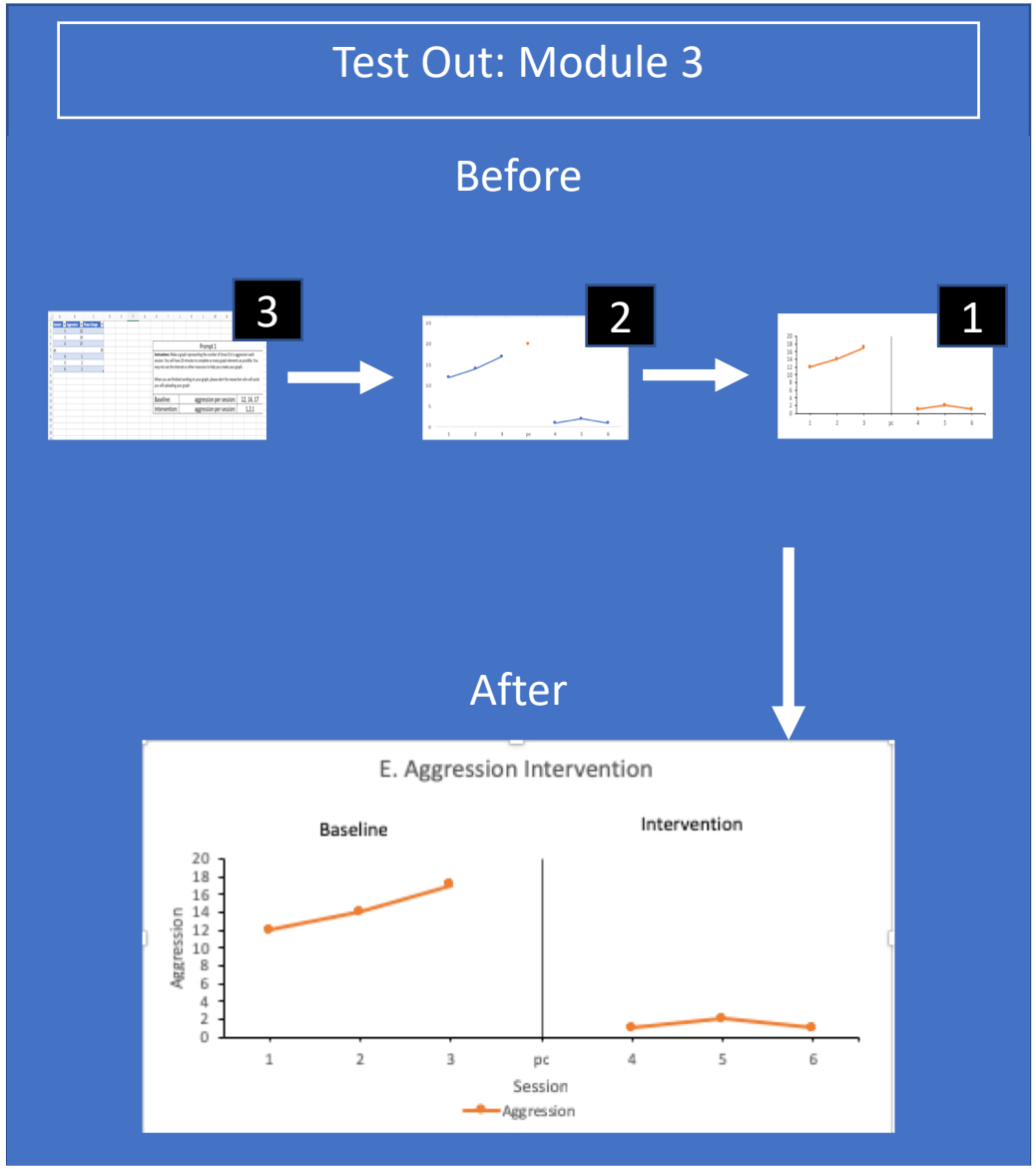
Module 1 - Labels				X	Finished
Module 2- Phase Change			X	X	Finished
Module 3 -Insert Graph		X	X	X	Finished Graph



Task Analyses (TA) Requirements to Test Out

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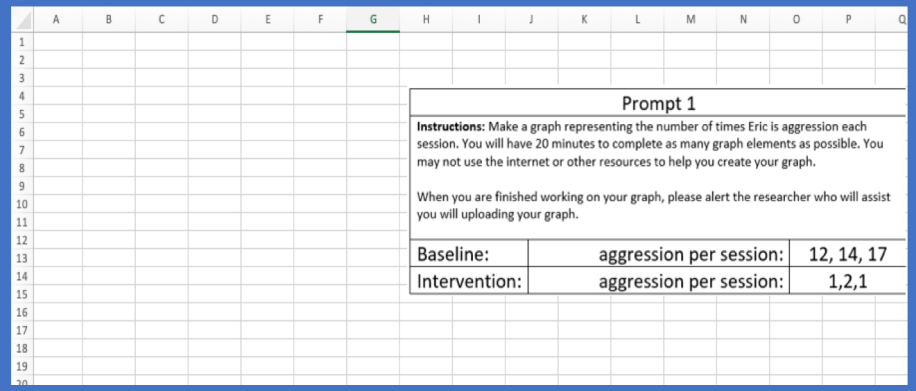
Module 2- Phase Change			X	X	Finished
Module 3 -Insert Graph		X	X	X	Finished Graph
Module 4- Insert Data					Finished Graph

Test Out: Module 1

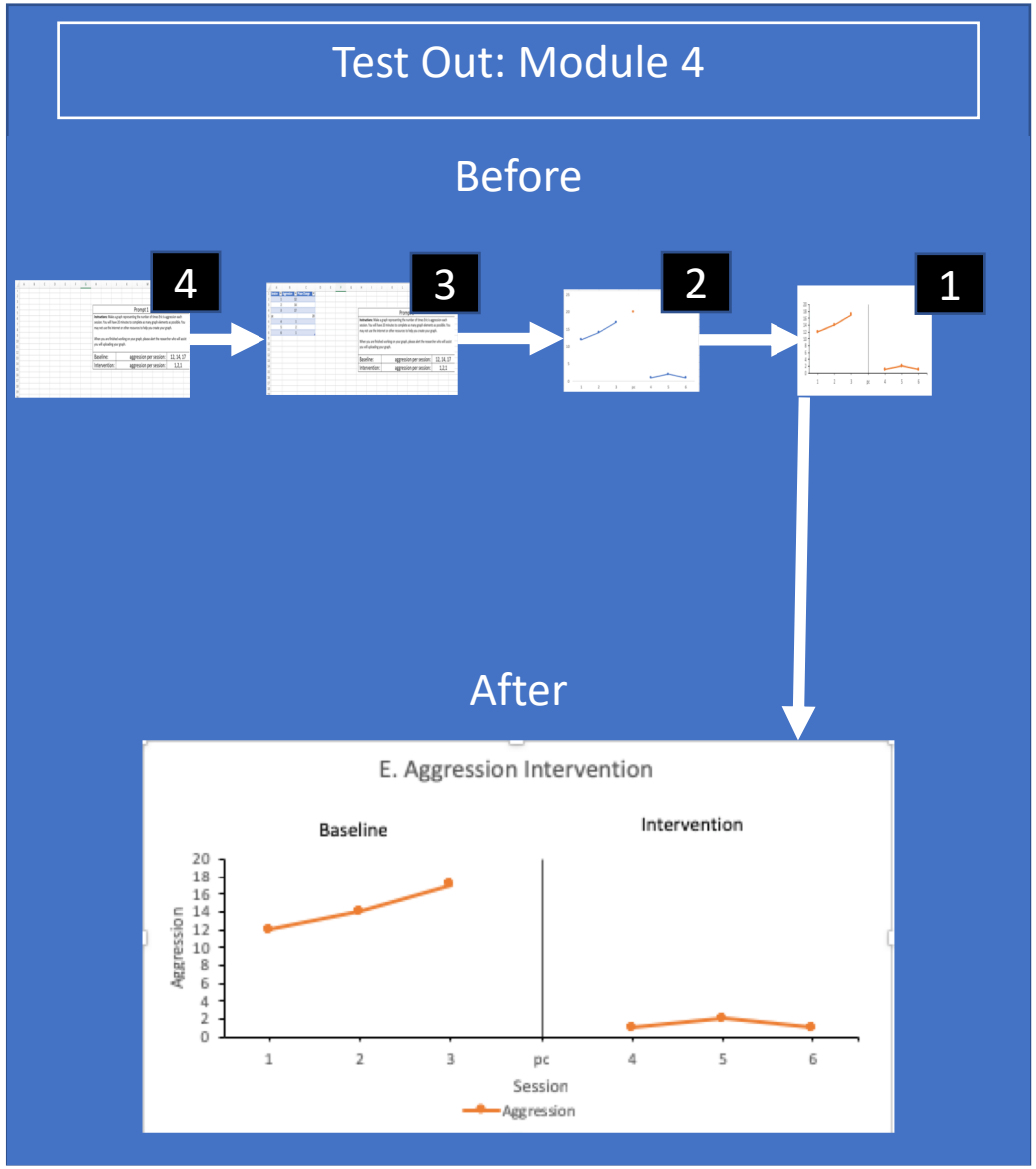
Before



After

Task Analyses (TA) Requirements to Test Out

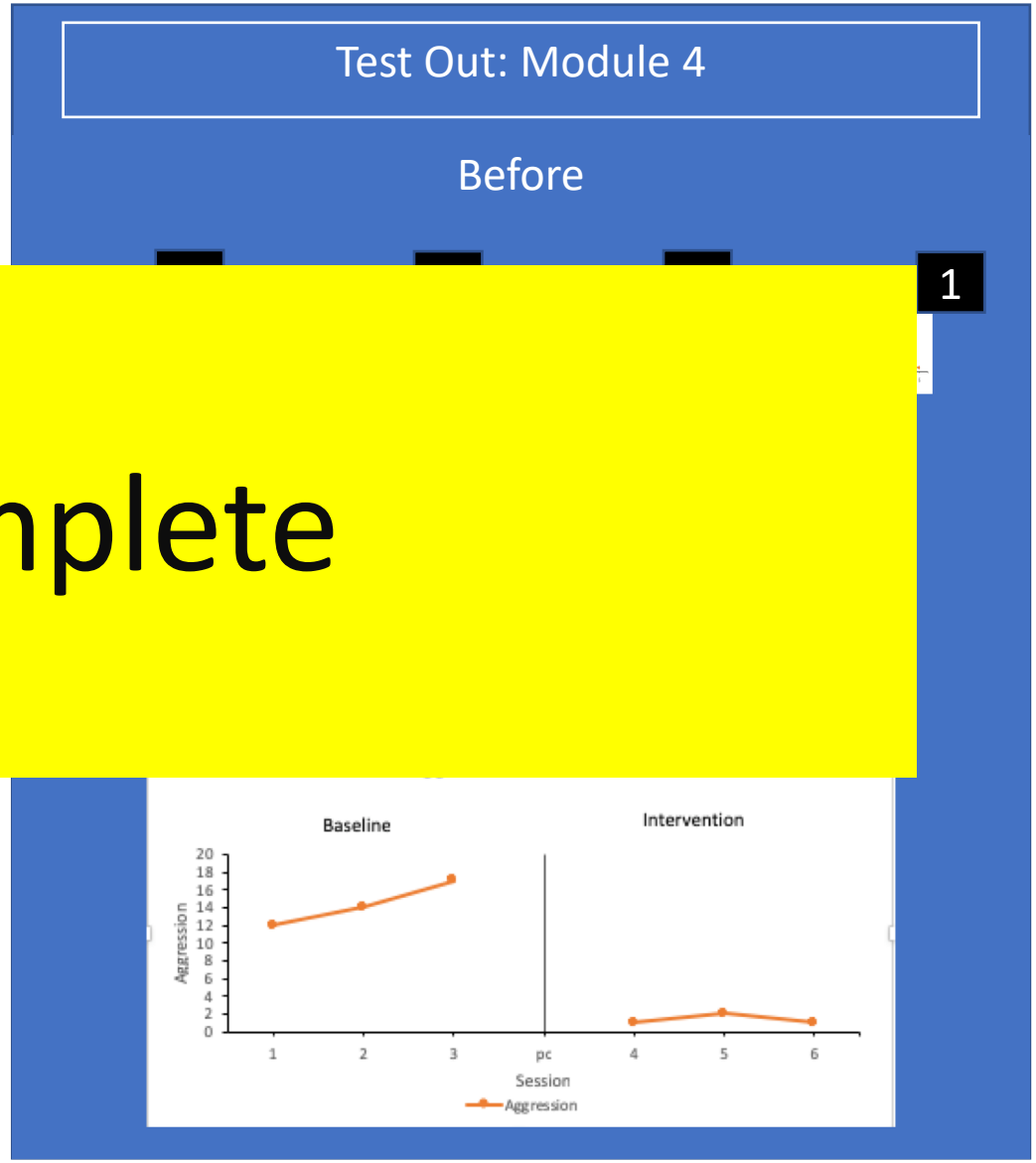
	TA 4	TA 3	TA 2	TA 1	Complete
Module 1 - Labels				X	Finished
Module 2- Phase Change			X	X	Finished
Module 3 -Insert Graph		X	X	X	Finished Graph
Module 4- Insert Data	X	X	X	X	Finished Graph



Task Analyses (TA) Requirements to Test Out

Training Complete

Mod					
Mod Cha					
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

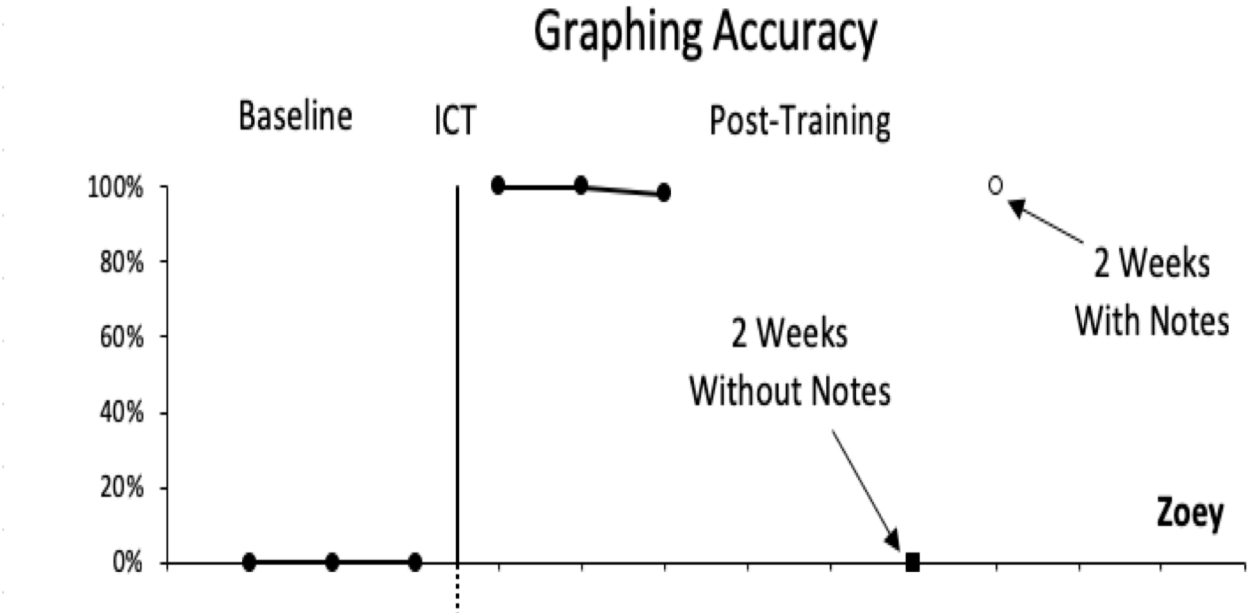
X-axis

- Sessions

Phase Labels

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

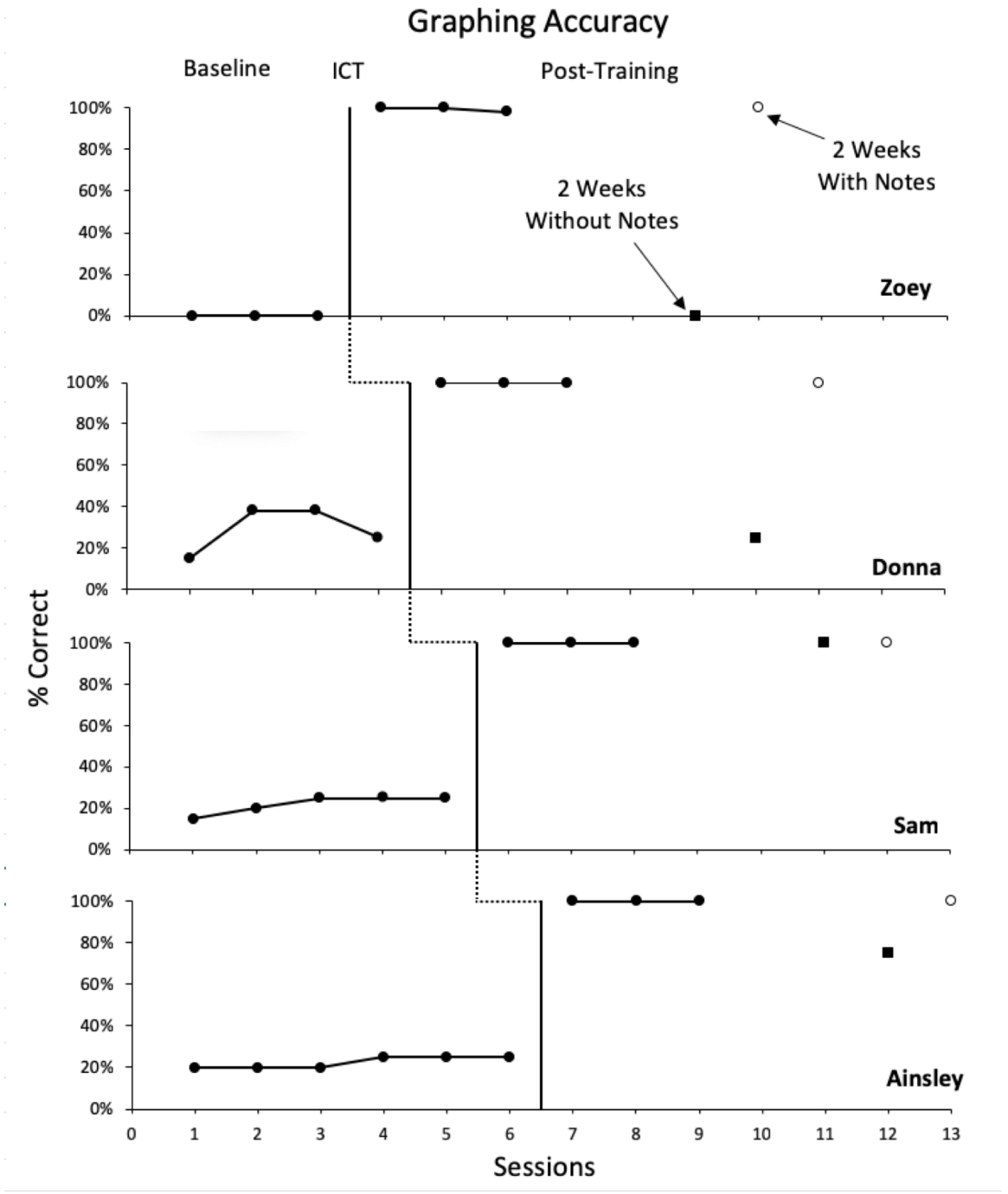
Do results replicate across participants?



Results

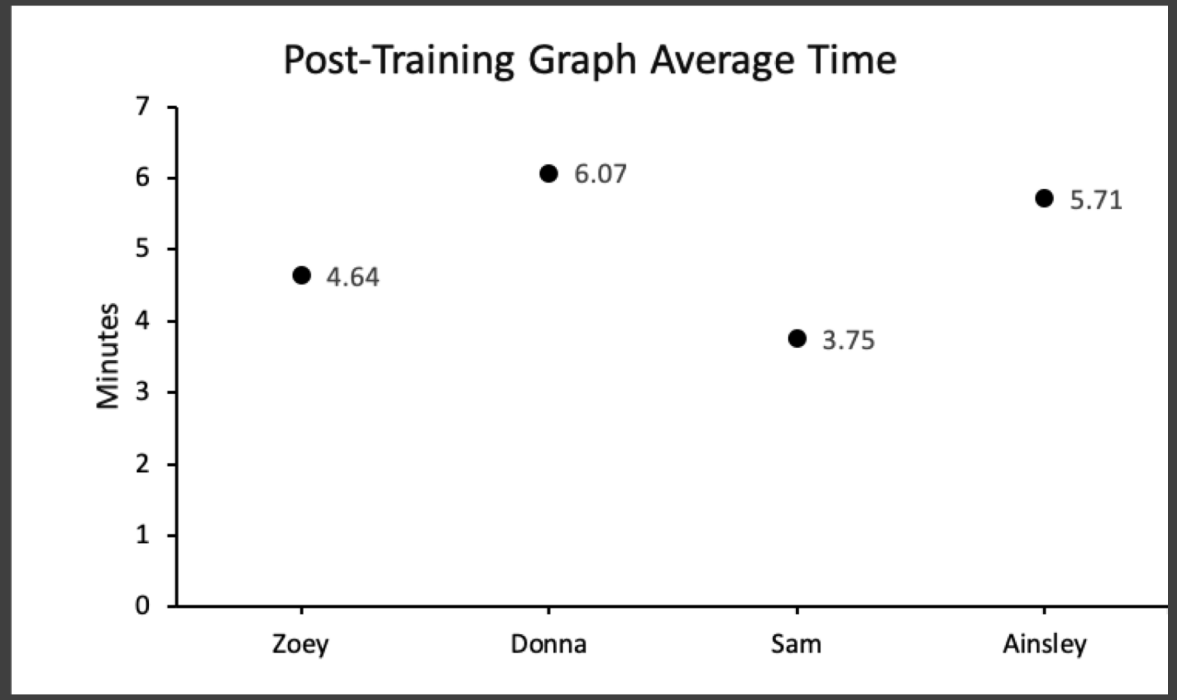
All participants score 98% or better on post-test graphs

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



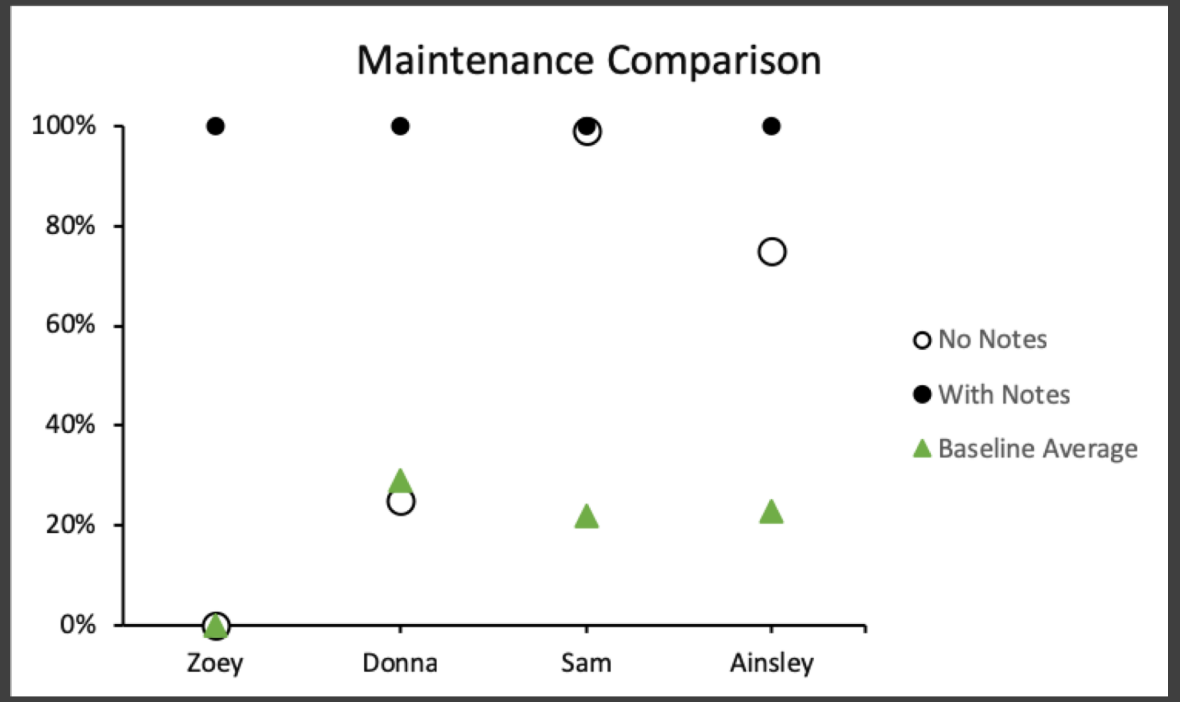
Graphing Speed

- 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



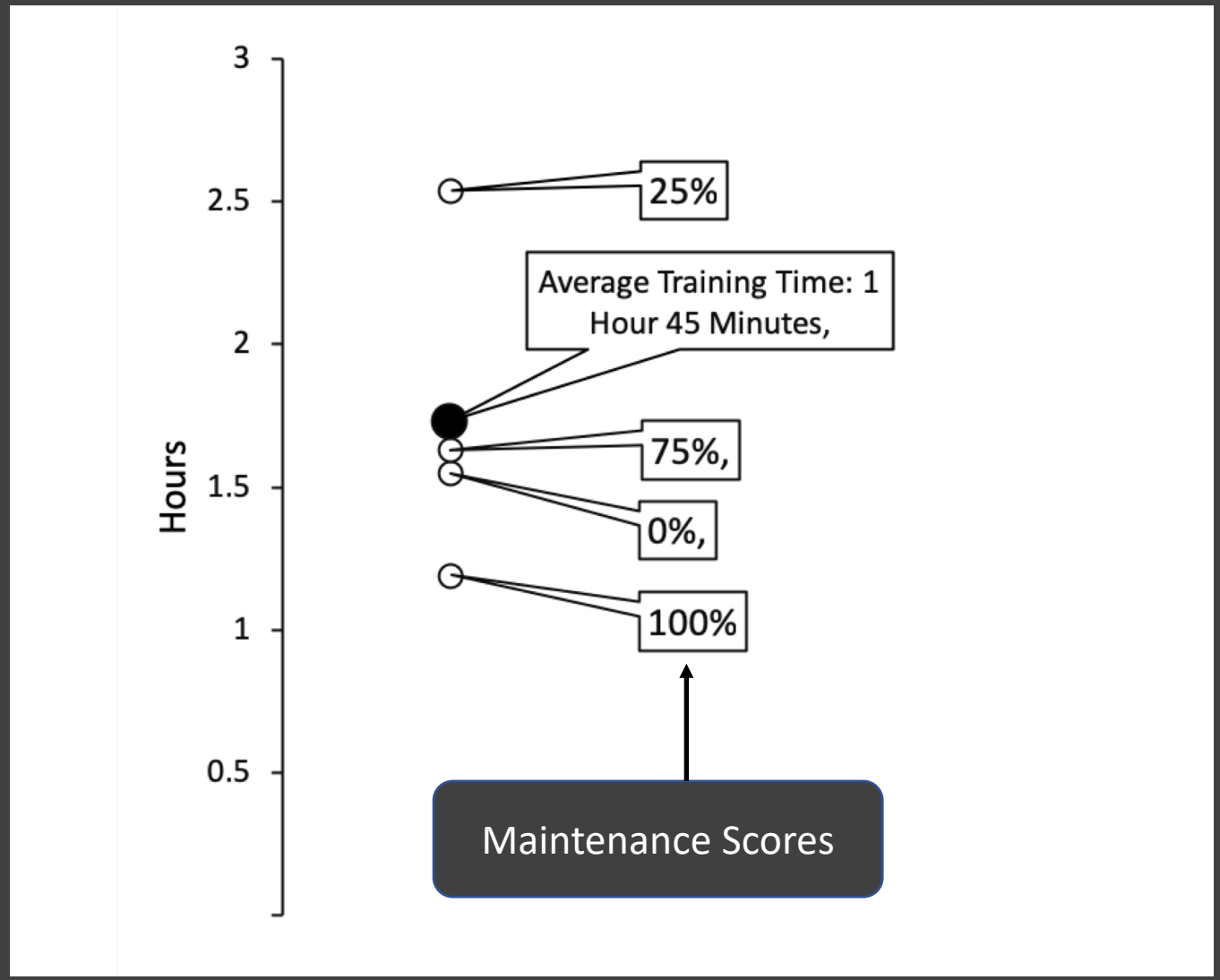
Average Duration:
1 hour 45 minutes

- 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

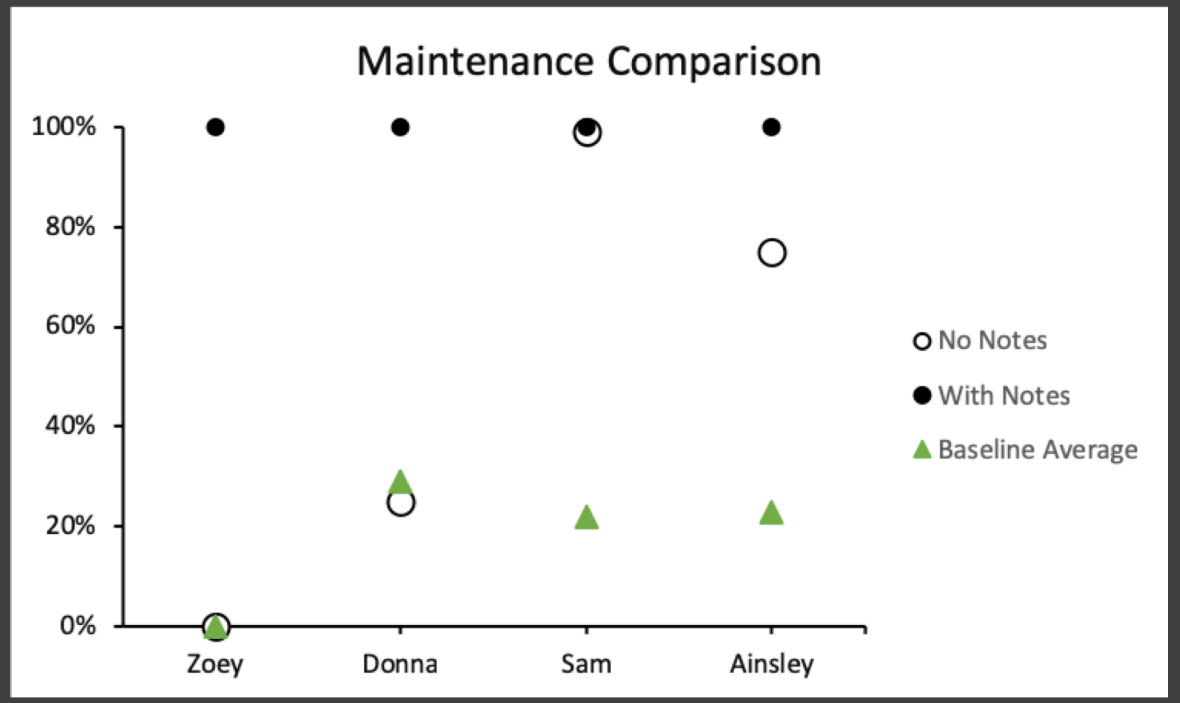
Time spent in training did not correspond with maintenance without notes scores.



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?