



Accuracy and Efficiency of Data Interpretation: A Comparison of Data Display Methods

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Introduction

- Research shows that the method with which data are displayed has an effect on interpretation of data (Deprospero and Cohen, 1979).
- Graphs that produce straight lines when data are plotted may facilitate analysis because trend can be quantified easily and trend lines can be projected easily into the future for prediction.
- Mawhinney and Austin (1999) found that Standard Celeration Charts took less time for identification of intervention onset than equal interval graphs and Statistical Process Control Charts, but that equal interval graphs had higher accuracy (62%) than Standard Celeration Charts (32%) and Statistical Process Control Charts (25%).

Methods

Participants

- 26 Board Certified Behavior Analysts from across the U.S responded from a poll of 446 who were contacted.

Materials and Procedure

- 90 stimulus sets, including 30 data sets, each displayed on equal interval graphs, tables, and Standard Celeration Charts.
- A website designed to run participants through stimulus sets that included the graphic display and asked the following questions about the data displayed:

“If the goal was met for each procedure, which procedure was most successful in increasing the behavior in the quickest, most economical way?” (Figure 1)

or

“Which program shows less variability?” (Figure 2)

Dependent Variables

- Frequency of correct and incorrect responding
- Interresponse time

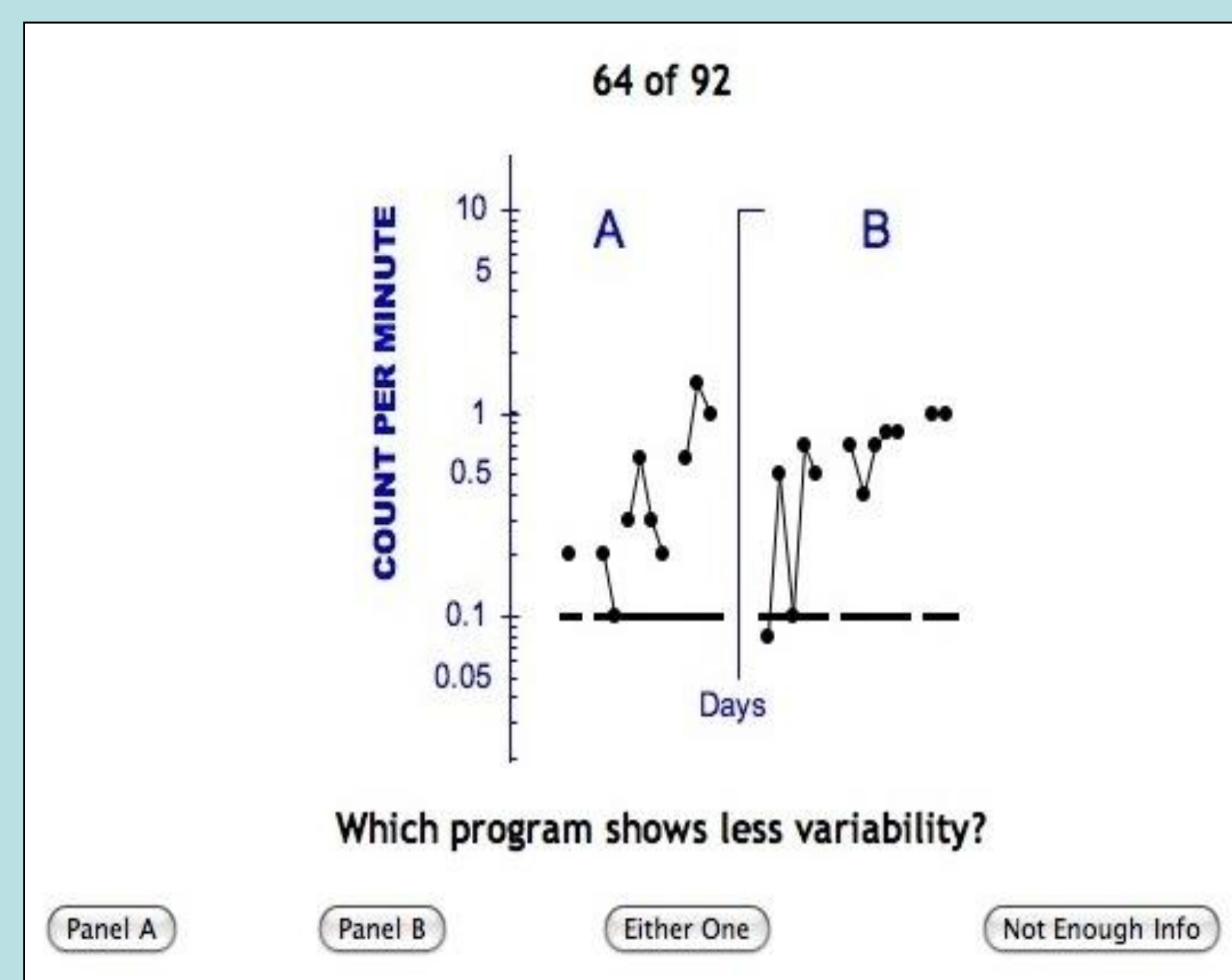


Figure 1

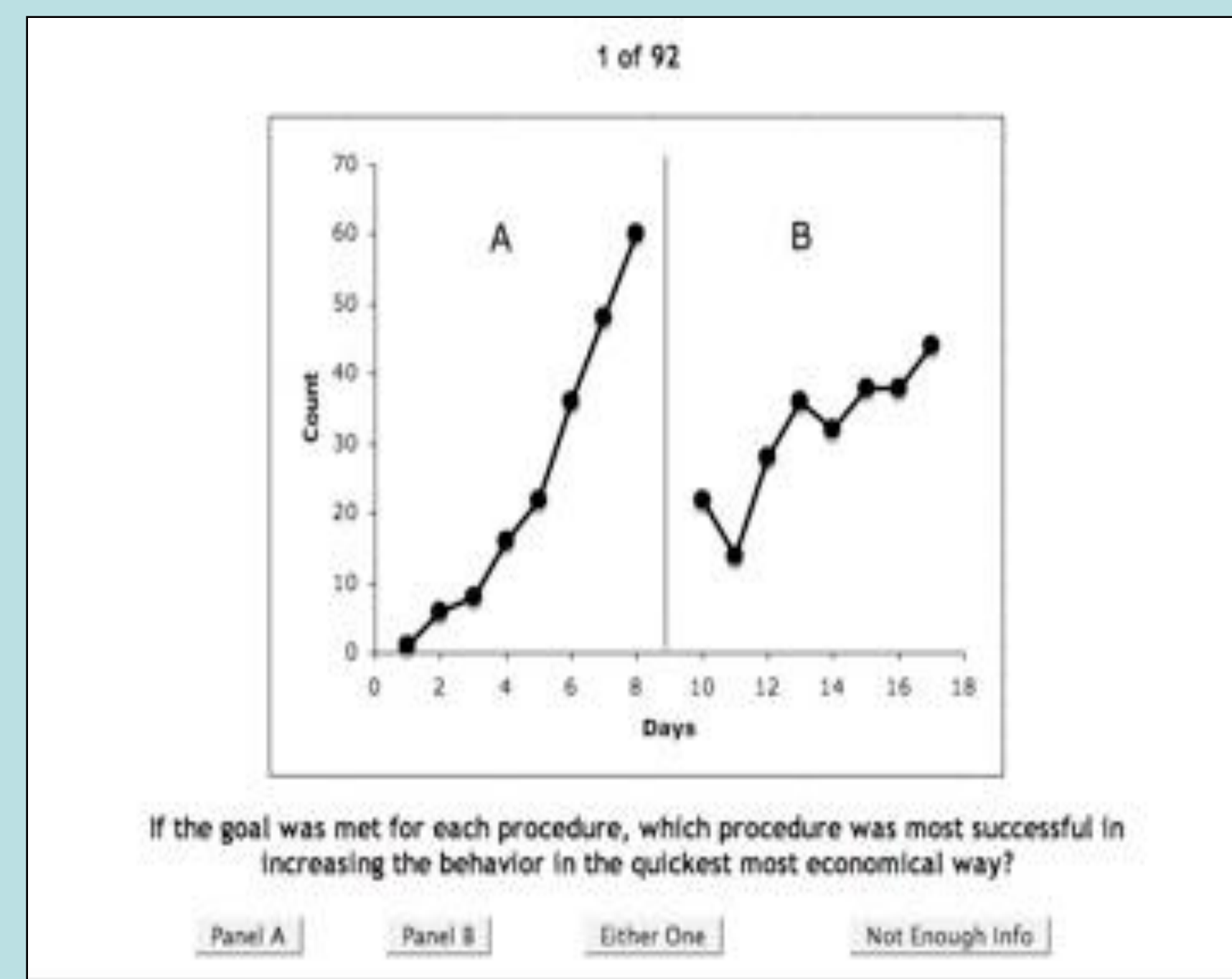


Figure 2

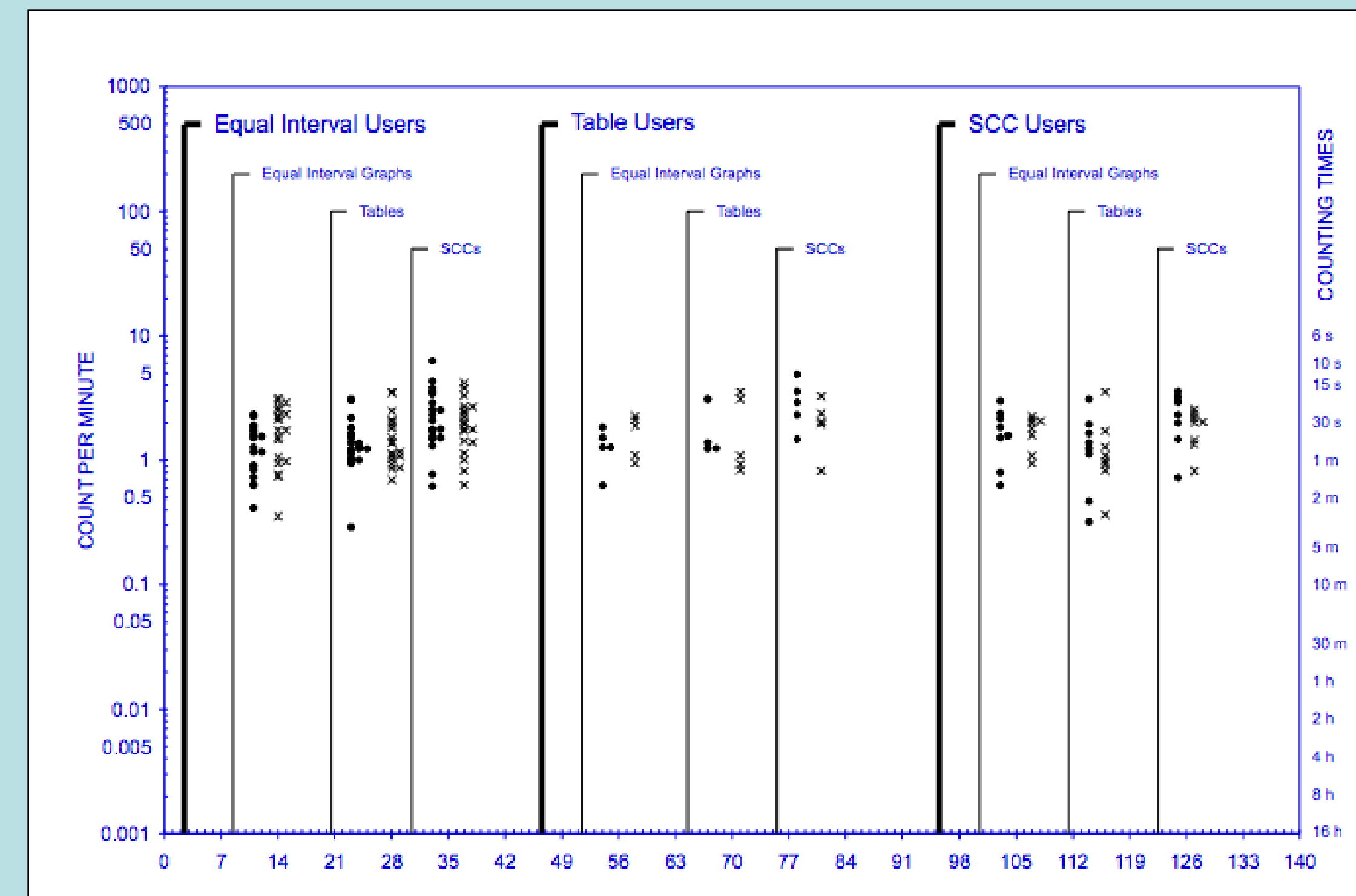


Figure 3

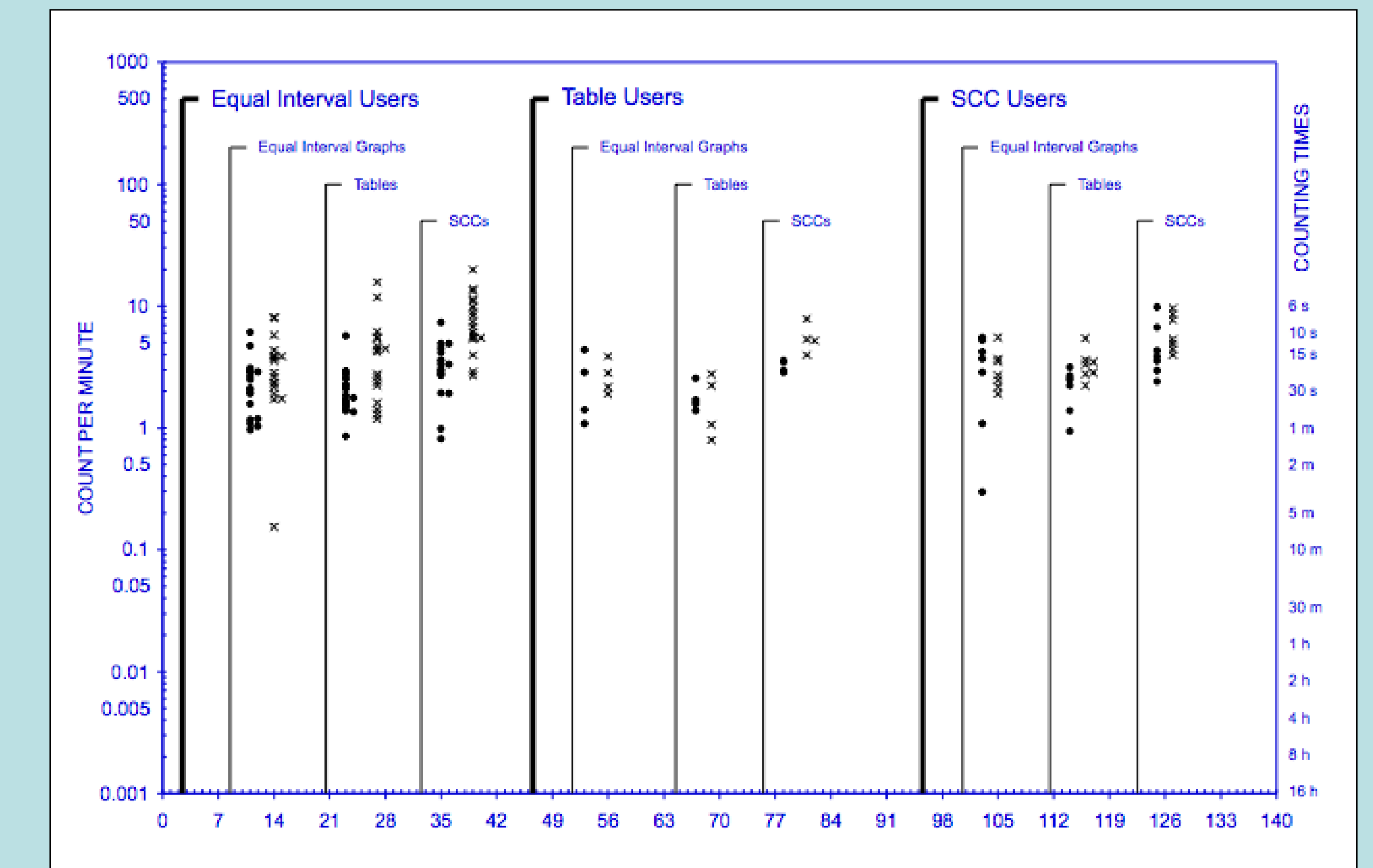


Figure 4

Rate of Change	Correct and Incorrect Response Rates Across Display Methods by Affinity Group																	
	Equal Interval Affinity Group						Table Affinity Group						SCC Affinity Group					
	Equal Interval Graphs		Tables		Standard Celeration Charts		Equal Interval Graphs		Tables		Standard Celeration Charts		Equal Interval Graphs		Tables		Standard Celeration Charts	
	Correct	Incorrect	Correct	Incorrect	Correct	Incorrect	Correct	Incorrect	Correct	Incorrect	Correct	Incorrect	Correct	Incorrect	Correct	Incorrect	Correct	Incorrect
Mean	1.32	1.82	1.45	1.61	2.44	2.08	1.31	1.67	2.02	1.90	3.04	2.09	1.74	1.74	1.41	1.34	2.41	1.85
Median	1.28	1.75	1.24	1.38	2.10	1.96	1.28	1.91	1.39	1.09	2.92	2.04	1.72	1.90	1.32	1.04	2.63	2.03
Range	0.41- 2.35	0.35- 3.16	0.29- 3.09	0.69- 3.53	0.62- 6.28	0.64- 4.19	0.63- 1.86	0.94- 2.27	1.24- 3.11	0.84- 3.53	1.48- 4.91	0.82- 3.27	0.63- 3.00	0.94- 2.27	0.32- 3.09	0.37- 3.53	0.73- 3.58	0.82- 2.56
Median Percentage correct or incorrect	40%	57%	47%	53%	53%	47%	40%	60%	53%	47%	60%	40%	47%	50%	53%	47%	60%	40%
Range of Percentages	20-67%	33-73%	0-60%	0-80%	13-80%	20-60%	40-47%	40-60%	47-60%	40-53%	53-60%	33-47%	20-67%	33-60%	27-67%	33-73%	33-60%	33-67%
Mean	2.41	3.50	2.10	4.58	3.31	8.24	2.44	2.69	1.81	1.72	3.21	5.59	3.27	3.13	2.21	3.38	4.80	6.37
Median	2.11	3.19	1.78	4.20	3.18	7.07	2.13	2.49	1.64	1.65	3.22	5.27	3.70	2.69	2.49	3.33	3.85	5.35
Range	0.97- 6.10	0.16- 8.14	0.86- 5.71	1.18- 15.71	0.81- 7.35	2.69- 20.00	1.09- 4.40	1.90- 3.85	1.39- 2.55	0.79- 2.78	2.86- 3.56	3.97- 7.86	0.30- 5.53	1.90- 5.53	0.95- 3.16	2.23- 5.41	2.40- 9.80	3.97- 9.60
Median Percentage correct or incorrect	37%	60%	27%	67%	33%	67%	43%	50%	53%	40%	40%	60%	53%	47%	40%	60%	40%	53%
Range of Percentages	27-73%	27-73%	0-60%	0-80%	7-40%	40-93%	27-60%	40-67%	33-67%	33-67%	27-40%	53-73%	7-60%	40-60%	20-53%	43-67%	20-60%	40-80%

Figure 5

Discussion

- SCCs occasioned the highest accuracies and frequencies overall, even among BCBA's who primarily use other types of displays; this may indicate a barrier to effective and efficient data analysis.
- Overall the comparatively low accuracies across all methods suggest that further attention be paid to training in the logic of data-driven treatment and in methods of efficiently collecting, displaying and analyzing human learning data.

References

- Deprospero, A., & Cohen, S., (1979). Inconsistent visual analyses of intrasubject data. *Journal of Applied Behavior Analysis*, 12, 573-579.
- Mawhinney, T. C., and Austin, J., (1999). Speed and accuracy of data analysts' behavior using methods of equal interval graphic data charts, standard celeration charts, and statistical process control charts. *Journal of Organizational Behavior Management*, 18(4) 5-45.

Results

- Affinity groups- 18 participants reported they primarily use equal interval graphs for interpretation, 5 use SCCs, 2 use tables, and 3 use all three methods for interpretation of data.
- Overall accuracy was highest on SCCs across all affinity groups, followed by tables, and then equal interval graphs for questions about rate of change (Figure 3). Accuracy for questions about variability was highest on equal interval graphs, followed by both SCCs and tables. (Figure 4).