

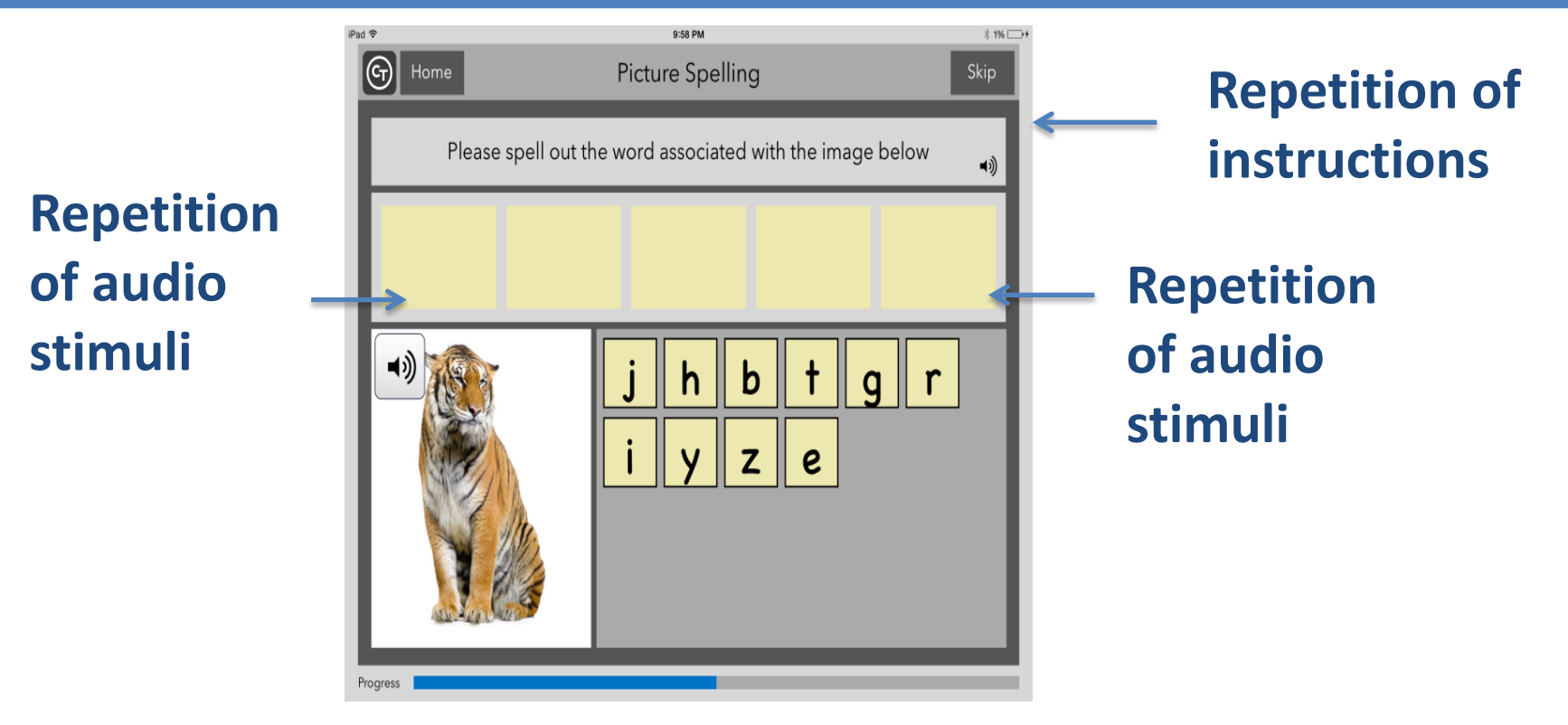
ABSTRACT

- How do individuals with aphasia relearn to use strategies during therapy and how does that translate to improvement in treatment?
- This study investigates this relationship while using Constant Therapy, which is an iPad-based therapy program with over 30 tasks.
- Fifty-one individuals with aphasia due to a stroke or traumatic brain injury were recruited for a 10 week treatment program.
- The software tracked both accuracy and hint counts (i.e., what level of assistance is needed), such as repetition of audio stimuli.
- Total hint counts were examined by session with a simple regression analysis both by participant (including hint counts of zero) and by task (excluding hint counts of zero) which found that, for both participants and tasks, half showed a significant relationship between accuracy and hint use.
- Total hint counts were also examined by cluster analysis, which resulted in a general trend where the greater the hint use, the lower the participant's accuracy, though interestingly, a couple of patients did show trends of higher accuracy with increased hint use.
- Additional analyses examining the relationship between accuracy and hint use over time specific to each task that each patient completed is ongoing.
- These results reveal that using cues can help overall accuracy but only to a certain extent and that overuse of cues can hinder accuracy.
- Ultimately, the results demonstrate the need for individualizing and moderating levels of assistance employed during rehabilitation.

BACKGROUND

A previous Aphasia treatment study utilized Constant Therapy, which is an iPad-based treatment program for individuals with Aphasia, to examine patients' accuracy and latency data across 30+ tasks over the course of a 10 week treatment program. For more information about this study please see Kiran et al. (2014) listed in the references.

WHAT ARE HINTS?



METHODS

- The Constant Therapy application allows for varied levels of assistance or hints for each task.
- Hints include repetition of audio stimuli or repetition of instructions.
- A patient's average accuracy on a task and the total number of hints he or she used were examined and analyzed by task and by patient.
- Thus, each task contains accuracy and hint data for all patients who used the task, and the data for each particular patient includes accuracy and hint data for all the tasks the patients completed throughout the treatment.
- It is important to note that the number of hints an individual used were averaged for each session to obtain the total hints per session for each task.
- Moreover, to be included in the analysis, a patient had to have completed at least 3 items in a task during a session.
- Tasks in which there were no hints available to use were not included in the analysis.

RESULTS: By Task

Description of Analysis by Tasks

- If a patient used 0 total hints per session, the data was not included in the task analysis.
- A simple regression was performed using IBM Statistica to examine how much hint use predicted accuracy during a particular task.
- A cluster analysis with 3 clusters using SPSS was also performed for the tasks found to be significant to demonstrate the relationships between amount of hint use and accuracy within a task.
- If a cluster only contained one data point, it was considered to be an outlier, and outliers were removed from data.

Simple Regression Values for Tasks Found to be Significant

Task	Adjusted R ²	p
Picture Ordering	0.021249	0.000228
Instruction Sequencing	0.206722	0.000035
Letter to Sound Matching	0.117321	0.000000
Picture Spelling Completion	0.499411	0.000000
Sound to Letter Matching	0.088852	0.000000
Word Copy	0.088244	0.000001
Word Identification	0.147590	0.000002
Map Reading	0.102890	0.000440
Symbol Identification	0.149441	0.000000
User Mail	0.133508	0.000341
Picture Matching	0.021295	0.021450
Phrasing	0.021280	0.002129
Sound Identification	0.090203	0.021219
Word Identification	0.085376	0.021773
Picture Spelling	0.121395	0.000000
Word Spelling Completion	0.070880	0.000000
Clock Math	0.015723	0.040223

Variations in Performance as a Function of Total Hints Used Across Tasks (in % tasks)

*17/30 tasks found to be significant. Color coded chart shows variation in performance across tasks.

Sound to Letter Matching Shows Decrease in Accuracy with Increase in Hint Use

Picture Spelling Shows Decrease, and then Slight Increase in Accuracy with Increase in Hint Use

Picture Ordering Shows Increase in Accuracy with Increase in Hint Use

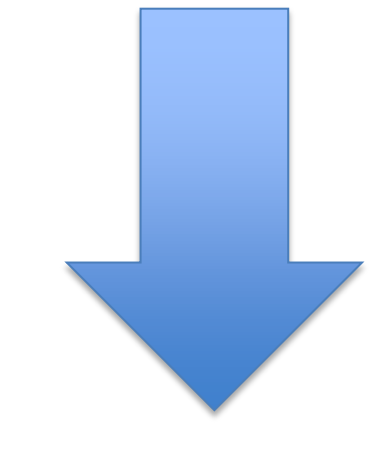
Cluster	1	2	3
AvgAccuracy	0.744	0.541	0.416
Total Hints	7	34	71
# Cases	366	130	68

Cluster	1	2	3
AvgAccuracy	0.796	0.626	0.718
Total Hints	9	46	113
# Cases	233	25	22

Cluster	1	2	3
AvgAccuracy	0.466	0.402	0.275
Total Hints	19	64	118
# Cases	188	58	53

CONCLUSIONS

- When collapsing across patients and levels, patients do not appear to improve with an increase in hint use except for the Picture Ordering task.
- The use of hints works for different individuals in different ways: Some patients improve with hint use, while other patients do not.
- The use of hints helps some individuals access information that is otherwise inaccessible, while it works to reinforce negative strategies for other participants.
- There is evidence that some light hint users can improve their performance by increasing their hint use.



There is a need to individualize levels of assistance for patients specific to the task in therapy in order to have the most effective outcomes

RESULTS: By Patient

Description of Analysis by Patient

- All data, including when a patient used 0 hints per session was included in the analysis.
- A simple regression was again performed to examine whether hint use was a strong predictor of accuracy.
- A cluster analysis, using 4 clusters was only performed on patient data found to be significant.
- If a cluster only contained one data point, it was considered to be an outlier, and all outliers were removed from the data.

Simple Regression Values for Participants Found to be Significant

Patient	Adjusted R ²	p
Patient 28	0.010108	0.042910
Patient 44	0.032282	0.021848
Patient 46	0.000201	0.000004
Patient 334	0.124641	0.000000
Patient 27	0.000000	0.000000
Patient 82	0.010102	0.000100
Patient 55	0.031606	0.000000
Patient 61	0.144174	0.000000
Patient 80	0.233609	0.000000
Patient 551	0.010104	0.000100
Patient 904	0.178176	0.000100
Patient 1174	0.104332	0.000000
Patient 1339	0.067671	0.000011
Patient 90	0.022325	0.000000
Patient 42	0.010104	0.000100
Patient 827	0.038036	0.001111
Patient 871	0.401295	0.000129
Patient 1091	0.020677	0.000000
Patient 1227	0.040107	0.017042
Patient 879	0.012827	0.000662
Patient 903	0.102107	0.000812
Patient 527	0.252099	0.000000
Patient 25	0.089834	0.000094

Variations in Performance as a Function of Total Hints Used Across Participants (in % patients)

*23/51 patients found to be significant. Color coded chart shows variations in performance across patients.

Patient 25 (Light Hint User) Shows Increase in Accuracy and then Slight Decrease with Hint Use

Cluster	1	2	3	4
AvgAccuracy	0.6428	0.75	0.521	0.582
Total	35	50	1	12
# Cases	3	2	131	18

Patient 551 (Heavy Hint User) Shows Decrease in Accuracy with Hint Use

Cluster	1	2	3	4
AvgAccuracy	0.6111	0.725	0.7355	0.6643
Total	30	2	9	16
# Cases	3	238	115	49

Patient 334 (Light Hint User) Shows Increase in Accuracy with Hint Use

Cluster	1	2	3	4
AvgAccuracy	0.8713	0.789	0.765	0.8725
Total	14	21	0	9
# Cases	21	7	217	19

FUTURE DIRECTIONS

- Examine data by type of hint used for each level of task for both tasks and patients.
- Investigate how a patient improves over time with hint use across sessions.
- Correlate participants' standardized assessment scores with levels of assistance used, and examine how it relates back to participants' levels of performance.

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Disclosure: SK owns equity in Constant Therapy and serves as the chair of the Scientific Advisory Board for Constant Therapy (www.constanttherapy.com). CD owns a portion of the stock equity that BU owns.

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REFERENCES

Kiran, S., Des Roches, C., Balachandran, I., & Ascenso, E. (2014). Development of an impairment-based individualized treatment workflow using an iPad-based software platform. *Seminars in Speech and Language, 35*. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/24449464>