Title: iPractice: The effectiveness of a tablet-based home program in aphasia treatment

Abstract:
The iPad and other tablet devices have enormous potential for personalized home practice to augment aphasia rehabilitation. The current study investigates the utility of an iPad-based home practice program, implemented post intensive therapy, for people with chronic aphasia. Six of eight subjects are participating in the home program. All participants maintained advances made on words trained during the intensive treatment and additionally were able to learn new words solely by practicing on the iPad. The results have implications for the use of home programs and tablet devices in people with chronic aphasia. Selecting appropriate candidates for tablet-based technology is discussed.

Introduction

The field of Speech Language Pathology is progressively moving towards regularly incorporating technology into treatment (Hirsch Atticks, 2012). In the last decade, for example, the decreasing cost, increasing ease of use, and "it" factor have encouraged both practitioners and persons with aphasia to reach for the iPad, even if they were novices with such technology.

To our knowledge, there is no scientific literature on the use of the iPad in aphasia rehabilitation; however, several studies have investigated both the effectiveness of computer programs in aphasia therapy, as well as the effectiveness of home programs (Fink, Brecher, & Schwartz, 2002; Ramsberger & Marie, 2007). Pederson, Vinter & Olson (2001) examined unsupervised computer rehabilitation of anomia. Using a program that targeted semantic, phonological, and written cueing, the authors found that, while performance varied, all participants were able to improve their confrontation naming post computer treatment. More recently, Palmer et al. (2012) conducted a randomized controlled trial of computer therapy with people with chronic aphasia. After five months of computer treatment, individuals in the experimental group were found to have significantly improved on confrontation naming tasks in comparison with the control group.

Computerized home practice allows for individualized treatment, accessibility for those in rural and remote locations, and importantly, massed practice. Additionally, it allows for some autonomy, which may be lacking in traditional treatment programs. The current study aimed to track the usefulness of a home program for maintaining and improving recent treatment gains in stroke survivors with chronic aphasia. Specifically, we investigated whether treated words could be maintained, and untreated words learned, using unsupervised practice on individualized iPad practice programs.

Methods

Participants: Eight English-speaking adults (4 female), ages 55-80 (mean 66.75), at least 8 months post-onset of single unilateral CVA affecting the language dominant hemisphere at the time of baseline testing. Participant demographics can be seen in Table 1, including aphasia classification and severity. All subjects participated in an intensive 2-week naming treatment program (reported elsewhere) prior to beginning the individualized home practice programs. Three subjects are not included in the present data analysis due to incomplete participation in the home program. The discussion will address identifying appropriate candidates for technology-based home programs.

Materials: Treatment stimuli consisted of images of objects (Snodgrass & Vanderwart, 1980) and actions (Masterson & Druks, 1998). Individualized interactive books were created for each participant using iBooks Author© software, and were distributed on iPads. For each participant, two books were created: one containing Objects and one containing Actions. Each book contained 20 words to be practiced; 10 had been trained in the intensive 2-week treatment program, and 10 were from a matched list of untrained words. Lists were matched on variables including word frequency, length, visual complexity, and accuracy on post-treatment probes. Each word had a chapter that contained 5 pages of different cueing methods for practicing the word, including the picture used in the probe, other images of the word, videos of a person saying the word, as well as discrimination tasks (ex: Which picture matches the word "car"?). Additionally, the Action books contained videos of the action being performed.

Procedure: After a 2-week intensive naming treatment program, iPads loaded with individualized iBooks practice programs were distributed to the participants. All participants received training on how to navigate the iPad in order to practice using the two iBooks (Actions and Objects), as well as how to connect weekly with an SLP via the GoToMeeting© app. Participants were also trained to locate, start and stop a digital stopwatch on the iPad before and after practice in order to track daily usage. After each self-initiated practice session, the subjects would copy into a log the numbers displayed on the stopwatch.

Participants met with the SLP via telepractice on their iPad, using GoToMeeting, once a week. Telepractice sessions predominantly consisted of informal conversation, but included a series of questions the clinician would ask, such as if the participant had been practicing using the iPad, if they were remembering to track how much time they spent practicing, if they were having any problems, and feedback regarding the participant's comfort and confidence in using the device. Once a month, for six months, participants completed probe testing in the clinic to track progress.

Results

The first three months of probe results post-introduction of the home practice program, and completed thus far, are reported here. Participants reported practicing, on average, 2 hours per week (see Table 2).

Progress was tracked for words in four training and practice conditions: trained words that were practiced (TR-PR) in the home practice program (HP), untrained words that were practiced in the HP (UNTR-PR), trained words that were not practiced (TR-UNPR), and untrained words that were not practiced (UNTR-UNPR). All five participants in the HP study showed a trend towards maintenance or continued improvement of the TR-PR words, and most (4/5) have demonstrated dramatic gains in UNTR-PR words. These results contrast with the UNTR-UNPR condition, which remained relatively unchanged for all participants throughout the course of treatment and beyond. See Figures 1-5.

Discussion

The preliminary results of this study demonstrate that home practice on the iPad can produce maintenance of words learned in intensive language treatment. Additionally, participants were

able to self-teach words that were not previously trained. This evidence provides support for a cornerstone of neurorehabilitation, i.e., that massed practice promotes coincidence (or Hebbian) learning (Pulvermuller & Berthier, 2008). Most notably, our findings suggest that after making significant progress in short-term, intensive language therapy, people with chronic aphasia are able to autonomously maintain and improve upon these gains with a tablet-based home practice program.

It is also important to address the "self-treatment" nature of the results. The home practice programs were carefully designed with the clients' needs and skills in mind. Furthermore, the training on the iPad and practice program and the weekly check-in with the SLP were likely essential aspects of these individuals' success.

Another consideration in discussion of home practice technology for persons with aphasia is candidate criteria. Of our eight participants who underwent intensive speech therapy, one participant had matching list errors in his iBooks program, compromising the first two months of data. Additionally, two were unable to complete the home practice program. Of these, one could not reliably be trained to initiate and correctly use the iPad; the other never agreed to the usefulness of "overlearning" what he gained during treatment; neither "bought in" to the idea of daily practice on the iPad. That being said, seven of eight participants had never used an iPad prior to being trained for this study, yet many of them learned quite rapidly. It appears that motivation to use the technology and adequate training are more important factors than age and prior experience with computers.

As tablets become normalized as treatment tools, it is important to ensure their efficacy in treating aphasia. This study is a first step in creating an evidence base for independent home practice using tablet devices. As clinicians and researchers move forward together, further research should be done on how to best train both clinicians and clients, and how to design applications and programs that will maximize individuals' success by capitalizing on their current skills, motivations, and the skills they hope to gain.

References:

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Pedersen PM, Vinter K, & Olsen TS (2001). Improvement of oral naming by unsupervised computerized rehabilitation. Aphasiology, 15, 151-169.

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Ramsberger G & Marie B (2007). Self-administered cued naming therapy: A single-participant investigation of a computer-based therapy program replicated in four cases. American Journal of Speech-Language Pathology, 16, 343-358.

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Table 1. Participant[1] Demographics and BDAE (Goodglass, Kaplan, & Barresi, 2001) Selected Subtest Scores

Patient Data			Auditory Comprehension				Repetition		Naming				
Patient/ aphasia class'fn	**Age when Tested**	**Time Post Onset when Tested**	**Aud. Comp. (mean of 3 %iles)**	**Word Discrim.**	**Commands**	**Complex Ideat'l. Material**	**Single Word Rep'tn.**	**Sentences**	**(BNT) Visual Confront. Naming**	**Responsive Naming**	**Animals**	**Tools**	**Actions**
	Maximum score:			***37***	***15***	***12***	***10***	***10***	***60***	***20***	***12***	***12***	***12***
ACL/ mod-to-severe Wern'k	**58**	**7 yrs.**	**18th**	**29.5**	**10**	**3**	**6**	**0**	**23**	**4**	**6**	**5**	**6**
MCR/ mod-to-severe anomia	**70**	**12 mos.**	**82nd**	**36.5**	**15**	**9**	**10**	**7**	**37**	**12**	**10**	**4**	**6**
NWS/ mod anomia	**67**	**24 mos.**	**72nd**	**36.5**	**13**	**10**	**8**	**7**	**47**	**15**	**11**	**8**	**9**
PBS/ severe anomia	**80**	**17 mos.**	**33rd**	**32**	**10**	**7**	**6**	**4**	**43**	**15**	**10**	**5**	**7**
SSM/ mild anomia	**63**	**25 mos.**	**83rd**	**36**	**15**	**10**	**10**	**9**	**48**	**20**	**10**	**9**	**10**
TJN/ mod-to-severe Broca	55	19 mos.	25th	34	6	4	9	3	12	6	12	3	3
VKR/ mod Wern'k	63	8 mos.	31st	30.5	9	8	8	2	41	13	10	8	9
QDN/ mod-to-severe anomia	78	8 mos.	62nd	33	14	10	7	2	42	18	7	7	9

1 Subjects included in the HP study are in bold type

Table 2. Participant Practice Time

Participant	Daily Average	Weekly Average	Monthly Average
ACL	0:22:10	2:06:58	9:53:22
MCR	0:10:24	1:06:32	4:51:18
NWS	0:22:11	2:21:46	9:36:33
PBS	0:20:10	2:27:07	9:36:09
SSM	N/A	N/A	N/A
Total:	0:18:12	2:00:34	8:29:20

Figure 1. ACL

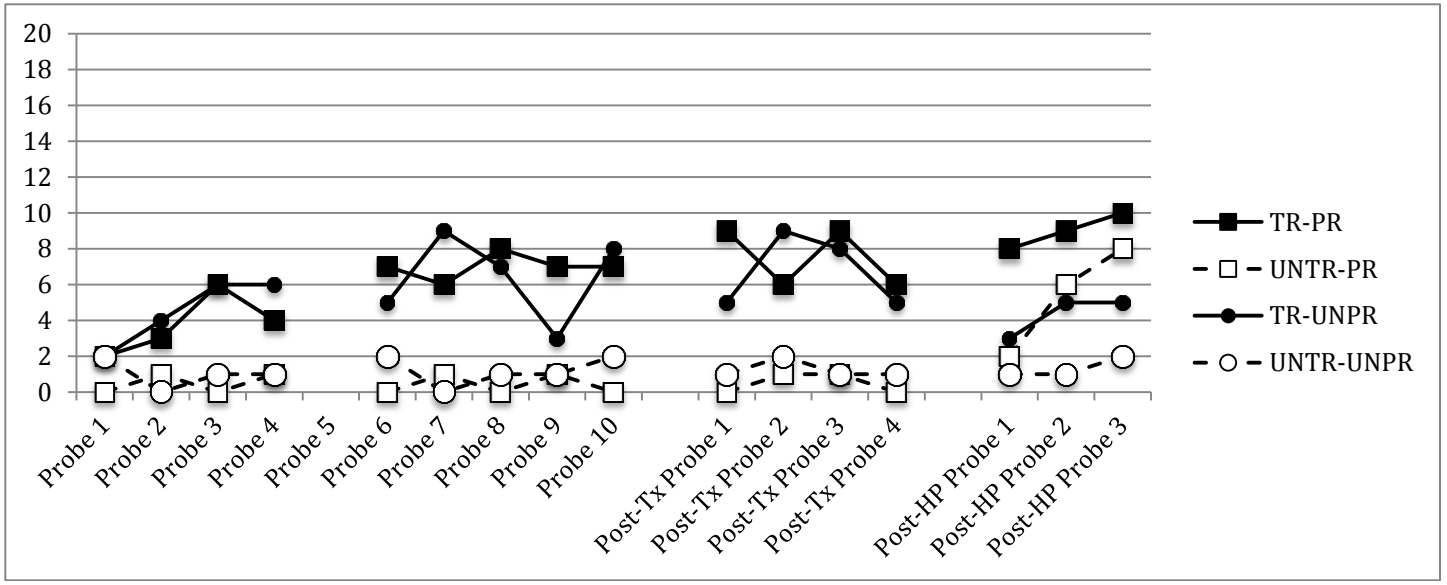
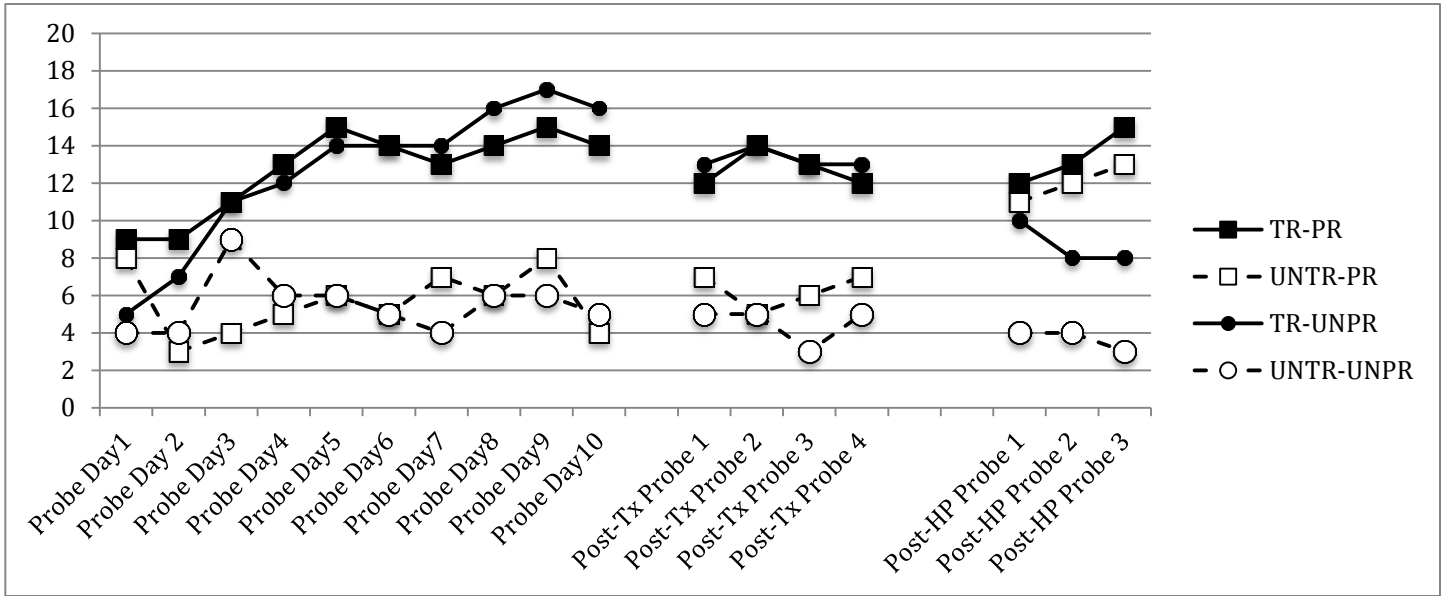


Figure 2. MCR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Post-Tx Probe 1
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TR-PR
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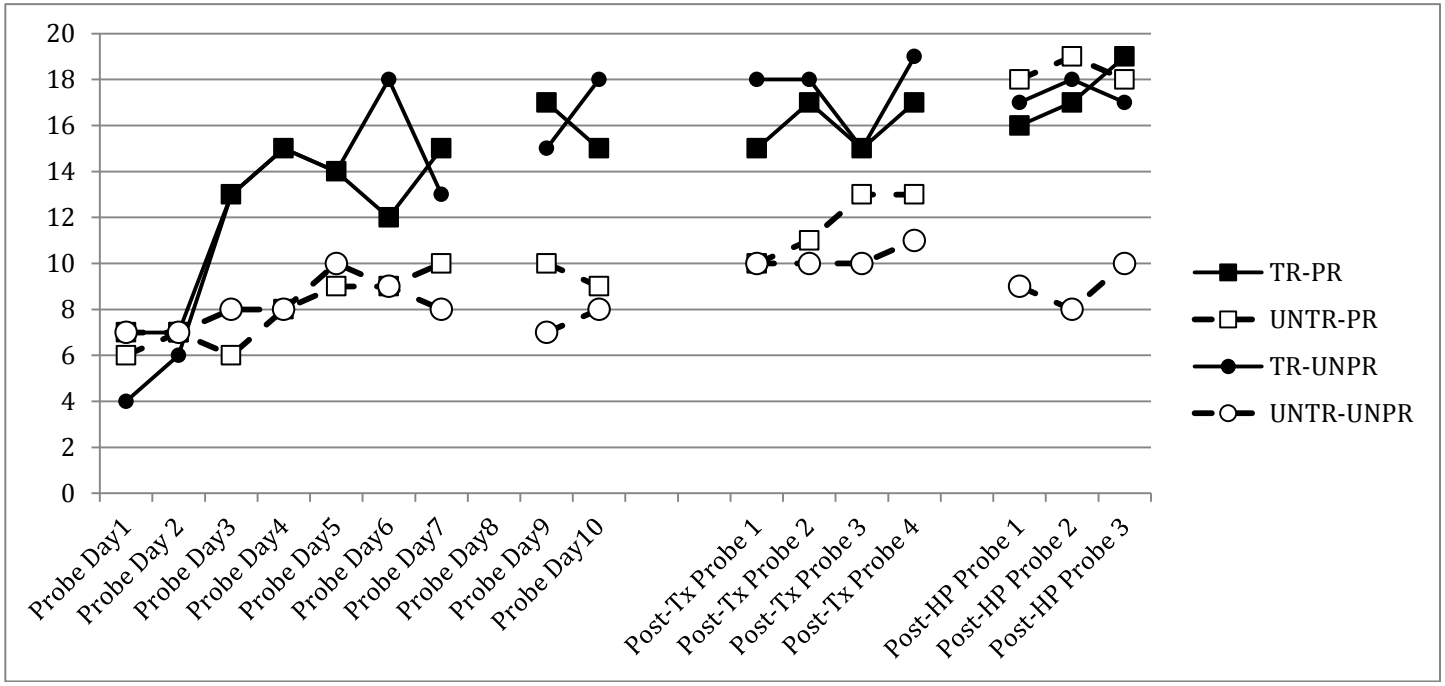
Figure 3. NWS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Post-Tx Probe 3
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Figure 4. PBS

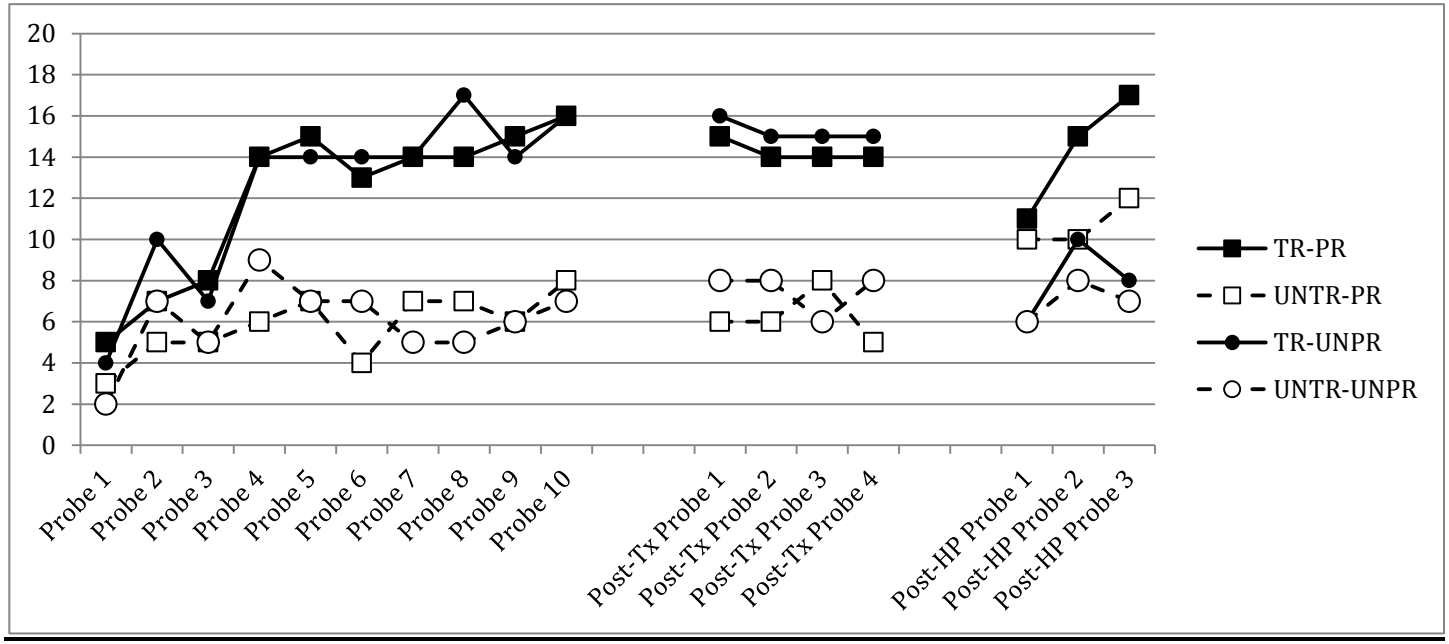
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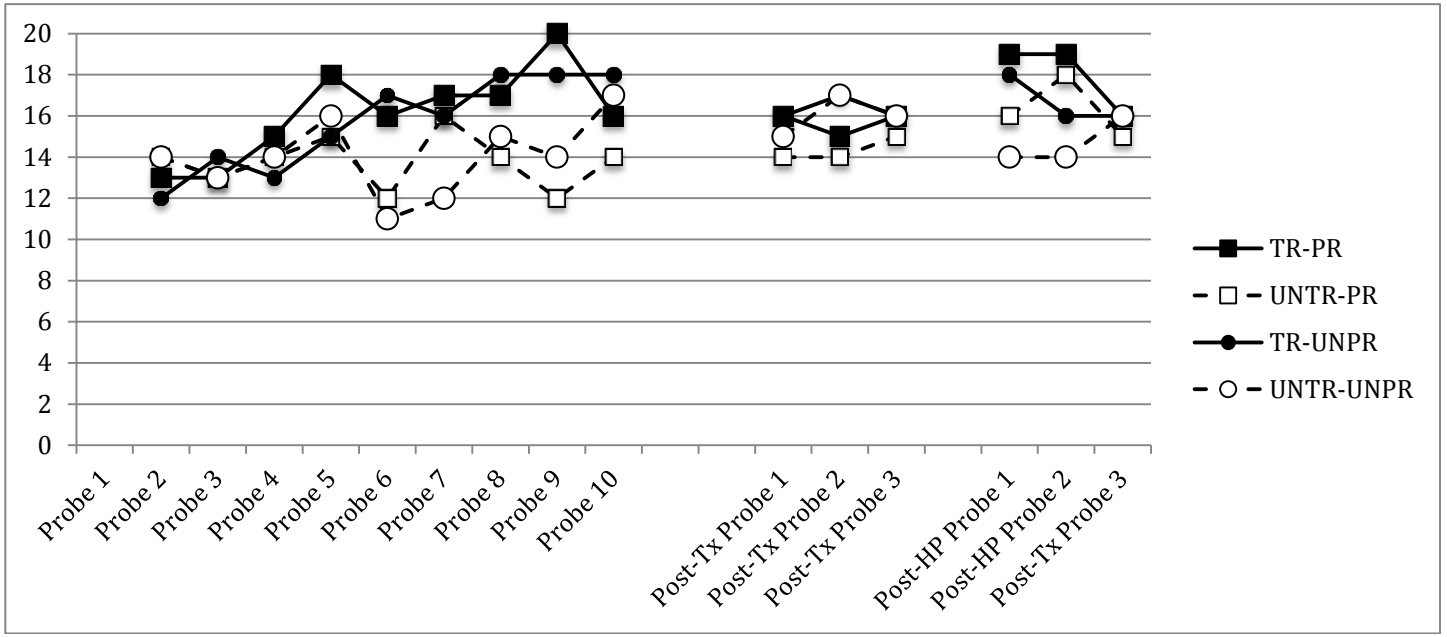
Figure 5. SSM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