Impact of Personalization on Acquisition and Generalization of Script Training: A Preliminary Analysis

Abstract

Eight individuals with chronic aphasia underwent intensive computer-based script training. Trained and untrained generalization scripts, matched for length and complexity, were developed. The two scripts shared personalized and non-personalized words/phrases. Training lasted three weeks. Script performance was probed periodically. For acquisition, the gain from baseline to post-treatment for both personalized and non-personalized words/phrases on the trained script was significant; the effect size of personalization over non-personalization was moderate. For generalization, the gain for both personalized and non-personalized items was also significant, but the effect size of personalization over non-personalization was small. Limitations of the study are discussed.

Summary

A growing body of evidence supports script training in aphasia (Bilda, 2011; Cherney, Halper, Holland, & Cole, 2008; Cherney, Halper, & Kaye, 2011; Goldberg, Haley, & Jacks, 2012; Lee, Kaye, & Cherney, 2009; Youmans, Holland, Munoz, & Bourgeois, 2005). The rationale for script training is derived from the instance theory of automatization (Logan, 1988), which suggests that automaticity of skills is achieved by retrieving memories of complete, context-bound, skilled performances. These memories are formed by repeatedly practicing a particular task. The goal is for persons with aphasia (PWAs) to achieve "islands of automatic speech" that can be produced fluently for use in real-life discourse (Youmans et al., 2005).

Reports of script training emphasize the importance of personalization -- individualizing script content to the PWA – because it has been assumed that personally relevant scripts are more engaging and motivating for participants (Cherney et al., 2008). However, there is no evidence that personalization results in more successful acquisition of script content or generalization to other contexts.

Previous research indicates that PWAs successfully acquire trained conversational scripts but, generalization is more limited and variable (Youmans et al, 2005). However, participants have reported generalization of words/phrases trained within a script to novel contexts, such as a restaurant or the gym (Cherney, Halper, & Kaye, 2011). It is possible that words/phrases used in novel contexts are those that are personally relevant to the PWA.

This study examined the role of personalization in the acquisition of words/ phrases within a trained script, as well as their generalization to an untrained context. Our research addressed the following questions:

Question 1

Are personalized words/phrases acquired more successfully than non-personalized words/phrases in a trained conversational script?

Question 2a

Do personalized words/phrases trained within a script generalize to an untrained context?

Question 2b

Is there better generalization to an untrained context for personalized versus non-personalized words/phrases?

Method

Participants

Eight individuals with chronic aphasia due to a left-hemisphere stroke participated. Table 1 shows their demographic data and aphasia severity.

Treatment

Treatment was provided using a computer program, *AphasiaScripts*^{TM}. An anthropomorphically accurate "virtual therapist" interactively guided the treatment, thereby ensuring treatment fidelity by removing clinician-related variables (e.g., expertise and personality.) The treatment software has experimental support regarding its efficacy (Lee et al, 2009).

Script training occurred six days a week with PWAs practicing for three 30-minute sessions per day at home for three weeks. The trained script was written on the screen and spoken by the virtual therapist, who also visually modeled accurate pronunciation. PWAs practiced the trained script with repetitive choral and independent oral reading.

Scripts

We developed two scripts of equal length, readability, and grammatical complexity for each PWA. Both scripts consisted of dialogues of ten turns, with the PWA as the responder in each turn. Although scripts differed in content and theme, some words and phrases were shared by both scripts. PWAs were offered four options for stating a personal choice (e.g., favorite food), and these choices were inserted into both the trained and untrained scripts. Four non-personalized words or phrases, considered both common and useful, were also inserted into both the trained and untrained scripts.

Figure 1 shows a pair of trained (ordering in a restaurant) and untrained (cooking) scripts. Both contain the same four personalized items and the same four non-personalized items. The untrained script was used to assess generalization of trained items to a different context.

Probes

During probe sessions, the lines of the script appeared on the screen and the PWA was required to read them aloud without any cues from the digital therapist. Trained and untrained scripts were probed three times at baseline, and once at the end of the three-week treatment. Trained scripts were also probed twice weekly during the treatment phase.

The outcome measure was percent accuracy of the shared items. Each script-related word was scored on the Naming and Oral Reading for Language in Aphasia (NORLA-6) scale (Gingrich, Hurwitz, Lee, Carpenter, & Cherney, 2013), a 6-point scoring system that ranged from 0 (no response) and 1 (unintelligible or unrelated response) to 5 (accurate and immediate response). Percent accuracy was the NORLA-6 score of each word as a percent of the maximum

accuracy of that word (always 5 points). Percent accuracy scores were averaged for each participant. Mean accuracy scores were then averaged over all eight participants, resulting in baseline and post-treatment accuracy scores for personalized and non-personalized words in both trained and untrained scripts.

The effect size of personalization over non-personalization was computed using Cohen's *d* (Cohen, 1988). Gains from baseline to post-treatment were calculated for each PWA. To obtain *d*, the difference between mean gains of personalized and non-personalized items was divided by their pooled standard deviation.

Results

Question 1

Are personalized words and phrases acquired more successfully than non-personalized words and phrases in a trained conversational script?

Figure 2 shows percent accuracy of trained items at baseline and post-treatment in the trained scripts. Paired, one-tailed t-tests indicated a significant gain from baseline to post-treatment for both personalized words/phrases (from 52.2 to 83.8 percent accuracy, $p<.0005$) and non-personalized words/phrases (from 48.3 to 73.0 percent accuracy, $p<.001$).

The effect size (Cohen's *d*) of personalized items over non-personalized items was .71, which is considered to be a moderate to large effect.

Question 2a

Do personalized words and phrases trained within a script generalize to an untrained context?

Figure 3 shows percent accuracy of personalized and non-personalized items that were trained and probed in the untrained generalization script. There was a significant gain for trained personalized items on the untrained script (from 54.8 to 67.2 percent accuracy, $p < .05$ on a one-tailed paired t-test).

Question 2b

Is there better generalization to an untrained context for personalized versus non-personalized words and phrases?

There was also a significant gain for trained non-personalized items on the untrained script (from 49.6 to 58.5 percent, $p< .05$). Effect size (Cohen's *d)* of personalized items over non-personalized items was .19, which is considered a small effect size.

Discussion

Recent studies of conversational script training in aphasia have frequently used personalized content. This preliminary study examined the impact of personalization on the acquisition and generalization of scripts.

Consistent with previous research, PWAs acquired both personalized and non-personalized items following three weeks of script training. There was also significant but less consistent generalization of both personalized and non-personalized trained items to an untrained script. The impact of personalization was greater during acquisition than during generalization

Clinically, these findings suggest that personalization during script training should be considered. However, a larger sample size is warranted to confirm our findings. Furthermore,

generalization was assessed via oral reading on an untrained script that represented a new context. It would be worthwhile to explore whether generalization to spontaneous speech in a real-life context is affected by personalization. Further discussion of script personalization and implications for clinical practice will be addressed.

Acknowledgement

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Table 1

Participant Characteristics

Participant	Age (years)	Gender	Handedness	TPO (months)	Education (years)	WAB AQ	Aphasia Type
ABEJO	51.8	M	R	48	16	68.8	NonFluent
AMBDE	61.6	M	R	21	11	74.5	Fluent
PIESH	66.4	F	R	59	14	67.6	NonFluent
WELED	64.5	M	R	37	14	80.1	NonFluent
CAVCH	25	F	L	13	13	54.4	NonFluent
SMIDA	44.5	M	R	8	18	28.1	NonFluent
SMISC	59.3	M	L	10	16	35.2	NonFluent
STEOM	42.9	M	R	15	12	55	NonFluent

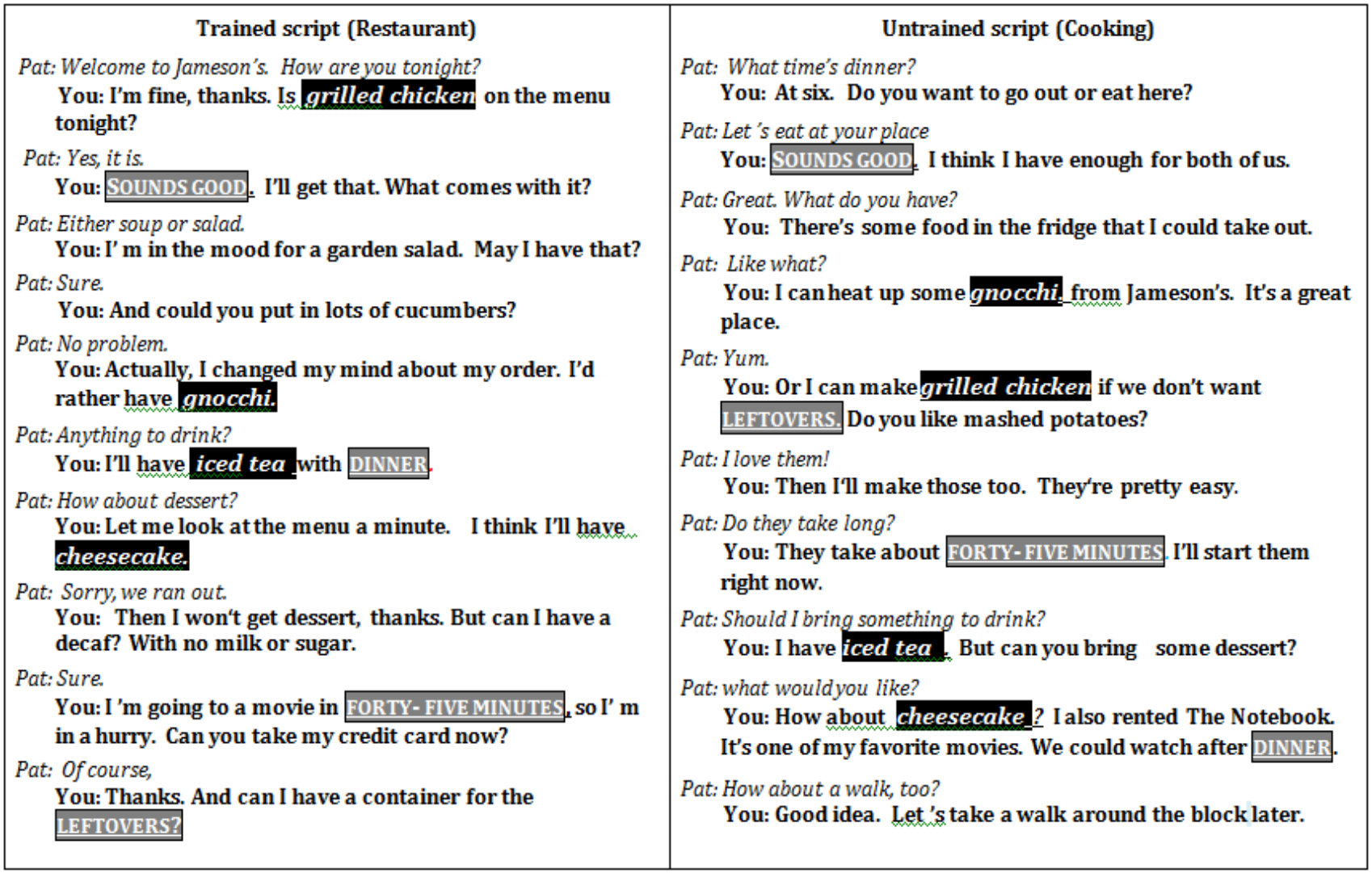

Figure 1. Sample of paired trained and untrained scripts. Four personalized and four non-personalized words and phrases are shared between the scripts. The personalized choices are: ***grilled chicken***, ***gnocchi***, ***iced tea***, ***cheesecake***. The non-personalized choices are: SOUNDS GOOD, DINNER, FORTY-FIVE MINUTES, LEFTOVERS.

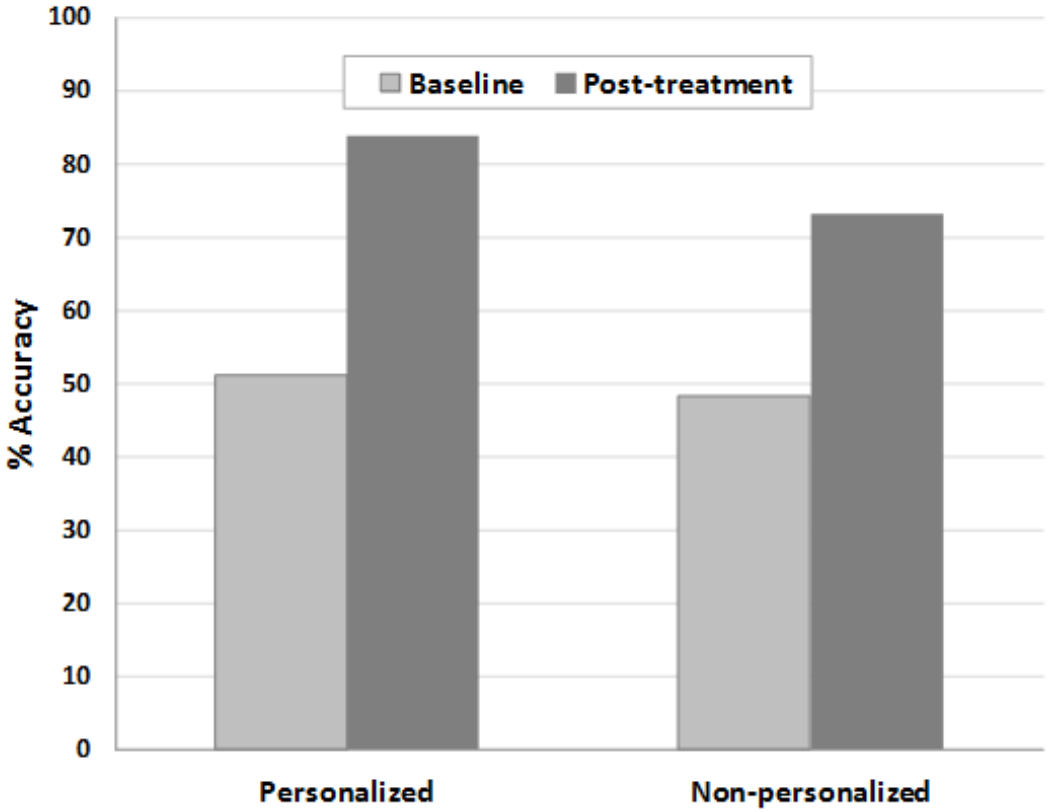

Figure 2. Acquisition of personalized and non-personalized words and phrases in trained scripts. Trained items were scored for percent accuracy in the trained scripts probes at baseline and post-treatment.

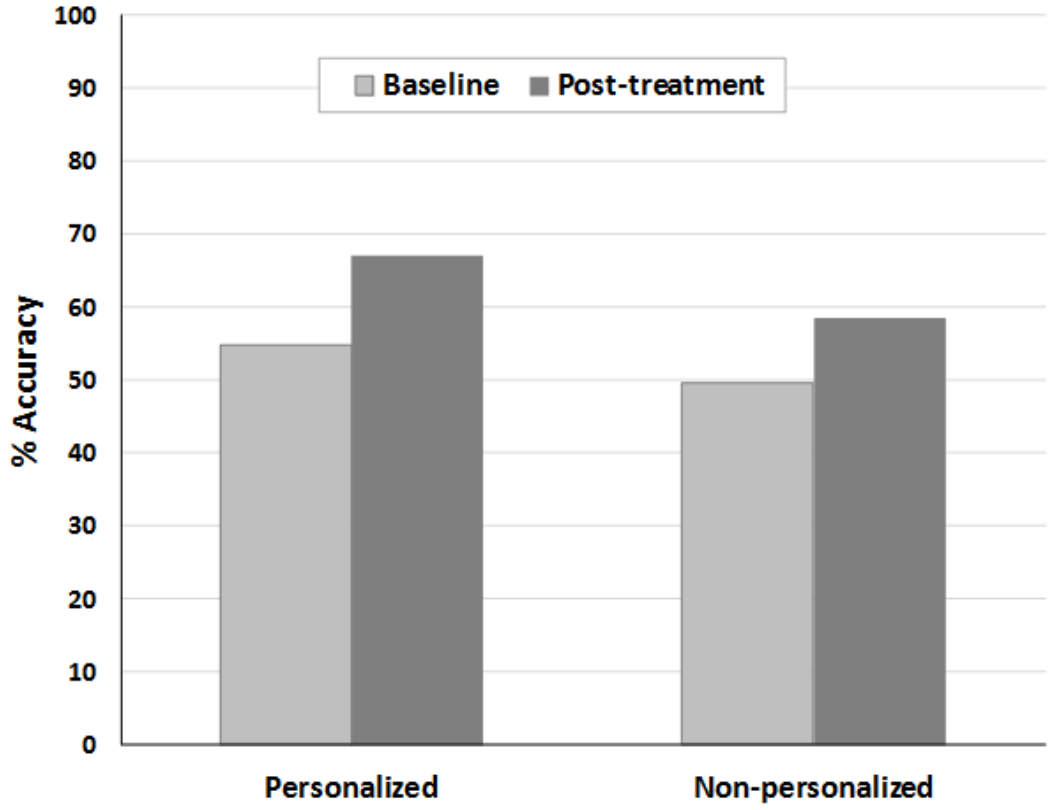

Figure 3. Generalization of personalized and non-personalized words and phrases to untrained scripts. Trained items were scored for percent accuracy in the untrained script probes at baseline and post-treatment.