

## Script Training and Automaticity in Two Individuals with Aphasia

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## The Effortful Struggle of Aphasia

- In normal speech, processes such as articulation and phonological encoding occur without effort or conscious attention; automatically (Levelt, 1989).
- Automatic processes are like pre-programmed skills: they are performed without effort, rapidly, consistently, and accurately (Logan, 1988).
- For many individuals with aphasia, speaking is an effortful struggle to find and produce words to convey their ideas. **Language production is no longer Automatic.**

## Current Treatment Approaches

- Traditional, Component Skill-Based aphasia therapy: focus is on repetitive drilling of component language skills such as naming or grammatical rule use.
- Functional aphasia therapy: focus is on versatile communication of whole messages in natural communication contexts.
- Although these approaches may indirectly facilitate some re-acquisition of automatic speech, neither concentrates specifically on reintroducing automaticity to the speech production of aphasic individuals.

## Overview of Script Training

- Focus is on re-injecting islands of automatic language production into speech of individuals with aphasia.
- Short scripts are mastered through repetitive drilling, until they are produced automatically: without apparent effort or struggle, consistently, and with few errors.
- Scripts are practiced in conversational contexts with multiple partners to promote generalization and use.
- Primarily a Functional approach to therapy
  - Client centered
  - Performed in natural, conversation context
  - Scripts practiced as whole tasks, not broken into component language skills
- Also incorporates massed, repetitive drilling common to Traditional, Component Skill-Based therapies.

## Script Training Procedure

1. Client and clinician select script topic, and work together to write a short script on the identified topic.
2. Script is broken into short phrases or sentences for script learning; phrases are written on individual cue cards (if written cues are helpful to client).
3. Sessions of ~ 30 - 45min., 2-3 times per week begin. Client practices with tape recording at home at least 15 minutes per day.
4. Script is trained in therapy one phrase at a time, using an established cuing hierarchy. Script is practiced in a cumulative fashion, as each script phrase is successively mastered.
5. Mastered scripts are generalized to novel conversation partners and practiced in functional situations.

### • Cuing Hierarchy for Training:

1. Client immediately repeats phrase.
  2. Client reads phrase aloud from cue card.
  3. Client repeats phrase in unison with clinician, with cue card in place; clinician gradually fades participation.
  4. Client independently repeats phrase with cue card in place, 10-15 times.
  5. Client independently repeats phrase ~20 times, without written cue card.
- All errors are immediately corrected. With any significant signs of struggle, the cuing hierarchy is implemented at level of support needed for success.
  - Client is never allowed to struggle for more than ~2 seconds before verbal or written cue is given. This helps prevent incorrect productions from being learned.

- Throughout script training, **verbatim repetition** is practiced, and verbatim repetition from memory is the standard for mastery.
- **Mastery for script learning:** When client correctly produces at least 95% of the portion of script material currently being trained at initiation of session, without cuing, that portion of the script is mastered, and the next phrase / short sentence is added to training.
- **Mastery of Completed Script:** When client independently produces at least 90% of an entire script verbatim, at the beginning of a session, without cuing or feedback, across at least two consecutive sessions, the script is considered to be mastered.

## Single Subject Investigation: Participants

- A single subject, multiple baseline design across behaviors was examined the acquisition of personally relevant scripts for two individuals with language production difficulty due to aphasia.
1. **MN:** 43 year-old female with chronic Broca's aphasia, WAB Aphasia Quotient of 48.7. Moderate to severely impaired conversational speech, halting, agrammatic, telegraphic.
  2. **FG:** 60 year-old male with chronic Conduction aphasia, WAB Aphasia Quotient of 68.8. Moderately impaired conversational speech, sporadically fluent, compromised by frequent errors and frequent self-corrections.

## Scripts: 3 for each participant

Topics for MN were: 1. Talking about Feelings, 2. Talking about my Day, and 3. Greeting as a Party Hostess

Example of MN script: Party Hostess

"Hi, thank you for coming. What can I get you to drink? We have beer and wine and soda. Please have something to eat."

Topics for FG were: 1. Telling about Childhood in Hawaii, 2. Asking personal "getting to know you" Questions, and 3. Asking for items and prices in a Grocery Store.

Example of FG script: Childhood in Hawaii

"I was born and raised in Hawaii. I grew up in Lanaki. I had to climb fifty-four stairs to get to my house. It was a beautiful view of the island."

## Multiple Baseline Design

- **Baseline:** Data for speech production on each script topic were taken for three sessions, at which time stable baselines were observed.
- **Treatment:** Script training began on one topic, while baseline data collection continued for remaining topics.
- As each script was mastered, script training began on another script, until all three scripts had been successively mastered.
- **Script Maintenance and Generalization:** Maintenance data was collected for several sessions following script mastery. Mastered scripts were practiced in conversation with novel partners to promote generalization to functional conversations.

## Data Collection and Analysis

- At the beginning of each session, participants spoke on each script topic, without clinician feedback. All script data was taken from these initial production attempts.
  - Transcripts were coded for the following dependent measures of script acquisition.
1. **% Script Correct:** The primary measure of script acquisition. The number of script words produced, divided by the total number of words in the script, and multiplying by 100.
  2. **Number of Errors:** defined as non-communicative repetitions, filler words, pauses of two seconds or more, and unrecognizable utterances.
  3. **Speaking Rate:** Number of words produced per minute.
    - Thirty percent of transcripts were re-coded for reliability.

## Social Validity

- 9, independent, unfamiliar coders rated script production samples from both participants
- One Baseline and one Maintenance sample was selected for each script, and presented in randomized order to social validity raters
- Raters coded each baseline and each script on three dimensions:
  1. Speaking Rate
  2. Speech Naturalness
  3. Amount of Information
- Paired t-tests, collapsed across scripts, compared Baseline and Maintenance ratings for each participant
- A Bonferonni correction was applied to control for inflation of error rates arising from multiple t-tests

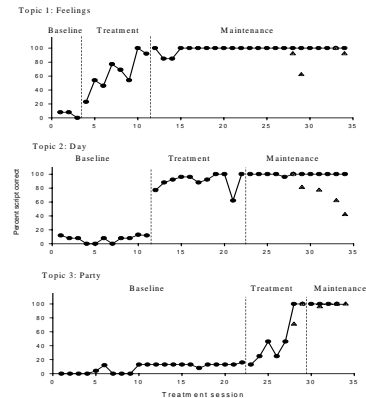
## Script Training Results: % Script Correct

- Scripts were mastered by both participants, and an effect of script training, as measured by the primary dependent measure of % Script Correct, was seen for each script across this multiple baseline design.
- Both participants consistently produced their scripts at 100% accuracy except for script 1 for FG, which was performed consistently at 98% accuracy.
- Number of sessions for mastery of a single script varied from 6 to 11 for MN, and from 5 to 11 for FG.

% Script Correct for MN across the three successive script topics:

1. Talking about Feelings
2. Talking about my Day
3. Party Hostess

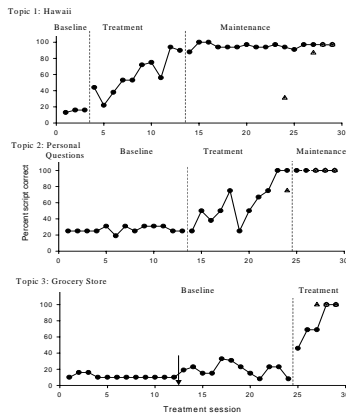
White triangles represent probes for generalization



% Script Correct for FG across the three successive script topics:

1. Childhood in Hawaii
2. Asking Personal Questions
3. Asking for items and prices at the Grocery Store

White triangles represent probes for generalization of scripts to conversation.

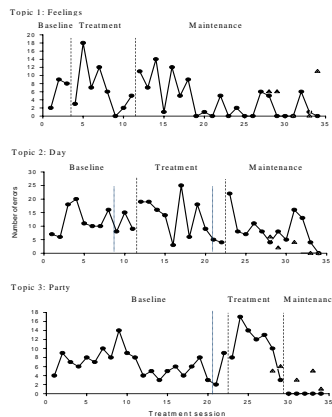


## Script Training Results: Number of Errors

- The number of errors produced as script training progressed was plotted to further describe the process of script learning.
- There was a marked decrease in error production by the end of script maintenance compared to baseline, for all scripts.
  - MN: repeated errorless production of Scripts 1 & 3, one flawless production of script 2.
  - FG: repeated errorless production of scripts 1 & 2. Error production on script 3 was variable.
- However, error production was variable during script learning, and did not decrease consistently with implementation of script training, as did the primary measure of % Script Correct.

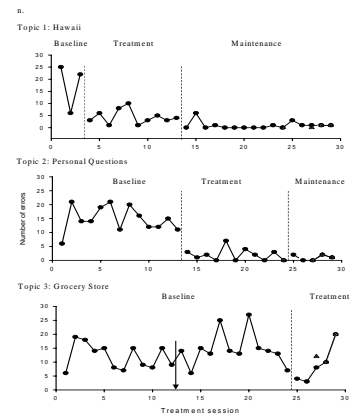
The number of errors produced by MN across sessions for each of the three script topics.

White triangles represent probes for generalization of the script to conversation.



The number of errors produced by FG across sessions for each of the three script topics.

White triangles represent probes for generalization of the script to conversation.

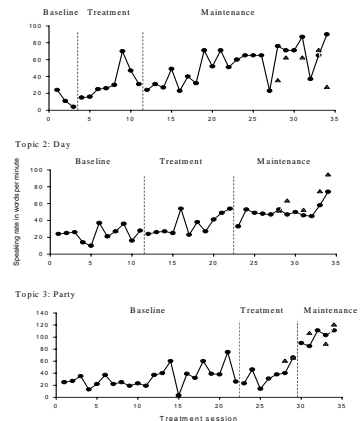


## Script Training Results: Speaking Rate

- Speaking rates increased dramatically and stabilized across all scripts toward the end of script training and during script maintenance.
- Increases from baseline average speaking rates to the end of script maintenance were...
  - MN: from 13 w/m to 90 w/m for script #1  
: from 24 w/m to 74 w/m for script #2  
: from 32 w/m to 111w/m for script #3
  - FG: from 38 w/m to 93 w/m for script #1  
: from 31 w/m to 91 w/m for script #2  
: from 35 w/m to 80 w/m for script #

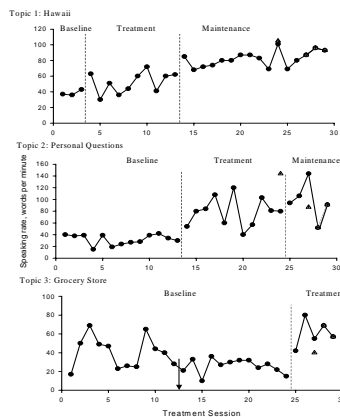
Speaking Rate for MN across sessions for each of the three script topics.

White triangles represent probes for generalization to conversation.



Speaking Rate for FG across sessions for each of the three script topics.

White triangles represent probes for generalization to conversation.



## Results: Generalization

- Probe data was taken during script maintenance for generalization of scripts to flexible conversations with novel conversational partners.
- Script accuracy and rate did tend to decrease during generalization, as conversational demands increased.
- However, all scripts were produced at least one time with 100% accuracy during generalization probes
- Both participants were able to re-organize and combine script elements flexibly during novel conversations.

## Results: Social Validity

- Independent raters coded productions of post-training, Maintenance script productions as more rapid, more natural sounding and more informative than Baseline script productions
- Raters perceived post-training, Maintenance speaking rates as faster than Baseline productions for both MN ( $t = -5.33$ ;  $p < 0.001$ ) and FG ( $t = -2.60$ ;  $p = 0.015$ )
- Raters perceived Maintenance script productions as more natural sounding than Baseline productions for both MN ( $t = -8.32$ ;  $p < 0.001$ ) and FG ( $t = -2.92$ ;  $p = 0.007$ )
- Raters coded information content for Maintenance script productions as significantly higher than Baseline productions for both MN ( $t = -8.53$ ;  $p < 0.001$ ) and FG ( $t = -4.60$ ;  $p < 0.001$ )

## Effectiveness of Script Training

- These results suggest that script training may be an effective treatment for individuals with expressive speech impairment due to aphasia.
- Training, as predicted, resulted in acquisition of specific islands of automatic speech that could be produced on a specific topic with a limited degree of flexibility.
- Script productions improved from a halting, ineffective, obviously impaired style at baseline to fluid, competent speech, produced flexibly in conversation.
- Script training is Practical: Time for mastery ranged from 5 to 11 sessions per script, with approximately 2 to 3 additional sessions for specific generalization practice in conversation with novel partners.

## Automaticity of Scripts

- As skills become automatic, performance becomes **rapid**, **relatively errorless**, and **stable** (Segalowitz 1993).
  - Scripts were produced **rapidly**: all mastered scripts were produced at dramatically increased speaking rates.
  - All mastered scripts were produced **flawlessly**, or with very few errors.
  - Script performances **stabilized** across productions as scripts were mastered.
  - Mastered scripts were generally produced with relative ease, without effort or struggle. This also suggests that scripts productions were automatic.

## Appropriateness/ Limitations of Script Training

- Script training is not expected to generalize widely or to improve overall communication across topics, nor does it appear to do so.
- Script training focuses on relatively normal, automatic speech production on a specific topic. It is appropriate for individuals who desire to speak relatively normally, on a certain topic, or in a certain social situation, that is very important to them personally.
- Script training does not focus on functional, but obviously impaired communication of a message using any means possible. Many individuals may wish to focus on functional, widely generalizable compensatory strategies, rather than honing their verbal ability on a specific, personally relevant topic.

## Strengths of Script Training

- The emphasis on a return to relatively natural verbal communication, even within a very limited context, may be very valuable to many individuals with aphasia. It is often important to be able to speak effectively on certain, specific, personally relevant topics.
- Script training may be particularly valuable when used in combination with more broadly oriented Functional and/or Component Skill-Based language therapies that focus on broad generalization of component skills or communication strategies.

## Future Directions

- This study was an initial description of and investigation of a script training approach to aphasia treatment.
- Future research might explore the most effective amount and type of generalization practice necessary to promote flexible use of scripts in conversation.
- Future research might investigate script training for individuals with various aphasia profiles.
- Future research might also explore the resiliency of script training across time, and determine any need for maintenance schedules to ensure retention of script learning and script automaticity.