Conversational script performance in adults with non-fluent aphasia: Treatment intensity and aphasia severity

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Background: A growing body of research in aphasia treatment has indicated that greater amount and intensity of treatment is associated with better outcomes in individuals with chronic aphasia. AphasiaScripts™ is a computerised conversational script training program that simultaneously collects accurate, reliable data about amount and intensity of treatment.

Aims: The purpose of this study was first to investigate the relationship between amount of treatment and improvement on conversational script performance in persons with chronic non-fluent aphasia, and second to investigate the influence of severity of language impairment on this relationship.

Methods & Procedures: We collected computer-generated treatment data from 17 participants with chronic non-fluent aphasia during the 9-week AphasiaScripts™ treatment protocol. Participants practised three individualised conversational scripts for 3 weeks each. We computed two measures of outcome performance: percent change in script content (script-related words) and percent change in rate (script-related words per minute).

Outcomes & Results: Amount of treatment varied greatly, from 1.9 to 16.9 hours per week. Amount of treatment was significantly correlated with percent change in script content ($r = .67, p < .01$) and rate ($r = .53, p < .05$), after an outlier was removed from the analyses. Severity of aphasia, measured by the Western Aphasia Battery Aphasia Quotient (WAB AQ), was negatively correlated with amount of treatment. When the sample was divided into two severity groups based on WAB AQ scores, amount of treatment was significantly correlated with improvement in content in participants with more severe aphasia, and significantly correlated with improvement in rate in participants with less severe aphasia.
Conclusions: Results are consistent with previous studies that support the relationship between aphasia treatment intensity and outcomes. Severity of aphasia and individual participants’ characteristics also impact the relationship between intensity and improvement. Individual participants’ treatment trends and characteristics of participants who benefit the most from conversational script training are discussed.

Keywords: Aphasia; Intensity; Rehabilitation; Script training; Computer treatment; Severity.

A growing body of research in aphasia treatment has indicated that more intense treatment results in better outcomes. For example, in a meta-analysis of 55 studies Robey (1998) demonstrated that the more intensive the therapy (i.e., more treatment hours per week), the greater the improvement. A retrospective analysis by Bhogal, Teasell, and Speechley (2003) supported the efficacy of more intensive aphasia therapy. Of 10 studies they examined, the 5 that had a significant treatment effect provided an average of 8.8 hours of treatment per week for an average of 11.2 weeks. The five studies without positive outcomes provided only approximately 2 hours of therapy per week for 22.9 weeks. Furthermore, number of treatment hours per week was significantly correlated with improvement on the language outcome measures. Several empirical studies have also shown intensive speech language therapy to be associated with significant improvements, but they have not directly compared more or less intensity within the same treatment (Mackenzie, 1991; Meinzer, Djundaja, Barthel, Elbert, & Rockstroh, 2005; Pulvermuller et al., 2001).

More recently, in a systematic review of the literature focusing on treatment intensity, Cherney, Patterson, Raymer, Frymark, and Schooling (2008b) identified only five studies that directly evaluated treatment intensity in chronic aphasia. These included a retrospective pre–post analysis of 40 participants that demonstrated greater improvements in naming skills over 6–8 weeks after intensive (23 times per week) compared to non-intensive (less than 3 times per week) aphasia therapy (Hinckley & Craig, 1998). Another study compared three pairs of participants matched in type and severity of aphasia, as well as demographic characteristics (Basso & Caporalì, 2001). All participants improved, but the three in each pair who received more intensive treatment (3–4 hours per day for 14–40 months) achieved higher test scores and made better use of language in daily life than those who received less intensive treatment (1 hour per day for 6–22 months). Cherney et al. (2008b) concluded that there is modest evidence for the efficacy of more intensive treatment of chronic aphasia. In summary, there have been a growing number of studies demonstrating that greater intensity of treatment is associated with greater improvement in individuals with chronic aphasia; however, they have either been retrospective or compared intensity levels between dissimilar treatments.

Severity of aphasia has also been investigated as a predictor of language outcome, with greater severity related to poorer outcome (Pedersen, Vinter, & Olsen, 2004). Research has demonstrated that initial severity of aphasia is a better predictor of outcome than any other factor, such as age, sex, or side of lesion (Kertesz & McCabe, 1977; Pedersen, Jorgensen, Nakayama, Raaschou, & Olsen, 1995). Furthermore, severity of aphasia is known to negatively influence recovery outcome in the presence of treatment. In Basso, Capitani, and Vignolo’s (1979) retrospective study of 281 patients, although rehabilitation had a significant positive effect on improvement in language skills, significantly fewer individuals with severe aphasia...
showed improvement than individuals with only moderate aphasia. While research studies have shown that both treatment intensity and severity of aphasia impact language outcomes, studies have not addressed both these variables together.

Therapy delivered via the computer can provide intensive treatment and the opportunity to collect accurate, reliable data about amount and intensity of treatment. A well-documented body of literature supports the positive effects of delivering computerised treatment to individuals with aphasia (e.g., Katz, 2001; Loverso, Prescott, & Selinger, 1992; Petheram, 2004). Several studies have also confirmed that people with aphasia are able to use computers independently with minimal therapist intervention (e.g., Katz & Wertz, 1997; Mortley, Wade, & Enderby, 2004; Pederson, Vinter, & Olsen, 2001).

Research evaluating AphasiaScripts™, a computerised conversational script training program, is currently underway at the Rehabilitation Institute of Chicago’s Center for Aphasia Research and Treatment. Initial results from this research have shown AphasiaScripts™ to be efficacious (Cherney, Halper, Holland, & Cole, 2008a; Cherney et al., 2007). In the study, participants were instructed to practise for at least 30 minutes per day; however, the computer-generated treatment data indicated great variability in the amount of time they actually practised over a 9-week period. The varying treatment amounts, self-selected by participants, created an opportunity for a secondary analysis focused on exploring the relationship between intensity of treatment and outcome. In this study, amount and intensity of treatment are synonymous because the 9-week treatment period was consistent for all participants. The purpose of this article is to investigate, for the first 17 participants with chronic non-fluent aphasia, the relationship between three variables: amount of treatment, severity of aphasia, and improvement on conversational script performance. Specifically, we address the following questions:

1. Is there a relationship between amount of treatment and amount of improvement on conversational script measures of content and rate?
2. Does severity of aphasia, as measured by the Western Aphasia Battery (Kertesz, 1982) Aphasia Quotient (WAB AQ), impact the relationship between amount of treatment and amount of improvement on conversational script performance?
   a) Is severity of aphasia related to amount of treatment?
   b) Is severity of aphasia related to amount of improvement on conversational script performance?
   c) Does the relationship between amount of treatment and improvement differ when the aphasia is more versus less severe?

**METHOD**

**Participants**

A total of 17 individuals (8 males, 9 females) with chronic non-fluent aphasia and apraxia of speech participated in the study (see Table 1). All participants presented with aphasia subsequent to a single left-hemisphere stroke as determined by history and physician report. All but one were right-hand dominant prior to their stroke. None had any history of other pre-morbid neurological disorders. Participants had at least a tenth-grade education and literacy in English prior to their strokes. Age ranged from 31 to 70 years old, with a mean of 53.3 (SD=12.7) years. The mean time
post onset of stroke was 65.8 (SD=67.0) months, with a range of 10.6 to 273.7 months. The mean WAB AQ score was 65.1 (SD=15.3), with a range of 30.5 to 85.3. All participants provided written informed consent under the approval of the Northwestern University Institutional Review Board.

### Procedure

The intervention lasted approximately 12 weeks and included a 2- to 3-week pre-treatment phase dedicated to script development and a 9-week treatment phase during which participants received computerised conversational script training.

**Pre-treatment phase.** Two to three weeks before beginning the computerised conversational script training, the speech-language pathologist met with participants and caregivers to develop three individualised scripts. Scripts were co-developed from topics of interest and situations in which participants expressed a desire for more effective communication, such as ordering in a restaurant, making a doctor’s appointment, or talking to grandchildren. Scripts included monologues and dialogues; in some dialogues the person with aphasia was the initiator of each conversational turn, while in other dialogues he or she was the responder. Script length and complexity were individualised to each participant’s level. For example, for the participant with the most severe aphasia (WAB AQ 30.5), number of target words ranged from 40 to 50 and number of turns were limited to eight or nine. For participants with less severe aphasia (WAB AQ 76.8 to 85.3) number of target words ranged from 96 to 141 and scripts included 10 longer conversational turns. After
script development was complete, they were recorded onto a laptop computer, which was loaned to the participant for home treatment.

**Computer treatment phase.** Participants received a total of 9 weeks of computerised conversational script treatment provided via AphasiaScripts™. The AphasiaScripts™ program uses an animated agent that is programmed to produce natural speech with correct movements of the speech articulators and serves as the virtual therapist or conversational partner (Cherney et al., 2008a).

AphasiaScripts™ allows the person with aphasia to repeatedly practise pre-recorded individualised scripts while using varying degrees of support. Conversational script treatment has three phases: First, individuals with aphasia listen silently to the whole conversation; second, participants practise each sentence of their conversational turn repeatedly; and third, the entire conversation is rehearsed in turn-taking with the virtual therapist. As the person with aphasia masters the script, he or she can remove the cues one by one, so that eventually practice is accomplished with the animated agent in a situation that simulates real conversation. Supports that can be used or removed by the participant include highlighting of the written word, presence of the entire written sentence, observation of the virtual therapist’s corresponding oral movements, and auditory cues from choral speaking of the sentence. Participants can also practice repeating individual words within a sentence. Participants’ utterances are recorded by the computer so they have an opportunity to play back and listen to their utterances.

The AphasiaScripts™ program offers those with aphasia control over their own treatment sessions. Clients can choose to practise individual words, sentences, or their entire conversational script as often as they wish. They can designate and track desired treatment time with a visual timer in the bottom corner of the screen. In addition, the program can be paused at any time to allow for short breaks.

**Data collection**

Participants met with the speech-language pathologist once a week to ensure that treatment was proceeding correctly and to take weekly probes.

**Amount of treatment.** Each script was practised for 3 weeks, so that the entire treatment period was 9 weeks. The computer program automatically provided a daily log of the amount of time spent by the participant in each phase of treatment. Figure 1 is an example of the log from one treatment session. For this particular session, ARCMI spent about 1 minute listening to the conversational script, i.e.

![Figure 1. Computer generated sample practice log.](image-url)
“Whole Conversation”, 38:47 minutes on “Sentence Practice”, and 16:52 minutes in “Conversation Practice”.

The computer-generated treatment log for each session also differentiates the amount of time the participant was logged into the program and the amount of that time he or she was actually on task (“Time on Task”) and not paused. The participants’ active engagement in the treatment task is assured because they are required to push the space bar to advance to the next sentence or phase.

The program also generated a weekly summary of participants’ practice, as illustrated by Figure 2. We summed the weekly “Time on Task”, recorded in minutes, across the 9 weeks of treatment for each participant and converted it into hours to get total treatment hours.

Reliability measures were not obtained for the computer-generated measures of time spent using the AphasiaScripts™ program; however, initial testing of the computer program during its development indicated that the logs reliably capture “Time on Task”.

Amount of improvement. Amount of improvement was calculated as the change from pre-treatment to post-treatment script performance. These pre- and post-treatment probes were taken with the participant interacting with the actual therapist rather than with the avatar on the computer. For each script, three baseline probes were taken prior to treatment and one post-treatment probe was taken after 3 weeks of computer treatment. Recordings of script performance during the baseline and post-treatment probe sessions were later transcribed and timed. Scripts were then scored for two measures of script performance: CONTENT was defined as the percent of all words said by the participant that were in the target script; RATE was defined as the number of these script-related words per minute. Inter-rater reliability for script scoring was established in a prior study; measures of content and rate were 96% reliable (Cherney et al., 2008a).

Baseline to post-treatment changes in both content and rate were separately calculated as a percent of the baseline, i.e., the difference between post-treatment and mean baseline performance divided by mean baseline performance.

$$\text{Percent change} = \frac{\text{post-treatment score} - \text{mean baseline score}}{\text{mean baseline score}}$$

Each individual script, then, received two measures of change: one for content and one for rate. The content measures of the three scripts were averaged, as were
the rate measures, to get two mean change measures for each participant (one for content, one for rate).

Severity of aphasia. As noted earlier, severity of aphasia was determined by the Aphasia Quotient on the Western Aphasia Battery, administered before the script development phase began.

Data analysis

Question 1: Does amount of treatment correlate with amount of improvement on conversational script measures of content and rate? Pearson product–moment correlations were calculated for total treatment hours and mean change in content and rate.

Question 2a: Is severity of aphasia related to amount of treatment? Pearson product–moment correlations were calculated for WAB AQ scores and total treatment hours.

Question 2b: Is severity of aphasia, as measured by WAB AQ, related to amount of improvement on conversational script performance? Pearson product–moment correlations were calculated for WAB AQ scores and mean change in content and rate.

Question 2c: Does the relationship between amount of treatment and improvement differ when the aphasia is more versus less severe? To investigate whether the relationship between amount of treatment and improvement differs according to severity, we divided participants into two groups: those with AQs below the median AQ, 65.6, and those with AQs above the median. For each severity group, Pearson product–moment correlations were calculated for total treatment hours and mean change in content and rate.

RESULTS

The computer-generated treatment logs indicated that the amount of treatment hours for participants varied greatly, from 1.9 to 16.9 hours per week, or an average of 5.8 to 50.6 hours per script. This contrasts with the minimum required treatment time of 30 minutes a day (3.5 hours per week). Treatment times that each participant practised on each script are presented in Table 2.

It is evident that one of the participants (COLPA) practised far more than any of the others. Her total treatment time was 151.85 hours, as contrasted with the median treatment time of 40.60 hours for the 17 participants. This was above the median by over six times the interquartile range, more than enough to identify her as an outlier (Moore & McCabe, 1999). The decision was thus made to eliminate COLPA from all subsequent statistical analyses, since her inclusion would distort the results.

Question 1: Does amount of treatment correlate with amount of improvement on conversational script measures of content and rate? For the 16 participants included in our analysis, after removal of the outlier, mean improvement in content was 45.72% (SD=57.59), with a range of 2.63 and 235.28%; mean improvement in rate was 137.48% (SD=109.53), with a range of −4.02 and 425.67%. The correlation between amount of treatment and improvement was significant for both content (r=.67, p<.01) and rate (r=.53, p<.05). Table 3 shows the improvement in content and rate for each individual participant.
Question 2a: Is severity of aphasia related to amount of treatment? WAB AQ was significantly negatively correlated with amount of treatment ($r = -0.56$, $p < 0.05$) indicating that the lower the WAB AQ score, the more participants practised.

Question 2b: Is severity of aphasia, as measured by WAB AQ, related to amount of improvement on conversational script performance? There was no significant correlation between AQ and improvement in rate. However, there was a significant negative correlation between AQ and improvement in content, indicating that the lower the AQ, the greater the improvement ($r = -0.49$, $p = 0.05$).

Question 2c: Does the relationship between amount of treatment and improvement differ when the aphasia is more versus less severe? Participants were divided into two groups of eight, depending on whether their AQ was below or above the median of 65.6. The lower AQ group had a mean AQ of 53.2 ($SD = 14.4$); the higher AQ group had a mean AQ of 75.4 ($SD = 5.0$). In the lower AQ group, treatment was significantly correlated with improvement in content ($r = 0.79$, $p < 0.05$) but not rate. In the higher AQ group, treatment was significantly correlated with improvement in rate ($r = 0.78$, $p < 0.05$) but not content. That is, for participants with more severe aphasia, amount of treatment was related to an increase in the proportion of words that were script related, but not an increase in the rate at which they were spoken. For participants with less severe aphasia, amount of treatment was related to an
increase in the rate at which script-related words were spoken, but not to the proportion of overall words that were script related.

### DISCUSSION

Determining the optimum amount of treatment is an important component of any aphasia intervention. However, many variables need to be considered, including factors that relate to individual patient characteristics, the type of treatment, and the amount and timing of treatment. Our analysis of conversational script data from 17 individuals with chronic non-fluent aphasia attempted to examine the complex inter-relationship between three components: amount of treatment, severity of aphasia, and outcome.

The first question addressed the relationship between amount of treatment and amount of improvement on conversational script measures. The use of the computer program, AphasiaScripts™, allowed for the automatic and reliable collection of data regarding amount of treatment. Amount of treatment was significantly related to improvement in both measures of content and rate, indicating that the more

### TABLE 3

Percent change in content and rate

<table>
<thead>
<tr>
<th>Participant ID</th>
<th>CONTENT (% of words that are script related)</th>
<th>RATE (script-related words per minute)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMACH</td>
<td>34.53</td>
<td>43.84</td>
</tr>
<tr>
<td>ARCMI</td>
<td>19.48</td>
<td>207.28</td>
</tr>
<tr>
<td>COLPA</td>
<td>22.81</td>
<td>535.23</td>
</tr>
<tr>
<td>COYCH</td>
<td>26.34</td>
<td>213.8</td>
</tr>
<tr>
<td>DOWMI</td>
<td>14.60</td>
<td>156.40</td>
</tr>
<tr>
<td>FITMA</td>
<td>2.63</td>
<td>-4.02</td>
</tr>
<tr>
<td>HEIED</td>
<td>91.12</td>
<td>83.44</td>
</tr>
<tr>
<td>KURAI</td>
<td>71.61</td>
<td>151.81</td>
</tr>
<tr>
<td>LUESH</td>
<td>12.73</td>
<td>65.90</td>
</tr>
<tr>
<td>MANMA</td>
<td>37.03</td>
<td>274.10</td>
</tr>
<tr>
<td>PEACA</td>
<td>88.19</td>
<td>104.88</td>
</tr>
<tr>
<td>PERMA</td>
<td>235.28</td>
<td>425.67</td>
</tr>
<tr>
<td>ROMJI</td>
<td>24.28</td>
<td>195.24</td>
</tr>
<tr>
<td>SCHBA</td>
<td>0.74</td>
<td>25.69</td>
</tr>
<tr>
<td>SCHRO</td>
<td>36.97</td>
<td>31.27</td>
</tr>
<tr>
<td>SIMAN</td>
<td>20.64</td>
<td>93.67</td>
</tr>
<tr>
<td>WILPA</td>
<td>15.38</td>
<td>130.76</td>
</tr>
</tbody>
</table>

n=17

<table>
<thead>
<tr>
<th>CONTENT (% of words that are script related)</th>
<th>RATE (script-related words per minute)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>44.37</td>
</tr>
<tr>
<td>SD</td>
<td>56.04</td>
</tr>
<tr>
<td>Range</td>
<td>2.63–235.28</td>
</tr>
</tbody>
</table>

n=16 without outlier (COLPA)

<table>
<thead>
<tr>
<th>CONTENT (% of words that are script related)</th>
<th>RATE (script-related words per minute)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>45.72</td>
</tr>
<tr>
<td>SD</td>
<td>57.59</td>
</tr>
<tr>
<td>Range</td>
<td>2.63–235.28</td>
</tr>
</tbody>
</table>

Correlation with amount of practice (Pearson product-moment)

*r* = .67, *p* < .01

*r* = .53, *p* < .05
participants practised during the 3 weeks allotted to each individualised script, the greater the improvement in script-related words and script-related words per minute. With more treatment, the participants were able to elicit more content at a faster rate. These findings are consistent with other studies that have shown a relationship between intensity and improvement (Bhogal et al., 2003; Cherney et al., 2008b; Robey, 1998).

The nature of computer therapy, unlike treatment provided only by a speech-language pathologist, is that treatment can be done at home, at the participant’s own convenience and on their own schedule. Although participants were instructed to practise at least 30 minutes per day, they varied widely in how much time they actually chose to spend on the treatment, from less than 2 hours per week to more than 16 hours per week. While increased treatment was related to increased script performance, other factors such as interest in the script or enjoyment of the task may also be related to both amount of practice and amount of improvement.

An examination of individual participants’ practice trends may provide valuable information about optimal treatment amount. During the 3 weeks of treatment on each script, some participants practised more per week, and some practised less. While we can rely on the accuracy of the amount of treatment data generated by the computer program, it is much more difficult to know participants’ reasons for practising. For example, FITMA, the only participant who did not demonstrate improvement on measures of conversational scripting, actually spent progressively more practice time on each of her three scripts. She practised a total of 701 minutes (11.68 hours) during 3 weeks dedicated to script 1; 708 minutes (11.81 hours) during script 2; and a total of 975 minutes (16.24 hours) on script 3.

In contrast, several participants chose to practise successively less each week on a given script (see Table 2). ROMJI, for example, consistently reduced his practice time during the 3 weeks allotted to each script, then increased his practice time when given a new script. (He practised 6.65, 4.70, and 4.10 hours on the consecutive weeks of script 1 treatment; 5.75, 3.54, and 5.42 hours per week for script 2; and 4.87, 3.88, and 1.69 hours per week for script 3.) SCHBA followed a similar pattern, returning to the same amount of practice at the onset of each new script. In addition, the total practice time for each successive script decreased for ROMJI (15.44, 14.71, and 10.45 hours per week for scripts 1, 2, and 3) as well as for others, although they were still able to achieve the same amount of improvement on each script. This pattern suggests that some participants may become more efficient at learning scripts over the 9 weeks of treatment. Further analysis of weekly probe data could potentially provide useful information necessary to predict the most beneficial amount of treatment for participants.

The second question addressed the relationship between severity of aphasia and amount of improvement on conversational script measures. Prior studies (e.g., Basso et al., 1979; Pedersen et al., 2004) found that severity of aphasia negatively impacted improvement after treatment. In contrast, we found that there was no significant difference in improvement in rate between more and less severely aphasic participants, while those with more severe aphasia actually improved more on content. More specifically, we found a significant negative correlation between AQ and improvement in measures of content but not rate. We also found that WAB AQ was negatively correlated with amount of practice, indicating the lower a participant’s AQ score, the more a participant practised. Thus our analysis demonstrated that the more severe participants in our sample chose more treatment
than the less severe participants, and that greater treatment was correlated with
greater improvement in content, although not in rate. In contrast, in the less severe
group, the more hours participants spent in treatment, the more they improved in
rate, but not content.

The result related to content—which contrasts with other studies that found that
severity of aphasia was related to less rather than more improvement—may be due
to a ceiling effect for the content measure for those with higher WAB AQs. For
example, participants in the higher AQ group were already producing baseline
scripts using a large proportion of the target words. Therefore they had less room to
make improvements in script content. However, there was no ceiling effect for rate,
and many of the high-AQ participants who showed little improvement in content
e.g., ROMJI, SCHBA, WILPA) made large improvements in rate.

An important question relates to differences in characteristics of those
participants who improved and those who did not, particularly with regard to
severity of the aphasia. Only one of the participants in our sample did not benefit
from treatment. FITMA practised 4.41 hours per week, a similar treatment amount
to the mean (n=16) of 4.48 hours per week. Yet FITMA did not make
improvements in content (2.63%) and rate (−4.02%). FITMA was also the
participant with the lowest WAB AQ at 30.5. In contrast, another participant with
a similarly low AQ, PERMA (WAB AQ=34.1) made large improvements (235.28%
in content, 425.67% in rate). Therefore WAB AQ alone cannot predict whether
amount of treatment relates to improvement measures on conversational scripting.
Individual subtest scores from the Western Aphasia Battery may be more helpful
predictors. For example, at the initial assessment, FITMA scored a 1 on the verbal
fluency subtest, indicative of recurrent, brief, stereotypic utterances, whereas
PERMA scored a 2, indicating she was able to elicit some single, though effortful
or hesitant, words. Perhaps, individuals who are able to elicit single words on the
WAB fluency subtest, scoring 2 or higher, are better suited to benefit from
conversational script treatment.

The degree of apraxia of speech may also be an important indicator of which
individuals benefit most from conversational script treatment. All 17 participants
presented with apraxia of speech with varying degrees of severity. Although we did
not include formal measures of apraxia of speech in our assessments, we predict that
for these participants with non-fluent aphasia, lower scores on the Repetition subtest
of the WAB are reflective of greater degrees of difficulty with motor planning.
Again, FITMA was the only participant in our sample who did not benefit from the
treatment. Thus, it is also noteworthy that FITMA presented with the lowest WAB
Repetition subtest score, 18 as compared to the other 16 participants whose scores
ranged from 30 to 90.

Finally, the outlier among the participants warrants discussion. COLPA’s mean
practice time, 16.87 hours per week, so far exceeded the others that she was removed
from all analyses to avoid distorting the findings. Her outcome data and the factors
that may have contributed to her amount of practice are worth examining.

Of all 17 participants, COLPA made the greatest improvement in rate, with a
535.23% change in script-related words per minute. This was consistent with our
finding that increased treatment correlated with increased improvement in words per
minute for those with a less severe aphasia. It is interesting to compare COLPA with
PERMA, who also made large changes in rate (425.67% change in script-related
words per minute). PERMA, however, practised only 7.62 hours per week, while
COLPA practised 16.87 hours per week. Perhaps COLPA could have made the same improvement in rate with less practice, or perhaps PERMA was simply more efficient at script learning. Note that COLPA’s WAB AQ was far higher (77.5) than PERMA’s (34.1), confirming that severity in itself does not impede increased improvement.

One factor that may have influenced COLPA’s treatment time is script topic. All three of COLPA’s scripts addressed her desire to return to work selling real estate. They included dialogues with potential buyers over the phone, showing a house, and setting up a closing meeting. Other participants’ script topics ranged from discussing their interests to ordering a meal in a restaurant to talking about their aphasia. COLPA was the only participant with all three scripts specifically geared towards preparation for return to work, thus script mastery was directly tied to a broader life goal. This additional goal may have been highly motivating for her and is one possible explanation for her amount of practice exceeding the others in the sample.

In conclusion, our analysis shows that, for individuals with chronic non-fluent aphasia, greater intensity of treatment in conversational scripting is associated with greater improvement in both content and rate. We also found that more severely impaired individuals chose to practise more.

Among more severe participants, treatment had a greater impact on eliciting improvement in script content rather than rate. Among less severe participants, treatment was more likely to benefit rate than content. This may have occurred because these participants had already reached a high content level and had little room for improvement. In addition, even within the same level of severity, some individuals were able to benefit from treatment more than others. In addition to individual variation in total treatment time, some participants increased and others decreased treatment time from week to week within a script, or from one script to the next. Collecting additional data with larger numbers of participants, with a greater range of severity levels, is warranted to more fully examine the question of which individuals benefit the most from conversational script training programs like AphasiaScripts™.

It is important to note that our data indicate correlation and not causation. Therefore we cannot conclude that more treatment per week causes greater improvement or that greater severity directly results in more or less improvement depending on the outcome measure. We can only conclude that there is a relationship between these variables. A randomised controlled trial that directly compares two different treatment intensities is necessary to reach conclusions about causation. Furthermore, our findings apply only to conversational script treatment and to the outcome measures used in this study. The relationship between amount of treatment and outcomes for other speech-language interventions merits future research.

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