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Script Training for Adults who Stutter

Courtney M. Rankin
University of South Florida, courtneyr@mail.usf.edu

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Script Training for Adults who Stutter

by

Courtney M. Rankin

A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Science
Department of Communication Science and Disorders
College of Behavioral and Community Sciences
University of South Florida

Major Professor: Nathan Maxfield, Ph.D., CCC-SLP
Michelle Bourgeois, Ph.D., CCC-SLP
Alexandra Brandimore, Ph.D., CCC-SLP

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ABSTRACT

Treatment for adulthood stuttering traditionally focuses on some combination of stuttering management and fluency management and may also target emotional and cognitive reactions to stuttering. However, long-term gains are often limited, and there is a need for continued development of approaches for mitigating impacts of stuttering. We know of no evidence-based therapy approaches designed to target functional communication in adults who stutter (AWS), despite widespread interest in improving functional communication in members of this speaker group. Script training is an intervention approach designed to improve accuracy and automaticity in functional communication. Script training was originally designed for use with adults with aphasia and was also recently applied successfully with adults with apraxia of speech.

The aim of this study was to determine effects of script training in AWS. Three males participated, one who stuttered mildly, one moderately, and one severely. Using a single-subject, multiple-baseline design, treatment and maintenance performance was compared to baseline performance on three dependent variables: Script accuracy, percentage of syllables stuttered, and speaking rate.

Results indicate that script training may benefit AWS. Script accuracy increased and percentage of syllables stuttered decreased in all three individuals. All participants reported a self-perceived increase in confidence communication.
INTRODUCTION

Stuttering is a fluency disorder characterized by audible or silent, repetitions or prolongations, of sounds or syllables, not readily controllable, and often accompanied by secondary behaviors that give the appearance of speech-related struggle (Wingate, 1964). A generally accepted diagnostic threshold is that individuals must exhibit stuttering-like behavior on at least 3% of syllables to be considered clinically significant (i.e., to diagnose a person with stutter) (Webster, R., 1980). Stuttering affects almost 1% of adults, or 3 million adults in the United States (Yairi, 2005). Stuttering that persists into adulthood can have significant, negative impacts. Adults who stutter (AWS) are 34 times more likely to develop social anxiety disorder than non-stuttering adults, which is a debilitating mental health problem (Iverach et al., 2009; Kraaimaat, Vanryckeghem & Dam-Baggen, 2002). Adulthood stuttering can also significantly limit the ability to participate in daily activities (Yaruss & Quesal, 2006). This may occur because AWS fear negative evaluation in social relations and act upon that fear by adopting a strategy of avoidance (Menzies et al., 2009). Importantly, adulthood stuttering can also negatively impact employment opportunities and earning potential. A 2009 National Stuttering Association (NSA) survey found that 40% of respondents reported being denied employment or job promotion because of their stuttering. The factors mentioned here, and many others, likely contribute to a reduced quality of life in AWS (Koedoot et al., 2011; Yaruss, 2001).
Several therapeutic approaches exist for reducing the impact of stuttering including speech therapy (Blomgren, 2010). Speech therapy aims to enhance fluency and reduce stuttering errors, while often incorporating cognitive therapy to address unproductive negative thought patterns associated with stuttering (Blood, 1995). Finally, participation in support groups has also been encouraged to help AWS cope with emotional reactions to stuttering (Reeves, 2002). While all of these approaches can be beneficial, gains achieved are not always maintained over the long term (Bothe et al., 2006). As a result, AWS report repeated experiences in speech therapy during their lifetime (McClure & Yaruss, 2003). This underscores the need for continued development of therapeutic approaches aimed at reducing the impacts of stuttering long term.

To date, there has been little therapeutic focus on improving functional communication in AWS and existing tools have marked limitations (Yaruss & Quesal, 2006). In contrast, support organizations, such as the National Stuttering Association, have long focused on this aim by providing tips, blogs, and workshops on improving communication skills, with great popularity. For this reason, the current project shifts focus from reducing stuttering via improved speech motor control to increasing functional communication in AWS, specifically by utilizing script training. Script training involves formulating and then intensively rehearsing functional communication scripts. This approach has been effective for improving functional communication in people with aphasia (Youmans et al., 2005), as well as in people with apraxia of speech (Youmans, Youmans, & Hancock, 2011a).
Thus, the aim of this study is to determine whether script training improves functional communication, reduces stuttering, and/or improves self-perceived quality of life in AWS. In the sections that follow, current approaches to the management of stuttering in adults are reviewed. Additionally, script training is introduced and outcomes in people with aphasia and with apraxia of speech are reviewed.

**Current Approaches to the Management of Stuttering in Adults**

Stuttering management and fluency shaping are two frequently used therapeutic approaches that largely target the modification of speech motor patterns in AWS (Blomgren, 2010). In stuttering management, AWS learn to reduce the severity of stuttering by reducing avoidance and struggle behaviors associated with stuttering. In fluency shaping, AWS learn to initiate and maintain forward speech movement in a manner that minimizes the presence of stuttering. Often, these two techniques are combined into a hybrid approach in which AWS first work to reduce stuttering severity by reducing habitual avoidance and struggle behavior, and then work to establish a new pattern of speaking that involves shaping fluent speech (Blomgren, 2010).

AWS report feeling more comfortable using a stuttering management approach versus using a fluency shaping approach (McClure & Yaruss, 2003). From a listener perspective, speech containing mild stuttering is preferred over speech that sounds overly-managed, at least in casual situations (Healey, 2010). A recent study reported improvements in the functional communication, as measured by the Overall Assessment of the Speaker's Experience with Stuttering (OASES) (Yaruss & Quesal, 2006), of AWS following traditional speech-focused therapy. However, improved communication was only seen in those who were able to maintain their new speech
skills for at least one year following therapy (Lee, et al., 2016). On the one hand, this finding shows that managing stuttering can improve functional communication in the long-term. On the other hand, AWS often are unable to manage their stuttering effectively in the long term. Many AWS have at least three experiences in therapy and as many as five experiences in therapy during their lifetimes (McClure & Yaruss, 2003). This suggests that neither stuttering management nor fluency shaping provide a complete long-term solution. Factors that might reduce relapse following speech-focused treatment have been a recent focus of investigation (e.g., Floyd, Zebrowski & Flamme, 2007).

In addition to speech therapy, AWS often participate in support groups (e.g., National Stuttering Association, International Stuttering Association), which aim to foster acceptance of one's identity as a person who stutters (Reeves, 2002). As part of this movement, support organizations sometimes focus on helping AWS improve functional communication (e.g., by publishing blogs or hosting workshops about interviewing or participating in meetings more effectively). To date, however, there has not been a systematic investigation of effectiveness of treatment approaches specifically aimed at improving functional communication in AWS.

There have been assessment tools created to evaluate functional communication in stuttering, such as the OASES (Yaruss & Quesal, 2006). The OASES is designed to assess the self-perceived impact of stuttering on quality of life. Participants answer questions about their knowledge of stuttering, their reactions to stuttering, and the impact of their stuttering on daily functional communication. Over half of AWS administered the OASES perceived a negative impact of stuttering on daily functional
communication (Yaruss, & Quesal. 2010). Although OASES scores have not been compared between AWS and normally-fluent adults, adolescents who stutter were shown to self-rate their functional communication abilities as significantly reduced compared with normally-fluent adults (Mulcahy et al., 2008). Certain personality traits seem to be associated with how AWS self-rate the impact of stuttering on functional communication. Specifically, AWS who more strongly exhibit the personality trait of neuroticism tend to rate their functional communication abilities more poorly on the OASES (Bleek, et al, 2012). With these findings in mind, it seems important to develop intervention strategies aimed at improving functional communication in AWS. As described next, script training has been used successfully for this purpose with adults with aphasia as well as with adults with apraxia of speech. Based tentatively on the gains these populations have achieved, it is hypothesized that script training might increase functional communication for AWS too.

**Script Training**

One approach that has been used to improve functional communication in people with aphasia and apraxia of speech is script training (Youmans, Youmans, & Hancock, 2011). In general, script training involves creating scripts that are relevant to the person and having that individual rehearse the scripts intensively over several treatment sessions. The overall goal of script training is to increase speaking rate and correctly memorize and verbalize the scripts. Success in script training is most often defined as reductions in content errors and increases in speaking rate, although other outcome measures are sometimes used as well (e.g., grammatical complexity of scripts
produced, naturalness of speech produced). Script training may be conducted in the speech clinic and at home using computer-based platforms.

The rationale behind script training is that speech production is fairly automatic and effortless. Script training attempts to establish greater automaticity in verbal production. The approach is based on the instance theory of automatization. Youmans, Youmans, and Hancock define this automaticity theory as “...the retrieval from memory of complete, context-bound, skilled performances” (Youmans, Youmans, & Hancock, 2011a, pg.23). From this perspective, as scripts are practiced, they transition from memory instances to automatic recall of past performances or actions. This theory also states that learning scripts in a complete, holistic manner is more beneficial than when broken down into separate components (Logan, 1988). This idea was taken and formed gradually into script training, originally with the goal of helping those with aphasia regain automaticity in verbal production so that communicating with others is less effortful, more natural and, ultimately, more functional. Furthermore, script training resulted in creating islands of automatic and fluent speech for people who had difficulty speaking or limited speaking abilities. This was demonstrated by Youmans et al. (2005) where scripts increased people with aphasia’s ability to produce automatic and fluent speech even though their abilities were limited (Youmans et al., 2005).

In the first published attempt to investigate script training effects, Youmans et al. (2005) demonstrated positive effects in adults with aphasia. In that study, clients generated three personally-relevant scripts, each comprised of three or four lines. Participants rehearsed one script at a time, line by line. Practice started with the first line only, which was rehearsed until it could be produced with 80% accuracy. After the first
line was mastered at this percentage accuracy, participants began rehearsing a combination of the first and second lines until they could be produced with 80% accuracy. This process was repeated until the entire (three- or four-line) script could be produced with at least 80% accuracy. At this point, the first script transitioned into a maintenance phase, during which participants practiced the script daily. Once the first script was mastered with 80% accuracy, the second script was targeted. This process was repeated for all three scripts. When participants reached at least 80% accuracy in all three scripts they worked to generalize their scripts to natural speaking situations. Outcome measures included error rate and speaking rate. For all participants, Youmans et al. (2005) observed an increase in errorless speech relative to baseline performance. In addition, speech rate increased.

In principle, both outcomes should affect better functional communication in people with aphasia, and this was documented in five different studies using self-report measures of communication success (reviewed in Kaye & Cherney, 2016). In two of those studies, an exit interview was completed by the spouse/caregiver of the person receiving the intervention. Respondents reported seeing significant improvements in the functional communication of their significant others which generalized to the home environment posttreatment (Cherney, & et al, 2008; Cherney & Halper, 2008). Three other research studies had participants self-rate changes in functional communication. Participants reported increases in functional communication in the areas of speaking confidence, communication success, and speaking ease (Bilda, 2011; Cherney, & et al, 2011; Manheim, & et al, 2009).
Since Youmans et al. (2005), similar positive effects have been observed for people with aphasia in script training for monologues, dialogues, situation-specific scripts, scripts of varying lengths, and script training in a virtual/computer-based intervention environment (see Kaye & Cherney, 2016). Of critical importance, script training was recently also adopted for use with adults with apraxia of speech. Results showed an increase in errorless speech attempts, similar to people with aphasia, as well as improved speech fluency (Youmans, Youmans, & Hancock, 2011a). Listeners also perceived adults with apraxia of speech as having more natural speech, increased speech rate, and reduced speech errors following script training (Youmans, Youmans, & Hancock, 2011b). With the evidence this study provides, showing the positive increases in not only functional communication but also an increase in the speaker’s ratings, it raises the question that this method of intervention may provide AWS an increase in their communication and self-views, while simultaneously helping to improve their fluency.

**Theoretical Rational for Script Use in Adults Who Stutter**

There are numerous theories of stuttering etiology (Howell, 2008) as outlined here script training should benefit AWS from several theoretical perspectives.

Based on the Demands and Capacities Theory, which states that disfluencies occur when the demands placed on a person who stutters exceed their capacity to verbalize, Script Training should reduce the language, motoric, and/or cognitive demands at the start of verbalizing. In principal, when using scripts, speech demands should be less likely to exceed the person’s capacity to communicate fluently. This is hypothesized because the AWS already has a plan of what they want to say, they have
already mapped out the motor movements, so the demands are reduced (Starkweather & Gottwald, 2000).

Additionally, the Multifactorial Dynamic Pathways Theory states that AWS do not have a stabilized speech production pathway. From this viewpoint, utilizing a pre-made, learned script should stabilize speech production pathways at the start of verbalizing because the speaker has already planned what he wants to say and rehearsed associated motor movements (Smith & Weber, 2017).

Finally, the Unstable/ Insufficiently Activated Internal Model Theory states that AWS do not have fully activated speech motor plans, which leads to their disfluencies. When an AWS produces a script, a rehearsed script should provide a stable, fully activated speech motor plan at the start of verbalizing (Max, 2004).

From the prospective of all of these theories, scripts should help AWS initiate verbal interactions successfully and possibly reduce the frequency of stuttering, at least within the scripts.

**Summary and Research Questions**

Stuttering affects ~1% of adults and can significantly impact quality of life. Standard treatment approaches include stuttering management, fluency management, and possibly also cognitive therapy. However, therapy does not typically focus on improving functional communication in AWS, despite evidence of differences or deficits in functional communication in AWS versus fluent-speaking adults.

Script training has been used successfully to improve functional communication in adults with aphasia and apraxia of speech, specifically by improving errorless production of scripts, increasing speaking rate/naturalness, and improving self-
perceived communication competence. To date, however, script training has not been examined in published research with people who stutter. The overall goal of this study is to investigate script training effects in AWS. Specific research questions include:

1) What are the effects of script training on functional communication in AWS, as measured by error rates in script production and speaking rate in script production?

2) What are the effects of script training on the frequency of stuttering-like disfluencies, as measured in a count of stuttering behaviors in monologue and read-aloud contexts?

3) What are the effects of script training on self-perceptions of functional communication?

Based tentatively on outcomes with people with aphasia and apraxia of speech, script training is predicted to increase errorless speech, increase speaking rate, improve self-rated functional communication, and, finally, improve speech fluency in AWS.
METHOD

Participants

Four adult participants with a diagnosis of stuttering were recruited for this study. These participants were AWS who had no recent history of speech therapeutic intervention and had stuttering that was at least mild in severity. This composition of participants allowed the comparison of the effects of Script Training in isolation (i.e., with no explicit focus on fluency control). All participants were native speakers of English, had normal or corrected-to-normal hearing and vision, and had no other concomitant speech, language or cognitive deficits. All study procedures were approved by the University of South Florida Institutional Review Board. Participants provided written informed consent before participating in the experiment; see Appendix A for USF IRB-approved Consent form.

Subject 1 was an 18-year-old male whose stuttering was rated mild in severity as determined using the Stuttering Severity Instrument (SSI) (Riley, 1994). He perceived his stuttering to have a “mild to moderate” impact on his quality of life, as rated using the Overall Assessment of the Speaker's Experience with Stuttering (OASES) (Yaruss & Quesal, 2006). Subject 1 reported having speech therapy in elementary and middle school, but not more recently in high school. Subject 1 withdrew from the study after five baseline sessions. Therefore, his scripts and data are not reported or discussed.

Subject 2 was a 45-year-old male whose stuttering was rated moderate in severity as determined using the SSI. He perceived his stuttering to have a “mild to
moderate” impact on his quality of life, as rated using the OASES. Subject 2 reported that it had been a few years since he had any intervention for his stuttering and that he did not use any therapeutic techniques.

Subject 3 was a 20-year-old male whose stuttering was severe as determined using the SSI. He perceived his stuttering to have a “mild to moderate” impact on his quality of life, as rated using the OASES. Subject 3 reported that he had not had any speech therapy since he was in middle school and that the intervention he received in high school focused on acceptance of stuttering rather than speech modification.

Subject 4 was a 22-year-old male whose stuttering was very mild in severity as determined using the SSI. He perceived his stuttering to have a “moderate to severe” impact on his quality of life, as rated using the OASES. Subject 4 reported that he had not had any speech therapy since he was in the fourth or fifth grade.

**Measures**

Before the study began, each participant was administered the SSI (Riley, 1994) to determine stuttering severity and the OASES (Yaruss & Quesal, 2006) to determine how individuals perceive stuttering to impact quality of life. The SSI provides a stuttering severity rating for each individual based on these four specific areas: 1) frequency of stuttering, 2) duration of stuttering, 3) physical concomitants associated with stuttering, and 4) naturalness of the individual's speech. The OASES determines quality of life impact by asking questions about four different domains: 1) a person's general knowledge about stuttering, 2) a person's reactions to stuttering, 3) a person's perceptions of their communication abilities in daily life, and 4) a person's perceptions about their overall quality of life.
Independent Variables.

In addition to these assessments, each participant chose three functionally relevant script topics. In collaboration with the researchers, participants wrote 3- or 4-line scripts about each topic (see Appendix C for each participants’ scripts). The language complexity of each script, shown in Table 1 for the three participants who completed the study, was quantified using a variety of measures including word count, Flesch reading ease (Farr, Jenkins, & Paterson, 1951), Flesch-Kincaid grade level (Fry, 1968), number of syllables in each script, and number of phonemes. Flesch reading ease is determined by using the average length of sentences and average number of syllables per word to determine the reading ease. The higher the reading ease score the easier a text is to read (i.e., 100 is easily understood by a middle school student, 60-70 is easily understood by a high school student, and 30 or less is generally understood by a college graduate). Flesch-Kincaid grade level is determined using the same information as the reading ease score (i.e., based on the average length of sentences and average number of syllables per word) to calculate the average grade level needed to comprehend the sentences (Stockmeyer, 2008).
Table 1. Language complexity of each script, separately for each participant.

<table>
<thead>
<tr>
<th>Subject 2</th>
<th>Script 1</th>
<th>Script 2</th>
<th>Script 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word Count</td>
<td>47</td>
<td>57</td>
<td>37</td>
</tr>
<tr>
<td>Flesch Reading Ease</td>
<td>61.3</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>Flesch-Kincaid Grade Level</td>
<td>7.9</td>
<td>8.8</td>
<td>8.1</td>
</tr>
<tr>
<td>Number of Syllables</td>
<td>71</td>
<td>87</td>
<td>56</td>
</tr>
<tr>
<td>Number of Phonemes</td>
<td>53</td>
<td>72</td>
<td>43</td>
</tr>
<tr>
<td>Subject 3</td>
<td>Script 1</td>
<td>Script 2</td>
<td>Script 3</td>
</tr>
<tr>
<td>Word Count</td>
<td>48</td>
<td>46</td>
<td>51</td>
</tr>
<tr>
<td>Flesch Reading Ease</td>
<td>77.7</td>
<td>69.8</td>
<td>68.4</td>
</tr>
<tr>
<td>Flesch-Kincaid Grade Level</td>
<td>6.3</td>
<td>7.3</td>
<td>7.9</td>
</tr>
<tr>
<td>Number of Syllables</td>
<td>64</td>
<td>67</td>
<td>74</td>
</tr>
<tr>
<td>Number of Phonemes</td>
<td>45</td>
<td>54</td>
<td>53</td>
</tr>
<tr>
<td>Subject 4</td>
<td>Script 1</td>
<td>Script 2</td>
<td>Script 3</td>
</tr>
<tr>
<td>Word Count</td>
<td>37</td>
<td>27</td>
<td>29</td>
</tr>
<tr>
<td>Flesch Reading Ease</td>
<td>63.9</td>
<td>88</td>
<td>86.1</td>
</tr>
<tr>
<td>Flesch-Kincaid Grade Level</td>
<td>7.3</td>
<td>3.2</td>
<td>3.6</td>
</tr>
<tr>
<td>Number of Syllables</td>
<td>55</td>
<td>35</td>
<td>43</td>
</tr>
<tr>
<td>Number of Phonemes</td>
<td>45</td>
<td>34</td>
<td>29</td>
</tr>
</tbody>
</table>
Dependent Measures

Dependent variables. During each baseline and treatment session, probes were administered at the beginning of the session. Dependent variables included percentage of script correct (PSC), percentage of syllables stuttered (%SS), and speech rate (in syllables per minute). No feedback was provided to participants while data was recorded.

Percentage of script correct. PSC was determined by dividing the number of script words produced correctly by the total number of words in the script and multiplying the quotient by 100. No substitutions of words or retrials were included in the calculations.

Percentage of syllables stuttered. Every syllable in each script was coded for the presence of stuttering behaviors. The Lidcombe Behavioral Data Language of Stuttering (LBDL, Tesson, Packman & Onslow, 2003) was used to guide this process. LBDL is a taxonomy of stuttering behaviors. Comprising this taxonomy are 1) Repeated movements (e.g., syllable repetitions, incomplete syllable repetitions, multisyllabic unit repetitions), 2) Fixed postures (e.g., fixed postures with audible airflow, fixed postures without audible airflow), and 3) Superfluous behaviors (e.g., superfluous verbal behaviors, superfluous non-verbal behaviors). Table 2 provides examples of each of these seven behaviors associated with stuttering. For each script, %SS was calculated by dividing the number of syllables affected by one or more of these stuttering behaviors by the total number of syllables and multiplying the quotient by 100.
Table 2. LBDL taxonomy of stuttering behaviors.

<table>
<thead>
<tr>
<th>Descriptor</th>
<th>Examples of Corresponding Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Syllable Repetition</strong></td>
<td>where...where...where's the ball?&quot;</td>
</tr>
<tr>
<td><strong>Incomplete Syllable Repetition</strong></td>
<td>&quot;I went to S...S...Sydney...&quot;</td>
</tr>
</tbody>
</table>
| **Multisyllable Unit Repetition** | "it's a...it's a ...it's a great..."  
                               | "what a great oper...oper...tunity"                                      |
| **Fixed Posture with Audible Airflow** | "mnmnmmy one" "fffishy gone!"                                         |
| **Fixed Posture without Audible Airflow** | "I ........ (no sound) bought ..."                                      |
| **Superfluous Verbal Behavior**   | "I went--oh well--ah--oh well-- I--well I went over..." Grunting       |
| **Superfluous Nonverbal Behavior** | Tics, grimacing                                                       |
Speech rate. Speech rate was computed (in syllables per minute) by multiplying the number of syllables in each script by 60 and dividing by the duration of the script in seconds (e.g., if a 75-syllable script were produced in 38 seconds, the rate of speech would be \(75 \times 60/38 = 118\) syllables per minute). Errors and retrials were included in the speech rate calculations. However, long pauses or extreme deviations from scripts, (i.e. "Hold on I forgot, let me think") were not included in rate calculations due to the participant being off-script.

Procedures

Procedures closely followed those used in Youmans et al. (2005). All training sessions were held at the University of South Florida Speech-Language-Hearing Clinic or in the Stuttering Intervention and Research Lab.

Probe session structure. Participants were required to attend at minimum one 60-minute session per week. Each treatment session was designed to allow for at least five 2-3-minute episodes of concentrated script practice, interspersed with five brief periods of casual conversation about various topics to avoid any repetition of scripts. At the beginning of each session, participants were video recorded talking about each of their three selected topics. Participants were prompted to begin scripts but were not given feedback during video recording. As scripts were mastered, treatment sessions ended with ~10 minutes of script conversation which encourage flexible use of the scripts.

Experimental Design

A single subject, multiple baseline design was used to determine effects of Script Training on percentage of script correct, syllables stuttered (%SS), and speech rate.
The study consisted of 3 phases: baseline, treatment, and maintenance. The subjects were given 1-line prompts for each probe during each phase of the study (Tell me about…). This design compared replications across subjects using their 3 script topics.

**Baseline phase.** During the baseline phase, participants were prompted to speak about their three script topics for five minutes without receiving feedback. These sessions were video recorded using a 15" MacBook Pro and an iPad Pro. A minimum of four baseline sessions were conducted before treatment was initiated for the first script that displayed low and stable %SS. Additionally, during the first probe, participants were informed that this study was focusing on their script accuracy, not their disfluencies.

**Treatment phase.** The treatment phase began with participants learning the first script with an errorless forward chaining procedure (i.e., Hello… Hello my name is… Hello my name is Bob). To promote script acquisition, scripts were trained one phrase at a time using blocked practice. During the blocked practice, a cueing hierarchy (Cherney et al., 2008; Youmans et al., 2005) was used. This hierarchy involved clinician modeling of the target phrase, clinician and participant productions of the phrase in unison, clinician and participant production of the phrase in unison with the clinician fading participation, independent productions by the participant with written cue cards, and finally independent productions by the participant with no cueing. The first line in the script was rehearsed until at least 90% accuracy was achieved, at which time the first and second lines were rehearsed until 90% accuracy was achieved, then all three lines of the script were rehearsed. When the entire script was produced with at least 90% accuracy over two consecutive sessions, the next script was trained and the
trained script(s) was monitored for maintenance. Training focused exclusively on mastery of the scripts; there was no emphasis on speech-oriented fluency control.

**Maintenance phase.** Participants were encouraged to practice trained scripts at home to maintain mastery; however, it was not required. After all three scripts were mastered, participants completed the OASES, SSI, and self-report measures. Participants were also formally questioned about their reactions toward, and satisfaction with, script training by a nonfamiliar communication partner without the experimenter present.

**Reliability.** Videotaped data was transcribed and coded by the author. In order to ensure reliability of scoring and coding, one additional person was taught the definitions of primary and secondary stuttering symptoms and trained in coding the data. Twenty percent of the scripts were transcribed by the author and another speech-language pathologist with expertise in stuttering. Reliability was checked periodically throughout the study by the second rater who reviewed the tapes then scored and coded the data. The second rater's coding was compared to that of the primary author to ensure 100% agreement.

**Data Reduction and Analysis**

PSC, %SS and speech rate data for each individual were graphed as a function of time and visually inspected for changes in level, slope, and variability. Level was examined by visualizing a line of best fit placed through the middle of the data points (i.e., half of the points below the line and half above), separately for each phase, and comparing the relative height of the lines in treatment versus baseline, and in maintenance versus baseline. Slope was determined by visualizing a linear trend line
through the points in each phase and determining whether each line had a positive or negative slope. Lastly, changes in variability were determined by comparing the spread of the data points in each phase.
RESULTS

Participant Attrition

Subject 1 withdrew from the study after participating in five baseline sessions. Even during the baseline phase, Subject 1 had multiple absences.

Script Training Measures

Percent Script Correct. Subject 2 completed script training in a total of 24 sessions. PSC for each script, during baseline, treatment, and maintenance phases, is shown in Figure 1. It is important to note the differences in the script complexity for subject 2; for scripts 1 and 2 a high school education is needed to comprehend them and for script 3 a middle school education is needed for comprehension. For script 1, PSC was relatively low but variable during baseline. Level increased from baseline to treatment, with slope steadily increasing during treatment. Level remained high during maintenance relative to baseline. Variability decreased during treatment and maintenance phases relative to baseline. Similar effects were seen for scripts 2 and 3. It is noteworthy, however, that slope increased sharply and then plateaued during treatment phase for both script 2 and script 3, in contrast to the relatively steady increase in slope during treatment phase for script 1. Improvement was observed for scripts 1 and 2, which indicates a loss of experimental control. However, accuracy continued to improve during treatment.
Figure 1. Percentage of script accuracy for Subject 2, separately for each script across sessions.
Subject 3 completed the script training study in a total of 17 sessions. PSC is shown in Figure 2. The language complexity for all three scripts indicated that a high school level of education is needed for comprehension of the scripts. For script 1, PSC was moderately low but variable during baseline. Level increased from baseline to treatment. Slope sharply increased then plateaued at 100% accuracy during treatment. Level remained high during maintenance relative to baseline. Variability was reduced during treatment and maintenance stages relative to baseline. It should be noted that treatment should not have been initiated on this script due to the lack of experimental control evidenced by the rising slope during the baseline. For script 2, slope steadily increased during baseline. PSC plateaued during treatment and remained stable during maintenance with low variability. For script 3, variability was high during baseline with a gradually increasing slope. Level increased, and variability was reduced, during treatment relative to baseline, and during maintenance relative to baseline. Improvement was observed in scripts 2 and 3 which indicates a loss of baseline control. However, accuracy continued to improve during treatment.
Figure 2. Percentage of script accuracy for Subject 3, separately for each script across sessions.

Subject 3: Percent Script Correct
To date, subject 4 has completed a total of 15 sessions and reached the mastery criteria for 2 out of 3 scripts. PSC is shown in Figure 3. Analysis of language complexity showed that a high school level of education is needed to comprehend script 1, while a middle school level of education is needed to comprehend scripts 2 and 3. For script 1, PSC showed a falling slope, a moderate level of accuracy and some variability during the baseline. Level increased from baseline to treatment. During treatment, slope sharply increased then plateaued to 100% accuracy with little variability. Level remained high in maintenance relative to baseline, again with little variability. For script 2, PSC appeared to show decreasing slope with little variability during baseline. Level and slope increased during the treatment phase. Level has remained high during maintenance relative to baseline. To date, subject 4 has only completed the baseline phase for script 3, but PSC has been at a relatively high level with a slightly rising slope during the baseline for script 3. Therefore, there is no need to train this script as it is highly accurate even without training. Improvement was observed during script 3 which indicates a loss of experimental control. However, accuracy continued to improve during treatment.
Figure 3. Percentage of script accuracy for Subject 4, separately for each script across sessions.
**Percentage of syllables stuttered (%)SS.** Figure 4 shows percentage of syllables stuttered (%)SS for subject 2. For script 1, the level of %SS was relatively high, somewhat variable, and the slope fell during baseline phase. Level decreased during treatment relative to baseline. During treatment, slope steadily decreased, and variability remained high. Level remained low during maintenance relative to baseline but variability remained high. It is interesting to note that, in two sessions of treatment and four sessions of maintenance, %SS dropped below the clinically significant level of 3%SS. For script 2, the level of %SS steadily decreased during baseline and variability was high. Level decreased in treatment and maintenance versus baseline. Variability also decreased during treatment and maintenance. For script 2, note that %SS dropped below the clinically significant level of 3%SS in two sessions of baseline, three sessions of treatment, and four sessions of maintenance. For script 3, the level of %SS began relatively high and had a gradually decreasing slope down to 0% of syllables stuttered. High variability was also observed. It is important to note that treatment should not have been initiated because stuttering was at 0% which continued on into treatment and maintenance. A loss of experimental control was experience during all three scripts.
Figure 4. Percentage of syllables stuttered for Subject 2, separately for each script across sessions.
Figure 5 shows %SS for subject 3. For script 1, %SS was relatively high and variable during baseline. Level decreased during treatment relative to baseline with a steadily decreasing slope. Level remained low during maintenance relative to baseline. Variability did not decrease markedly during treatment or maintenance for script 1. For script 2, level was moderate and variability was quite high. Level and variability decreased during treatment relative to baseline and also during maintenance relative to baseline. For script 3, although level and variability were high, slope decreased during baseline. Level did not appear to change during treatment or maintenance relative to baseline although variability decreased during treatment and maintenance. It is noteworthy that %SS only dropped below the clinically significant level of 3% during one session for subject 3; specifically, during script 3 on the 11th baseline session %SS dropped below 3%. A loss of experimental control was experienced during all three scripts.
Figure 5. Percentage of syllables stuttered for Subject 3, separately for each script across sessions.
Figure 6 shows %SS for subject 4. For script 1, %SS was relatively low with a steadily decreasing slope during the baseline phase. During treatment, level and variability decreased relative to baseline. Level and variability also remained low in maintenance relative to baseline. For script 2, %SS was highly variable during baseline and the slope steadily decreased to 0%SS. During treatment, level and variability were reduced relative to baseline. Level and variability also remained low in maintenance relative to baseline. As noted previously, subject 4 has only completed the baseline phase for script 3 to date. To date, %SS has been relatively low with some variability during baseline. It is noteworthy that, for scripts 1 and 2, %SS dropped below the clinically significant level of 3%SS in all treatment and maintenance sessions. A loss of experimental control was experienced for all three scripts.
Figure 6. Percentage of syllables stuttered for Subject 4, separately for each script across sessions
**Speaking rate.** Figure 7 shows speaking rate data for subject 2. For script 1, low normal rates were observed during baseline with some variability. During treatment, level did not appear to change relative to baseline and variability remained high. Similarly, during maintenance, level did not appear to change relative to baseline and variability did not change. Similar speaking rate outcomes were observed for scripts 2 and 3.

Figure 8 shows speaking rate data for subject 3. For script 1, variability was relatively low during baseline. Level did not appear to change in treatment relative to baseline. Level, as well as variability, did appear to increase in maintenance relative to baseline. For script 2, some variability was observed in baseline. Level appeared to increase, and variability appeared to decrease, in treatment and maintenance relative to baseline. For script 3, slope steadily increased during baseline. Level appeared to increase in treatment versus baseline and in maintenance during baseline.
Figure 7. Rate, measured by words per second, for Subject 2, separately for each script across sessions.
Figure 8. Rate, measured by words per second, for Subject 3, separately for each script across sessions.
Figure 9 shows speaking rate for subject 4. For script 1, rates were relatively low and not highly variable during baseline. Level increased during treatment relative to baseline. During treatment, slope steadily increased. Level remained high during maintenance relative to baseline. Variability appeared to increase in maintenance relative to baseline. For script 2, speaking rates were relatively low during baseline with some variability. Level increased in treatment versus baseline, but variability remained high. Level remained high in maintenance during baseline. For script 3, speaking rates have been increasing in slope from approximately 150 words per minute to 250 words per minute.
Figure 9. Rate, measured by words per second, for Subject 4, separately for each script across sessions.
Pre- versus Post-Therapy Assessments of Stuttering Severity and Quality of Life Impacts

**Stuttering Severity Instrument.** As shown in Table 3, the overall stuttering severity rating for subject 2 remained the same pre- versus post-therapy, although the frequency and duration of his stuttering were both reduced post-treatment. The overall stuttering severity rating for subject 3 went from Severe to Moderate, due to reductions in stuttering duration and physical concomitants. It is noteworthy that while overall severity of stuttering was reduced for subject 3, frequency of stuttering remained the same. Subject 4 is still enrolled in the study and post-intervention assessment is pending completion.

Table 3. SSI scores pre-intervention and post-intervention.

<table>
<thead>
<tr>
<th></th>
<th>Frequency of Stuttering Score</th>
<th>Duration</th>
<th>Physical Concomitants</th>
<th>SSI-Measure Severity Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
<td>Pre</td>
<td>Post</td>
</tr>
<tr>
<td>Subject 2</td>
<td>13</td>
<td>10</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Subject 3</td>
<td>13</td>
<td>13</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Subject 4</td>
<td>7</td>
<td>Pending</td>
<td>6</td>
<td>Pending</td>
</tr>
</tbody>
</table>
**Overall Assessment of the Speaker’s Experience of Stuttering.** As shown in Table 4, subject 2 perceived stuttering to have approximately the same impacts on quality of life pre- and post-treatment. Although OASES scores lowered a bit for subject 2, impact ratings did not change post- versus pre-therapy (for example, his impact rating in the General Information domain was "moderate" pre- and post-treatment).

In contrast, subject 3 perceived stuttering to have a reduced impact on his quality of life post-treatment relative to pre-treatment, particularly in domains of General Information, Reactions to Stuttering and Communication in Daily Life. In these domains, impact ratings changed from "moderate" to "mild-moderate."

Subject 4 is still enrolled in the study and post-intervention assessment is pending completion.

Overall impact, indicated by the Total Impact Rating (last column of Tables 5 and 6), did not change for subject 2 or 3 post- versus pre-script training.
Table 4. OASES scores pre- intervention and post-intervention.

<table>
<thead>
<tr>
<th>OASES Subtests</th>
<th>General Information</th>
<th>Reactions to Stuttering</th>
<th>Communication in Daily Life</th>
<th>Quality of Life</th>
<th>Total Impact Score</th>
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</thead>
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<tr>
<td>Subject 2</td>
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<td>Impact Score:</td>
<td>Impact Score:</td>
<td>Impact Score:</td>
<td>Impact Score:</td>
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<tr>
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<td>Pre: 34</td>
<td>Pre: 44</td>
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<td></td>
<td>Post: 59</td>
<td>Post:48</td>
<td>Post:32</td>
<td>Post:34</td>
<td>Post:43</td>
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<tr>
<td>Impact Rating:</td>
<td></td>
<td></td>
<td>Impact Rating:</td>
<td>Impact Rating:</td>
<td></td>
</tr>
<tr>
<td>Pre: Moderate</td>
<td></td>
<td>Pre: Moderate</td>
<td>Pre: Mild to Moderate</td>
<td>Pre: Mild to Moderate</td>
<td>Pre: Mild to Moderate</td>
</tr>
<tr>
<td>Post: Moderate</td>
<td></td>
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<td>Post: Mild to Moderate</td>
<td>Post: Mild to Moderate</td>
</tr>
<tr>
<td>Subject 3</td>
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<td>Impact Score:</td>
<td>Impact Score:</td>
<td>Impact Score:</td>
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<td>Pre: Mild</td>
<td>Pre: Mild to Moderate</td>
</tr>
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<td></td>
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<td>Post: Mild to Moderate</td>
<td>Post: Mild</td>
<td>Post: Mild to Moderate</td>
</tr>
<tr>
<td>Moderate</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject 4</td>
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<td>Impact Score:</td>
<td>Impact Score:</td>
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</tr>
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<td>Pre: 64</td>
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<tr>
<td></td>
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<td>Post: Pending</td>
</tr>
<tr>
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<td></td>
<td></td>
<td>Impact Rating:</td>
<td>Impact Rating:</td>
<td></td>
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<tr>
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<td></td>
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<td>Pre: Moderate to Severe</td>
<td>Pre: Moderate</td>
<td>Pre: Moderate to Severe</td>
</tr>
<tr>
<td>Post: Pending</td>
<td></td>
<td>Post: Severe</td>
<td>Post: Severe</td>
<td>Post: Pending</td>
<td>Post: Pending</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

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DISCUSSION

This is the first study to investigate the impact of script training on fluency in adults who stutter. Importantly, all three participants achieved script mastery and exhibited evidence of reduced frequency of stuttering in most or all scripts.

Script Accuracy

Each participant reached the mastery criterion for each of their scripts (i.e., no participant failed to reach mastery). Overall, treatment resulted in increased script accuracy and decreased variability in script accuracy. For some scripts, accuracy improved gradually until mastery was reached. However, for many scripts, slope sharply increased and then plateaued, indicating relatively fast early gains in script accuracy as treatment was initiated. Some scripts were mastered before treatment began, indicating that AWS were able to recall portions of their scripts with increasing accuracy even without the introduction of formal treatment. Reasons behind this loss of experimental control during baseline are not immediately clear.

Overall, PSC findings from the current study are similar to those of people with aphasia and apraxia of speech in other published studies. One notable difference between AWS and adults with aphasia and apraxia can be seen in the baseline phase. In general, AWS were observed to start out with higher PSC. More specifically, the AWS hovered around or above 50% accuracy during baseline. In contrast, adults with aphasia hovered around 20% accuracy or below during baseline (Youmans et al., 2005), while adults with apraxia hovered between 20-40% accuracy during baseline (Youmans, Youmans, & Hancock, 2011b).
Another notable difference is that AWS in the current study required an average of about 4 treatment sessions to achieve mastery of the scripts. In the previous studies, adults with aphasia have required an averaged of 10 treatment sessions (Younmans et al., 2005) and adults with apraxia of speech required an average of 11 treatment to achieve script mastery (Younans, Youmans, & Hancock, 2011b).

Overall, the observed effects indicate that AWS had little difficulty mastering scripts, especially when compared with adults with acquired aphasia and apraxia of speech. This is consistent with published research demonstrating that language learning (and memorization) is generally intact in AWS, although subtle differences in language processing may exist in this speaker group (e.g., see Maxfield, 2015).

**Stuttering Frequency**

Overall, %SS decreased during training and maintenance relative to baseline. For some subjects, %SS decreased even during the baseline phase. This may have been due to increasing familiarity of the subjects with the protocol and experimenter. However, for most participants, %SS continued to decrease when script training was introduced and remained relatively low during maintenance. This is consistent with previous research, which has found that repeated rehearsal of sentences results in reductions in stuttering (Brenner, Perkins & Soderberg, 1972). The difference here, is that rehearsal spanned several weeks and involved multi-sentence scripts, while participants in Brenner et al. (1972) rehearsed individual sentences over a 20-minute span. The authors suggested that rehearsal, in particular audible rehearsal, of sentences allows AWS the opportunity to coordinate articulatory and phonatory
components of speech production. Perhaps the same effect is involved in script training albeit for material comprised of multiple sentences.

It is important to ask whether the current effects can be explained by the well-known "adaptation effect" on stuttering. This effect was documented as early as the 1930's and replicated in subsequent research (Johnson, Brown, Curtis, Edney, & Keaster, 1967; Johnson & Knott, 1937; Van Riper & Hull, 1955; Max & Caruso, 1998). The "adaptation effect" refers to a phenomenon whereby individuals who stutter often exhibit a reduction in stuttering by about 50% over five repeated readings of the same material. Max and Caruso (1998) found that acoustic and articulatory changes observed during the so-called "adaptation" were different from acoustic and articulatory changes observed in other fluency-enhancing conditions. They used these findings to argue that the "adaptation effect" on stuttering results from motor learning. Methodologically, script training is quite different from traditional "adaptation" studies in that script training spans multiple sessions, involves rehearsal from memory rather than reading aloud, and performance is not recorded during consecutive rehearsals. In addition, whereas the traditional "adaptation effect" tends to subside after five consecutive readings of the same material, no such effect was observed in the current study. Still, it is interesting to question whether mechanisms in the well-known "adaptation effect" are also involved in driving-down stuttering frequency during script training.

Finally, it is noteworthy that different participants exhibited varied patterns of change in %SS. Subject 2 (rated as having moderately severe stuttering pre-treatment) and subject 4 (rated as having very mild stuttering pretreatment) exhibited the largest decreases in %SS. These two subjects experienced a reduction in %SS that dropped
below the clinically significant level of 3%SS in multiple sessions during each of the phases for all three of their scripts. In contrast, subject 3 (rated as having severe stuttering pre-treatment) exhibited decreased stuttering frequency although to a lesser magnitude. These results suggest that script training may result in greater reductions in stuttering frequency in individuals who stutter less severely pre-treatment.

**Speaking Rate**

Subjects 2 and 3 exhibited little, if any, change in speaking rate during script training. While they did exhibit major fluctuations in speaking rate throughout the study, overall there was no change. No change in speaking rate is interesting because reductions in stuttering (which were observed for these two participants) are often associated with simultaneous increases in speaking rate (Kalinowski, Armson, and Stuart, 1995).

Unlike subjects 2 and 3, subject 4 exhibited fairly consistent increases in speaking rate during the first two scripts from baseline to treatment and during maintenance. This may be related to the fact that subject 4 was rated as having relatively mild stuttering pre-treatment, while subjects 2 and 3 were rated as having more severe stuttering pre-treatment. These results suggest that speakers who stutter mildly pre-treatment may experience gains in speech efficiency during script training.

It is interesting to compare the results of this study with those observed in adults with aphasia and apraxia of speech. In previous research (Youmans et al., 2005; Youmans, Youmans, & Hancock, 2011), adults with aphasia and apraxia of speech generally exhibited gradual, but highly variable increases in speaking rate associated with script training. Specifically, for adults with aphasia, the average increase was from
28 words per minute to 89 words per minute (Youmans et al., 2005). For adults with apraxia, the average increase was from ~25 words per minute to between 60 and 80 words per minute for two of the subjects, while another subject began with a higher speaking rate (above 60 words per minute) and achieved a speaking rate above 150 words per minute following script training (Youmans, & Hancock, 2011). In the current study, only subject 4 demonstrated a similar effect, with his rate of speech beginning at around 150 words per minute and increasing to around 250 words per minute following script training.

Overall, comparing the current results with previous research reveals that script training often benefits speech efficiency in adults with aphasia and apraxia, but not always in AWS. At this point, it is unclear why adults with more severe stuttering (subjects 2 and 3) in the current study exhibited reductions in stuttering with script training but not increased speaking rate (increased efficiency). One possibility is that adults who stutter more severely have decreased attentional resources for controlling speech production demands (a hypothesis proposed by George Bosshardt, 2006). From this perspective, script training may have helped subjects 2 and 3 stabilize speech production enough to reduce stuttering but not increase speaking rate. In contrast, AWS with less severe stuttering may have greater attentional resources for controlling speech production demands. From this perspective, script training may have helped subject 4 stabilize speech production enough to both reduce stuttering and increase rate.

**Pre- versus Post-Therapy Stuttering Severity**

Subject 2 did not exhibit a marked reduction in overall stuttering severity (as measured by the Stuttering Severity Instrument) pre- versus post-treatment. However,
stuttering severity did decrease from "severe" to "moderate" in subject 3. While script training may have influenced this effect, it is also important to recognize that stuttering severity can fluctuate fairly significantly from assessment to assessment (Howell, Soukup-Ascencao, et al, 2011). Thus, for subject 3, an overall reduction in stuttering severity is just as likely to have resulted from increasing familiarity with the examiner post- versus pre-treatment.

**Impacts on Quality of Life**

Subject 2 did not exhibit a marked decrease in OASES scores (i.e., he did not perceive stuttering to have significantly reduced impacts on quality of life post- versus pre-treatment). In contrast, subject 3 did exhibit some notable reductions in OASES scores following script training. Specifically, OASES scores indicated that stuttering impacts on quality of life for subject 3 changed from "moderate" to "mild-moderate" in the domains of General Information, Reactions to Stuttering, and Communication in Daily Life. The General Information section of the OASES asks questions about one’s perceived fluency and speech naturalness, knowledge about stuttering and stuttering therapy, and overall perceptions about stuttering in general. The Reactions to Stuttering section of the OASES asks questions about one’s affective, behavioral and cognitive reactions to stuttering. Finally, the Communication in Daily Life section of the OASES asks questions about the degree of difficulty one has when communicating in general situations, at work, in social situations, and at home (Yaruss & Quesal, 2006).

It is conceivable that participation in script training could have impacted all three of these domains. However, it is difficult to know to what extent (if any) changes in OASES scores for subject 3 were driven by participation in script training. Another
treatment approach targeting psychological aspects of stuttering (self-regulation of negative thought patterns) resulted in significant reductions in OASES scores for an entire cohort of AWS (Beilby, Byrnes & Yaruss, 2012).

Other research has shown that script training can have positive effects on quality of life in other speaker groups. For example, two adults with apraxia of speech self-rated their speech before and after script training (Youmans et al., 2011). Both participants indicated having a more positive self-perception of their communication following script training. Specifically, the participants indicated increases in confidence, ease of speaking, and speech naturalness. This provides additional evidence that script training may, indeed, impact cognitive/affective aspects of people with communication disorders in addition to improving their functional communication ability. Although OASES scores changed notably for only one participant, post-treatment interviews revealed that both participants felt more confident when using scripts perceived increases in fluency when using scripts.

**Participant Impressions of the Therapeutic Intervention**

A post script training interview was conducted a few weeks after final experimental treatment session. A nonfamiliar communication partner was brought in to ask each subject a series of questions about the study. The experimenter who administered script training was not present for the interview.

Both subject 2 and 3 indicated that they would utilize script training outside of the study. They reported that the training increased their fluency and confidence in speaking ability. Specifically, subject 3 reported that he has already used some of his scripted lines in regular conversations and reports that he had a more positive outlook.
on his communication abilities while utilizing the scripts. While subject 2 reported that he currently has no need to utilize the scripts he wrote during the study, he said that he would utilize this approach in the future to help him with presentations at conventions or to coworkers. Finally, both subjects enjoyed participating in the study, but felt the time needed to complete the study was long and felt a sense of pressure to be perfect while reciting their scripts at the beginning of the study.

Limitations

One potential limitation of this study is that there was a loss of experimental control during the baseline phase, at least for every subject involving some of their scripts. This was evidenced by increasing slopes (for script accuracy) and decreasing slopes (for percentage of syllables stuttered) during baseline. Participants did not have access to their scripts until the treatment phase was initiated. However, they were able to recall at least some of their scripts with accuracy during baseline sessions, often using the exact wording of the scripts with different adjectives. Examples of the substituted adjectives were as follows: “mom” and “dad” instead of “father” and “mother” or saying, “so far” instead of “recently”. This indicates that the AWS had good recall right from the beginning of the study, and that recall sometimes gradually improved along with some reductions in stuttering even before treatment phase.

Another potential limitation of the study is that the script training may have taken longer than necessary in some cases. Home practice was encouraged, but not mandatory, for participants in this study. Both subjects reported that they did not initially practice scripts at home but did increase home practice as time went on.
Still another potential limitation of the study is that the effects of script training on stuttering frequency, beyond the immediate script material, were not formally assessed. Thus, it is difficult to know whether script training generalized. Informally, changes in stuttering frequency were not noticed during random interspersed conversations with participants during script rehearsal. Participants also reported, during the post treatment interview, that they did not feel reductions of stuttering during use of scripts generalized to extended conversation.

**Clinical Implications**

While in single-subject intervention research a loss of baseline control is typically considered to be detrimental loss of experimental control in the current context is potentially clinically informative. Increasing PSC and decreasing stuttering during baseline phase both indicate that merely composing a script once and recalling it over weeks, without training or practice, can yield improvements in PSC and decreased stuttering frequency. Thus, this project has uncovered a low cost yet potentially powerful approach (script composition and period recall) that yields reductions in stuttering frequency as well as positive self-perceptions of communication in AWS.

**Future Directions**

One question for future research is whether (and to what extent) reductions in stuttering observed with use of scripts generalize beyond clinical interactions and script material. Another direction for a future study is to explore what types of scripts and script topics are beneficial for AWS. Scripts that vary in length, detail, or social function may have different effects on stuttering behavior than the scripts featured in this study. Also unknown is whether script training may benefit children who stutter as well as
aging adults who stutter. It would also be useful to investigate whether use of scripts impacts listener perceptions of people who stutter.

From a technical perspective, it would also be interesting to investigate how script training impacts specific types of stuttering behavior. As outlined in the Method, the current study used a system that categorized stuttering behaviors into primary symptoms of stuttering, superfluous verbal behaviors associated with stuttering, and superfluous non-verbal behaviors associated with stuttering. An informal look at the current data suggests that script training markedly reduced the amount of superfluous verbal behaviors associated with stuttering (e.g., starters such as "um" and "you know"). A more detailed analysis would reveal other symptoms of stuttering that were impacted by script training.

Finally, it is interesting to consider whether a different dependent variable might be useful for defining the baseline, treatment and maintenance phases of script training with people who stutter. Instead of using PSC, we wonder whether it would be more useful to use %SS to achieve better baseline control. Specifically, using a criterion of at least three consecutive sessions above the clinically significant level of 3%SS may provide a more clinically-relevant starting point at which to initiate treatment. Along this same line, the mastery criteria for %SS would require the AWS to remain below the clinically significant level of 3%SS before beginning treatment on the next script.

Summary and Conclusions

The current study provides preliminary evidence that script training may benefit AWS. All participants in this study exhibited reductions in stuttering during script training. At least one participant perceived reduced negative impacts of stuttering on
quality of life following script training. Finally, one participant increased efficiency of speech production (increased speaking rates) during script training. These effects indicate that future feasibility of testing is warranted to continue exploring benefits of script training for people who stutter.
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APPENDIX A:

IRB Consent Form

Informed Consent to Participate in Research Involving Minimal Risk and Authorization to Collect, Use and Share Your Health Information

Pro # 00035861

You are being asked to take part in a research study. Research studies include only people who choose to take part. This document is called an informed consent form. Please read this information carefully and take your time making your decision. Ask the researcher or study staff to discuss this consent form with you, please ask him/her to explain any words or information you do not clearly understand. The nature of the study, risks, inconveniences, discomforts, and other important information about the study are listed below.

We are asking you to take part in a research study called: Script Training in Adults who Stutter

The person who is in charge of this research study is Courtney Rankin. This person is called the Principal Investigator. However, other research staff may be involved and can act on behalf of the person in charge. She is being guided in this research by Nathan Maxfield, Ph.D., CCC-SLP.

The research will be conducted at the University of South Florida Speech-Language and Hearing Clinic.

Purpose of the study

The purpose of this study is to find out if Script Training will increase functional communication by combining and utilizing the motor learning and automaticity theories. Based tentatively on outcomes with people with aphasia and apraxia of speech, script training is predicted to increase errorless speech, and improve self-rated functional communication in adults who stutter.

Why are you being asked to take part?

We are asking you to take part in this research study because you have been previously diagnosed with at least a mild stuttering disorder.

Study Procedures:

If you take part in this study, you will be asked to:

• The study will take place once a week at the USF Speech-Language and Hearing Center.
APPENDIX B:
Participant Scripts

Subject 2:

Script 1:
1. I would like to tell you about my family, my wife is Angela and she is from Colombia
2. We have a two-year-old daughter named Antonia.
3. She is very entertaining, smart, adventurous, and funny
4. Antonia loves animals, so we like to go to the zoo as a family.

Script 2:
1. Several years ago, I got into home brewing
2. Making beer at home is challenging but rewarding.
3. Over the years, I have continued to learn about the various aspects of brewing because there is always something new to learn about ingredients and the brewing processes.
4. So far, I have won a silver medal for a porter, I brewed.

Script 3:
1. Hello, my name is J L
2. I am an anthropologist who works at the James A Haley Veterans Hospital
3. I currently conduct research with veterans with traumatic brain injuries
4. Also, I am planning to conduct art therapy research
Subject 3:

Script 1:

1. My dad grew up in Pittsburg and I have a lot of family who still live out there.
2. I grew up watching the Steelers and I have fallen in love with the team.
3. The entire city rallies behind their sports teams and everyone is super involved and excited.

Script 2:

1. As a person who stutters, I’ve experienced therapy growing up both good and bad
2. I want to be able to relate with clients and make them feel comfortable
3. I’ve been fortunate to have overcome my issues with stuttering and want to help others do the same

Script 3:

1. I am a student at the University of South Florida wanting to specialize in Speech Language Pathology.
2. I would love to be able to observe you in order to gain more experience in my field.
3. Please let me know if there is any way that I can get involved or observe.

Subject 4:

Script 1:

1. My two main hobbies are reading and playing on my computer.
2. I like non-fiction a lot but I am more partial to reading fantasy series.
3. On the computer I alternate between surfing the web and video games.
**Script 2:**
1. I live on a ten-acre sized property.
2. My dad grows blueberries on some of it.
3. We used to have cows but thankfully we got rid of them.

**Script 3:**
1. I have a father, mother, and one brother.
2. My dad is a cop and my mom is a nurse.
3. My brother is in school to be an electrical engineer.
APPENDIX C:

Script Training Exit Interview

Opening Questions:
1. How did you learn about this research study?

2. Can you tell me about a typical script training session?

Key Questions:
3. How do you feel about the script training treatment?

4. What, if anything, did you like about the treatment?
   Probe: Aspects that were helpful?

5. What, if anything, did you dislike about the treatment?
   Probe: Aspects that were unhelpful?

6. How would you describe your confidence to communicate with others using your scripts?
   Probe: Does this change for different scripts? Different listeners/situations?

7. How would you describe your confidence to communicate *fluently* while using your scripts?
   Probe: Does this change for certain scripts? Different listeners/situations?

8. Do you see yourself using script training in your everyday life?
   Probe: How do you see yourself using it?/Why not?

9. How would you feel about participating in script training treatment again?
   Probe: Willing? Unwilling?

Closing Questions:
10. How do you think this treatment can be improved?

11. What suggestions would you give to future participants?