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# Speech Remediation of Long-Term Stuttering: A Case History

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## Abstract

This research article describes the remediation of moderate stuttering in an adult client who experienced speech dysfluency for more than 40 years. Treatment took place at an urban residential rehabilitation mission where the client was court sentenced for a history of felonies and current narcotic sales and use. In conjunction with the operant conditioning instruction of the rehabilitation mission, the Ryan Fluency Program was implemented along with the initial use of *pause time* in response to the complex needs of the client. The article provides an overview of the assessment (Fluency Interviews, Criterion Tests) and treatment program. At present, 2.5 years post-initiation of treatment, the client has reported and been observed to have achieved smooth, forward-flowing, natural sounding speech throughout his work environment, family interaction, and daily life.

## Keywords

stuttering, operant conditioning, fluency, motivation

## Introduction

Discussions of stuttering research often detail the clinical aspects of the disorder, identify appropriate therapeutic interventions, and consider outcomes. The current emphasis on evidence-based practices requires adherence to this approach; however, within this clinical perspective, some of the human aspects of stuttering and of stuttering management can be lost. It is some of the unusual human aspects of stuttering that distinguish this case from many of those found in the literature. The client discussed in this case study was a felon who had been incarcerated multiple times, never completed high school, had stuttered for more than 40 years, and experienced remediation of his dysfluencies late in life.

Stuttering is a complex disorder and can be defined as speech that contains sound, syllable, or word repetitions, as well as blocking and silent and/or audible prolongations. It can occur on content or function words and may or may not be accompanied by secondary struggle behavior (Duffy, 2005; Martin & Haroldson, 1981). A review of stuttering literature reveals multiple approaches to treatment (Lattermann, Shenker, & Thordardottir, 2005), and controversies surrounding the recovery (Anderson & Felsenfeld, 2003), and etiology of the disorder (Bothe, Davidow, Bramlett, & Ingham, 2006; Hayhow, 2010; Olander, Smith, & Zelaznik, 2010; Yaruss, 2001).

Although there are many established interventions for stuttering therapy, the two primary behavioral methods include fluency shaping and stuttering management. Fluency shaping involves a reduction in or the elimination of stuttered speech; its goal is the prevention of fluency disruptions.

Stuttering management instructs the person who stutters to react to stuttered speech without tension or struggle; its goal is speech free of obvious effort (Bothe et al., 2006; Prins & Ingham, 2009). In addition to these behavioral approaches, there are established interventions that involve the use of technology, including delayed-auditory feedback (DAF) and SpeechEasy (Bothe et al., 2006).

The debate surrounding recovery involves lack of a clear consensus of what constitutes recovery from stuttering (Lattermann et al., 2005) and whether the fluency changes can be considered natural and automatic, or intentional (Bothe et al., 2006). Furthermore, the complex etiology of the disorder contributes to the controversy in that stuttering can be incipient (Bloodstein, 2006) or acquired (Duffy, 2005), and can be attributed to linguistic, genetic, or psychosocial causes (Gordon, 2002).

The research reported in this article describes the use of an operant conditioning program, based on fluency shaping, as a therapeutic intervention. Operant conditioning has been established as (a) evidence-based (Finn, 2003; Onslow, 2003), (b) client-sensitive, (c) empirically driven, and (c) an efficacious model to reduce the behavior of stuttering (Bothe, 2003; Bothe et al., 2006; Franklin, Taylor, Hennessey, & Beilby, 2008; Nittrouer & Cheney, 1984; B. Ryan, 2001; B. P. Ryan & Ryan, 1995). One established operant conditioning

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program is the Ryan Fluency Program (RFP). The RFP involves establishing fluency with a single spoken word and increasing that fluency, in a series of steps, to 5 min of conversation: Clients progress in their fluency through the three phases of establishment, transfer, and maintenance (B. Ryan & McMicken, 2007). Published research has demonstrated the validity and effectiveness for the three phases described above (Bothe et al., 2006; B. Ryan, 2001; B. P. Ryan & Ryan, 1995; B. Ryan & Van Kirk, 1973). The reader is referred to the appendix for a detailed description of this hierarchy.

The RFP program was chosen for use in this study based on published efficacy (Bothe et al., 2006; B. Ryan, 2001), the primary author's familiarity with the program, and the previous successful application (B. Ryan & McMicken, 2007) in a university setting following standard American Speech-Language-Hearing Association (ASHA) guidelines (ASHA, 1995) for supervision. An additional factor in the decision to use an operant conditioning approach with this client was based on its usefulness in indirectly modifying complex attitudes regarding the self (Quarrington, 1977). The client discussed in this case study experienced many of the negative consequences associated with stuttering that have been described in research, including the often concomitant, social, emotional, and cognitive aspects (Yaruss, 2001). These consequences have been shown to be societal based and personally imposed, and can include feelings of low self-esteem, humiliation, isolation, shame, and restrictions across relationships, employment, and education (Plexico, Manning, & DiLollo, 2004).

## Purpose

The primary purpose of this study was to document the reduction of the overt stuttering behaviors of a long-term stutterer and the subsequent continuous production of effective speech. Effectiveness was defined as speech that was free of overt dysfluencies, natural sounding, appearing spontaneous across settings and communication partners, and free of obvious, external controls (Kalinowski, Saltuklaroglu, Dayalu, & Guntupalli, 2005; Prins & Ingham, 2009).

## Method

### Client

The client in this study was a 47-year-old man (TF) with a 44-year history of moderate stuttering. At the time of referral for speech-language pathology evaluation and treatment, the client was living in a residential drug and alcohol rehabilitation mission. He had been court ordered into this facility in lieu of incarceration with the explicit understanding that any rule deviation would result in a return to incarceration. The program's 2-year, behaviorally based approach was developed specifically for individuals with histories of substance abuse. During their

stay, residents are required to take classes geared toward rehabilitation and a high school diploma. More advanced educational opportunities are available when appropriate.

TF's long drug history included methamphetamine and cocaine use since the age of 14. He spent 1 year in the California Youth Authority and did not graduate from high school. He served 12 years in prison for armed robbery and was jailed for several short periods of time for narcotics use and sales. Work history was intermittent and included truck driving and auto mechanics. With regard to emotional status, TF reported that his speech had been a source of emotional torment and educational failure since childhood. In interviews with his program counselors, he related that on many occasions he had contemplated, but never attempted, suicide. Previous speech therapy for stuttering included limited and unsuccessful treatment as an adolescent in the public school system.

### Testers and Clinicians

The first author and two graduate student clinicians performed assessment and alternated administering the treatment with the client. The graduate student clinicians involved in the therapeutic process had been trained in the university setting on use of the RFP and its specific therapy application, Gradual Increase in the Length and Complexity of an Utterance (GILCU). The first author supervised the student-administered assessment and treatment to ensure compliance and accuracy during evaluation and individual speech therapy sessions.

### Speech and Other Assessment

Baseline fluency testing was accomplished using the revised Fluency Interview (FI; B. V. Ryan & Ryan, 2005), with the addition of telephone speaking and the use of language appropriate for an adult. In addition to the FI, Criterion Tests (CTs) of 5 min each of reading, conversation, and monologue were delivered at the completion of each phase. Stuttering behavior was rated initially as moderate across the tasks of reading, monologue, and conversation. All assessment was performed live due to the mission's privacy policy, which prohibited audio and videotaping. As such, the researchers counted and documented stuttered words (SWs) rather than syllables. The average observed SWs per minute (SWs/M) was 9 SWs/M. Accompanying behaviors consisted primarily of single and multiple part-word repetition with occasional prolongations and struggle, which included eye blinks.

As part of the initial assessment, the Erickson S-24 Scale (Andrews & Cutler, 1974) was used as a qualitative measure. This scale was used to capture TF's perceptions about his communication abilities, pre-treatment and post-treatment. Higher scores on the 24-point scale indicate increased difficulty with and decreased perceptions regarding communicative competence. TF's score on the Erickson S-24

Scale was 18 out of 24, which indicated a prevalence of negative emotions or behaviors associated with stuttering.

In addition, the client was asked to assess his speech naturalness, pre-treatment and post-treatment, using a 9-point scale (1 = *highly natural speech*, 9 = *highly unnatural speech*; Martin, Haroldson, & Triden, 1984). Initially, he rated his pretreatment speech naturalness at a Level 7. These measures were repeated post-establishment and post-transfer.

Following initial testing with the FI and CTs, a modification to the standard RFP was introduced as a technique to assist with fluency. This modification, described as *pause time*, was used solely in the initial 3 hr of counseling and interviews by the first author, who suggested that the client try to stop himself when he felt he was going to stutter, pause for a second, and then try to speak fluently. When this modification was used, the behavior was always counted as a stutter. TF adopted this technique intermittently throughout establishment, until he had developed his own strategies and pace.

### Reliability

All timing and counting of SWs were performed live during the initial evaluation and FI and CT sessions, with both graduate student clinicians and the first author timing and counting SWs independently. During these assessment sessions, all three individuals involved in the treatment were present. During treatment, the first author was present and supervised the graduate student clinicians 50% of the time.

The procedure consisted of counting total SWs and total words spoken (WS), and dividing either of those numbers by the talking time of the client to yield SWs/M and WS per minute (WS/M). The testers also noted topography (type) of stuttering, which fell into the following classifications: whole-word repetition, part-word repetition, prolongation, and struggle.

To ensure interjudge reliability, the two graduate student clinicians were trained on counting SWs, prior to evaluation, with the B. Ryan and Van Kirk (1973) audiotape recordings for counting different types of dysfluencies, Tapes 1 through 3. When the training was completed, both students were able to identify SWs emitted by persons who stuttered on the test on Tape 3 with 90% to 95% accuracy.

Interjudge reliability during assessment and treatment was determined by an agreement between the first author and at least one of the two graduate student clinicians. Agreement was generally high with both students and the instructors (above 90%), with only occasional instances of disparity. The first author maintained notes documenting the number of SWs and WS at least once a week. TF was aware when he was being timed and when his SWs were being counted. During treatment, CTs, and FI, agreement between the first author and the two graduate student clinicians was very high as there were so few, if any, examples of stuttering. Two and a half years after initiation of treatment, there was a total of 1 SW during 50 total minutes of talking time ( $1/50 = 0.02$  SWs/M) and the agreement between two observers was 100%.

### Treatment

TF was assessed and began treatment 1 month after starting the 2-year residential program. The chaotic nature of the facility was such that there was no consistent treatment location and there were frequent interruptions due to the unpredictable nature of the setting. Although these conditions were neither standard nor ideal, no other options existed for the assessment and treatment procedures. Ongoing criterion for success of the procedures consisted of 0.0 SWs/M during program steps and 0.5 SWs/M or less during 5 min each of reading, conversation, and monologue in posttreatment CTs. Following standard protocol, during the treatment portion of the program, the participant was told "good" by the clinician after each correct, fluent response, and "stop, speak fluently," if the responses were stuttered. The client used the *pause time* procedure occasionally during the establishment phase.

At the program outset, the clinicians strictly adhered to the RFP and stopped TF only when a SW was uttered. Due to the nonstandardized use of *pause time*, pauses were counted as SWs in the program. TF's reading selections were chosen from personally relevant texts. Monologue topics involved discourse on specific passages and their personal relevance. Conversation involved reflections on his family and his troubled past. TF's requisite parole hearings were used as part of his transfer activities. He was seen twice a week in treatment, although the frequency was sometimes reduced to once a week if treatment conflicted with his on-site work schedule and requisite classes. TF was encouraged to verbally participate in these classes when he felt comfortable with the process.

### Results

The results are shown in Tables 1 and 2.

### Establishment

Total establishment hours for the three modalities of reading, monologue, and conversation were 23 hr over 10 weeks, with the client seen twice a week for 50-min sessions. The time required for the establishment phase was longer than the reported mean of 8.1 hr (B. Ryan, 2001), which may reflect the multiple session interruptions and the inconsistent treatment location. However, consistent improvement was demonstrated as measured by the FIs and CTs.

### Transfer

The transfer program continued for the next 6 months, with the client being seen 2 to 3 times a week in a variety of settings. He was seen for a total of 61 hr in transfer, which exceeded the reported mean indicated by Ryan of 11.7 hr (B. Ryan, 2001). This extended number of transfer hours reflects the commitment of the researcher, the commitment

**Table 1.** Results of FI and CT (a) Pre-GILCU Establishment, (b) Post-Establishment Through Pre-Transfer, and (c) Post-Transfer for Client TF

Date (Phase)	Tests			Hours
	FI (SWs/M)	CT (SWs/M)	CT (WS/M)	
October 11, 2009 (Establishment)	M	M	M	
October 11, 2009 (Establishment)	9.5	11.3	110.6	23
January 13, 2009 (Transfer)	NA	0.4	105.5	61
July 1, 2009 (Maintenance)	0.0	0.0	115.0	32
Total	NA	NA	NA	116

Note: FI = Fluency Interview; CT = Criterion Tests; GILCU = Gradual Increase in the Length and Complexity of an Utterance; SWs/M = stuttered words per minute; WS/M = words spoken per moment; NA = not applicable or not done.

**Table 2.** Results of Speech Naturalness Scale (Martin, Haroldson, & Triden, 1984) and Erickson S-24 Scale (Andrews & Cutler, 1974)

	Speech Naturalness <sup>a</sup>	Erickson S-24 Scale <sup>b</sup>
	9-point scale	24-point scale
Pre-treatment	7	18
Post-treatment	1	4

<sup>a</sup>Norms: Individuals who stutter,  $M = 6.52$  ( $SD = 2.0$ ), and nonstuttering individuals,  $M = 2.12$  ( $SD = 1.17$ ; Martin et al., 1984).

<sup>b</sup>Norms: Individuals who stutter,  $M = 19.22$  ( $SD = 5.38$ ), and nonstuttering individuals,  $M = 9.14$  ( $SD = 4.24$ ; Manning, 2009).

and motivation of the client, and the multiple opportunities available for transfer activities in the mission community, which went well beyond those described in the RFP and B. Ryan (2001). This considerable increase in hours and activities was deemed necessary because the client had been treated unsuccessfully in the past and appeared to benefit from the additional training.

Transfer began with sessions held 1 to 3 times weekly based on TF's schedule. Treatment consisted of 1- to 2-min segments of talking time in various settings and activities, such as making phone calls, giving directions, and using set questions to interview coworkers, other mission students, and his supervisors. The first author was able to incorporate many of the frequent unusual speaking situations from the mission into TF's transfer activities (e.g., having to go to the police station and make a report of a terrorist threat to the desk sergeant and detective on duty).

One month into his transfer program, TF became a member of the security team at the rehabilitation mission. This position offered frequent opportunities to speak to guests as they entered the facility and required him to speak over the security radio communication system. The first author incorporated these speaking opportunities into his transfer activities; some transfer sessions were held in the guard station. During transfer, TF's supervisor reported occasional stuttering when TF was in stressful situations, such as when his work responsibilities required him to reprimand other mission residents. However, in clinical session, no more than 1 to 2 SWs/M were noted with transfer session averages of 0.05 SWs/M. Overall, TF improved from 0.4 to 0.0 SWs/M on the FI and CTs. The use of these varied settings and situations is supported by research that

has demonstrated the relevance of these factors in treatment, as they reveal a more accurate indication of the stuttering behaviors (Finn, 2003).

### Maintenance

At the time of this report, TF was being seen once a week in maintenance and had completed 32 hr. This therapeutic time is longer than the average reported 11.2 hr by B. Ryan (2001). TF was given extra time in maintenance. In all, 13 months after his initial speech assessment, TF spoke extemporaneously about his speech at the graduation ceremony at the rehabilitation mission in front of 300 attendees, including friends, family, community members, and mission staff. His speech, as reported by several observers, was reported to be free of dysfluencies. The first author was also in attendance and observed no incidences of stuttering. Two recent informal conversations with the first author and several graduate students revealed no incidences of observed or reported stuttering.

### Other Assessments

As discussed above, TF's pretreatment speech naturalness was self-rated using the 9-point speech naturalness scale (1 = *highly natural speech*, 9 = *highly unnatural speech*; Martin et al., 1984) at a Level 7, and posttreatment and post-transfer naturalness were self-rated at a Level 1: Research has validated the use of this scale to evaluate speech quality and to assist in treatment decisions (Finn, 2003). In addition, the client's communication attitudes were self-assessed pretreatment with the Erickson S-24 Scale (Andrews & Cutler, 1974) at a level of 18. Post-transfer, his Erickson S-24 Scale

score was 4, which indicated that his self-perception of speech difficulty was minimal.

### Final Observations

Following transfer, when compared with normally fluent speakers, TF generally spoke in a slower yet animated manner (Table 1, 115.0 WS/M,  $M = 150.9$ ,  $SD = 31.9$ , 1  $SD$  range of 119-182.6; B. Ryan, 2001). In interview, he mentioned several times that his fluent speech required focus. In a recent posttreatment interview, conducted by the first author, he explained that he is still getting used to how his new speech feels and sounds, that it was beginning to feel more *natural* to him, and that it is much easier to produce under all circumstances. The relevance of these statements is reflective of the clinical significance of the treatment, in that "how it feels" is a measurable difference available only to the client, a predictable finding validated across research (Finn, 2003; Guntupalli, Kalinowski, & Saltuklaroglu, 2006). TF recently reported that in certain environments, he tends to become anxious and hurried. Under these circumstances, his speech requires greater focus, which he does not consider a problem. The required concentration described by the client has been corroborated by participants of other studies, who have been reported to state that recovery from stuttering requires vigilance and attentiveness (Anderson & Felsenfeld, 2003; Boberg & Kully, 1994). Of note is that TF did not demonstrate any apparent anxiety-related fluency diminishment while in the clinic or in multiple transfer situations.

Maintenance began on a once-a-week treatment basis with the client additionally reporting weekly for 15 min over the phone on his fluency skills. He has been given a CT on a monthly basis. TF's use of *pause time* remained at zero during maintenance. TF was in a monitored maintenance program, which was gradually faded out over a year. At the time of this report, TF was working as an auto detailer and was enrolled in a religious college program to become a pastor. He has continued with a self-reported stuttering level of 1 or 2 incidences in 50 min of talking and a monthly CT of 0.0 SWs/M in conversation, reading, and monologue. He does not use the *pause time* procedure at this time. He reports that he has maintained what he and other listeners consider to be fluent, natural sounding, spontaneous speech across settings and communication partners, which is free of obvious, external controls.

### Discussion

Late remediation from stuttering is considered rare and has received little attention in the research field (Anderson & Felsenfeld, 2003), but it does occur. This remediation can occur with and without intervention (Finn, 1997). Repeated research and thematic analysis (Anderson & Felsenfeld, 2003; Finn, 1996; Plexico et al., 2004; Quarrington, 1977) has identified several factors that have contributed to this late recovery including (a) a motivation to change, (b) a

change in confidence, (c) direct speech changes, (d) conscious practice, and (e) relaxation. An analysis of a group of late recovering participants by Quarrington (1977) supports the contention that the cognitive factor of internal motivation was intrinsic to the recovery.

TF was a highly motivated individual whose goal was to reduce his level of stuttering. He experienced effective remediation of his stuttering behavior with the RFP and his concomitant experience at the rehabilitation mission. Even with the multipoint data collection and documented improvement in settings outside the clinic discussed in this case study (Quarrington, 1977), the influence of the mission rehabilitation experience makes it difficult to identify the exact variables involved in his attainment of nonstuttered, fluent speech. Further compounding issues are reflected in some of the limitations of this study: the inconsistent treatment setting and schedule, the rehabilitation mission privacy policy, which prohibits audio or visual recordings, and the application of novel program modifications.

TF was a unique clinical case because of his long history of stuttering, drug addiction, and incarceration. He chose the rehabilitation mission program over incarceration because of the opportunities it offered; he was motivated to change on many levels. It was that sense of motivation that led him to consider the possibility of speech-language therapy (SLT) to assist him with his communication. The first author accepted TF into SLT based on his perceived sincere desire for change and his deeply felt and frequently expressed sadness and anger over a lifetime of stuttering. TF was able to make behavioral changes in his speech, and experienced parallel success in other areas of his life, as evidenced by his educational and vocational pursuits and his graduation from the rehabilitation program. Research has shown (Plexico et al., 2004) that participants who have recovered from stuttering have described a similar intertwined influence of successful stuttering management and collateral success in other areas of their lives.

Although operant conditioning approaches have demonstrated an increase in fluency among people who stutter (Bothe et al., 2006; Franklin et al., 2008; Nittrouer & Cheney, 1984; B. Ryan, 2001; B. P. Ryan & Ryan, 1995), multiple researchers contend that further research needs to be undertaken to continue to identify effective and efficacious treatments and provide further advancements in evidence-based research (Neumann et al., 2005; B. P. Ryan & Ryan, 1995; Thomas & Howell, 2001). A study by Thomas and Howell (2001) revealed that recommended treatments by SLPs were not always validated by comprehensive research. Continuing, they recommend long-term outcome research, replicability, and good sample size to solidify the integrity of approaches to stuttering. It is clear that although case studies have limitations by the very nature of their structure and design, they have value in the development of clinical insight (Haynes & Johnson, 2009) and may be appropriate for programs that have been individualized (Thomas & Howell, 2001). Furthermore, as one of the basic purposes of research is to accumulate a

body of evidence supporting or contradicting an approach (Hayhow, 2010), this case study has the potential to influence future effective treatment approaches.

This case study supports appropriate modifications to established treatments to meet clients' individual needs, a contention supported by research (Quarrington, 1977). Furthermore, in addition to the successful application of a modified operant conditioning program with a client who stuttered, the first author demonstrated that the investment of additional time, in excess of published parameters, helped this client become more fluent. Although no single factor has been identified as the cause of this need of increased time for intervention, the client's previous failed attempts at remediation and the resulting fear of failure may have been contributing issues. The successful outcome of this case study is a reminder that published standards should not be considered limits and that some clients can become more amenable to treatment with a greater investment of time. Finally, this case study supports previously published research implicating motivation in late recovery from stuttering. While this factor cannot be isolated as a dependent variable, it cannot be discounted as a contributing factor in the client's increase in fluency.

## Limitations

Specific limitations of this study include the unknown influence of the clinician-delivered questionnaires on the client's perspective on his fluency, the lack of inclusion of naïve listeners for speech naturalness ratings, and an inability to provide quantitative statistical analysis with regard to counting total words and SWs. Furthermore, case studies such as this one reflect limitations, including a lack of ability to generalize the study conclusions and the lack of methodological and statistical data needed for statistical analysis. The results of the present single-participant design may provide positive findings of the effectiveness of the interventions for a single participant; however, one can only generally hypothesize, based on these limited data, whether these methods would show equal effectiveness with other similar participants and should be interpreted with caution. However, this case study suggests the use of an operant conditioning-based program for the treatment of stuttering previously resistant to intervention and encourages clinician commitment to new approaches using evidence-based practices toward helping clients achieve remediation of the stuttering behavior.

## Appendix

### *Gradual Increase in Length and Complexity of Utterance (GILCU) Program*

Step number	Stimulus	A Reading	B Monologue	C Conversation	R Recycle
1	"Read/say one word fluently"	Reads 1 word, 10 consecutive 0 SWs	Says 1 word, 10 consecutive 0 SWs	Says 1 word, 10 consecutive 0 SWs	Reads/says 1 word, once at 0 SWs
2	"Read/say two words fluently"	Reads 2 words, 10 consecutive 0 SWs	Says 2 words, 10 consecutive 0 SWs	Says 2 words, 10 consecutive 0 SWs	Reads/says 2 words, once at 0 SWs
3	"Read/say three words fluently"	Reads 3 words, 10 consecutive 0 SWs	Says 3 words, 10 consecutive 0 SWs	Says 3 words, 10 consecutive 0 SWs	Reads/says 3 words, once at 0 SWs
4	"Read/say four words fluently"	Reads 4 words, 10 consecutive 0 SWs	Says 4 words, 10 consecutive 0 SWs	Says 4 words, 10 consecutive 0 SWs	Reads/says 4 words, once at 0 SWs
5	"Read/say five words fluently"	Reads 5 words, 10 consecutive 0 SWs	Says 5 words, 10 consecutive 0 SWs	Says 5 words, 10 consecutive 0 SWs	Reads/says 5 words, once at 0 SWs
6	"Read/say six words fluently"	Reads 6 words, 10 consecutive 0 SWs	Says 6 words, 10 consecutive 0 SWs	Says 6 words, 10 consecutive 0 SWs	Reads/says 6 words, once at 0 SWs
7	"Read/say one sentence fluently"	Reads 1 sentence, 5 consecutive 0 SWs	Says 1 sentence, 5 consecutive 0 SWs	Says 1 sentence, 5 consecutive 0 SWs	Reads/says 1 sentence, once
8	"Read/say two sentences fluently"	Reads 2 sentences, 5 consecutive 0 SWs	Says 2 sentences, 5 consecutive 0 SWs	Says 2 sentences, 5 consecutive 0 SWs	Reads/says 2 sentences, once
9	"Read/say three sentences fluently"	Reads 3 sentences, 5 consecutive 0 SWs	Says 3 sentences, 5 consecutive 0 SWs	Says 3 sentences, 5 consecutive 0 SWs	Reads/says 3 sentences, once
10	"Read/say four sentences fluently"	Reads 4 sentences, 5 consecutive 0 SWs	Says 4 sentences, 5 consecutive 0 SWs	Says 4 sentences, 5 consecutive 0 SWs	Reads/says 4 sentences, once
11	"Read/talk fluently for ½ min"	Reads aloud ½ min at 0 SWs	Talks in monologue ½ min at 0 SWs	Converses ½ min at 0 SWs	Read/monologue/ conversation, ½ min at 0 SWs
12	"Read/talk fluently for 1 min"	Reads aloud 1 min at 0 SWs	Talks in monologue 1 min at 0 SWs	Converses 1 min at 0 SWs	Read/monologue/ conversation, 1 min at 0 SWs
13	"Read/talk fluently for 1½ min"	Reads aloud 1½ min at 0 SWs	Talks in monologue 1½ min at 0 SWs	Converses 1½ min at 0 SWs	Read/monologue/ conversation, 1 min at 0 SWs

(continued)

**Appendix (continued)**

Step number	Stimulus	A Reading	B Monologue	C Conversation	R Recycle
14	“Read/talk fluently for 2 min”	Reads aloud 2 min at 0 SWs	Talks in monologue 2 min at 0 SWs	Converses 2 min at 0 SWs	Read/monologue/ conversation, 2 min at 0 SWs
15	“Read/talk fluently for 2½ min”	Reads aloud 2½ min at 0 SWs	Talks in monologue 2½ min at 0 SWs	Converses 2½ min at 0 SWs	Read/monologue/ conversation, 2 min at 0 SWs
16	“Read/talk fluently for 3 min”	Reads aloud 3 min at 0 SWs	Talks in monologue 3 min at 0 SWs	Converses 3 min at 0 SWs	Read/monologue/ conversation, 3 min at 0 SWs
17	“Read/talk fluently for 4 min”	Reads aloud 4 min at 0 SWs	Talks in monologue 4 min at 0 SWs	Converses 4 min at 0 SWs	Read/monologue/ conversation, 3 min at 0 SWs
18	“Read/talk fluently for 5 min”	Reads aloud 5 min at 0 SWs	Talks in monologue 5 min at 0 SWs	Converses 5 min at 0 SWs	Read/monologue/ conversation, 5 min at 0 SWs
Criterion Test (CT)					
	<0.5 SWs/M—next	Reads aloud	Talks in monologue	Converses	Redo CT
	>0.5 SWs/M—recycle	for 3 min	for 3 min	for 3 min	
Review					
	Read/talk	Reads aloud	Talks in monologue	Converses	
	1 min fluently	1 min at 0 SWs	1 min at 0 SWs	1 min at 0 SWs	

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