

Neurogenic Stuttering and Altered Auditory Feedback

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BACKGROUND:

In recent years, a number of studies have investigated the effects of frequency altered feedback on developmental stuttering, e.g. Stuart & Kalinowski (2004) and Hargrave, Kalinowski, Stuart, Armonson, & Jones (1994).

The present case study documents the effects on neurogenic stuttering of several fluency enhancing conditions, including frequency-altered feedback. Besides the present study, only one other study is known to the author that documents the effects of frequency-altered feedback on neurogenic stuttering (Balasubramanian, Max, Van Borsel, Rayca, and Richardson, 2003).

Neurogenic stuttering is characterized as adult-onset stuttering which appears subsequent to brain damage (Lebrun, 1997). Neurogenic stuttering has been associated with a variety of conditions including strokes, extrapyramidal disease, traumatic brain injury, drug use, and oxygen deprivation (Silverman, 1996). Although some authors have stated that neurogenic stuttering is readily distinguishable from developmental stuttering (e.g. Helm-Estabrooks, 1993; Manning, 2001), others have presented evidence to the contrary (Lebrun, 1997; Van Borsel, 2001, Joke. de Nil, and Sharpe, 2007). Neurogenic stuttering has sometimes been characterized as resistant to fluency enhancing techniques (Manning, 2001; Balasubramanian et.al. 2003). The author's experience with neurogenic stuttering (Humphrey, 2007) was quite different from that of the present subject.

HISTORY:

The subject, a 37 year-old male, was seen for a fluency evaluation on July 23, 2004. He reported being fluent until age 12, when he was hospitalized for three months subsequent to a diagnosis of Reye's syndrome, and he was in an induced coma one month. He reported that he was on phenobarbitol after regaining consciousness, and began to stutter when the phenobarbitol was discontinued.

EVALUATION SUMMARY:

Audition:

The subject passed a hearing screening at 20 dBHL for 500, 1000, 2000, and 4000 Hz, bilaterally.

Intelligibility:

A portion of the Frenchay Test of Dysarthria (Enderby, 1983) was administered to assess

intelligibility. The subject was required to read single words and sentences. He was rated as 67% intelligible for the single words and 92% intelligible for the sentences. During conversation, rapid bursts of unintelligible speech were observed, along with slurring of speech.

Fluency:

On the Stuttering Severity Instrument-3 (Riley, 1994), the subject obtained a frequency task score of 13, a duration score of 6, and a physical concomitant score of 0. His overall score of 19 classified him as “mild”.

During the spontaneous speech task used for the SSI-3, stuttering dysfluencies occurred on 12% of syllables. During the reading task used for the SSI-3, the subject stuttered on 9% of syllables. His stuttered speech was characterized by whole word repetitions, part word repetitions, and interjections. A high number of units of repetition and bursts of rapid speech were noted, along with periods of unintelligible speech due to rapid rate and slurring. However, his overall speaking rate of 210 syllables per minute was average (Guitar, 1998).

On the Cooper Assessment of Stuttering Syndromes-Adults, the subject was rated as having a moderate problem. His rating of a “severe problem” on the Feelings and Attitudes section was a factor in producing a more severe overall rating on the CASS-A than on the SSI-3. The high number of units of repetition observed, combined with the effects of dysarthria led to an impression of more severe involvement than the ratings obtained using either the CASS-A or the SSI-3.

FLUENCY ENHANCING CONDITIONS:

The effects of several fluency enhancing conditions were compared:

Delayed Auditory Feedback:

The subject listened to delays of 500msec, 300 msec, and 150 msec while reading; produced by a Kay Facilitator, Model 3500 (Kay Elemetrics).

Frequency-Altered Feedback:

Frequency-altered feedback was delivered using a Boss VT-1 Voice Transformer. The subject was required to read and converse while listening to his own voice shifted one octave up; he was also required to converse while listening to his own voice shifted one octave down.

Choral Reading:

The subject was required to read simultaneously with a female clinician.

Summary of Results:

Conversation – no AAF 12% dysfluent

Reading – no AAF 9% dysfluent

DAF Reading– 500 msec 15.2% dysfluent
DAF Reading- 300 msec 29% dysfluent
DAF Reading- 150 msec 20% dysfluent

Choral Reading with clinician 1.5% dysfluent
FAF Reading – up one octave 1.0% dysfluent

FAF Conversation – up one octave 7.4% dysfluent
FAF Conversation – down one octave 1.6% dysfluent

DISCUSSION:

For the present subject, an increase in dysfluencies was noted during delayed auditory feedback. This finding was consistent with the finding of Balasubramanian et.al. (2003), who noted a slight increase in dysfluencies across the fluency enhancing conditions they employed. The present subject commented that delayed auditory feedback interfered with his ability to concentrate on what he was saying.

However, for the present subject, reductions in dysfluencies were noted during choral reading, and while reading and conversing during frequency-altered feedback. These results run counter to the results of Balasubramanian et.al.(2003), who reported no improvements in fluency for their subject during choral reading or frequency-altered feedback.

Several differences between the studies should be considered when comparing results of the two studies. Balasubramanian et.al. (2003) used frequency shifts of only 1/2 octave. The present study used frequency shifts of a full octave. The patient studied by Balasubramanian et.al. (2003) had an ischemic lesion to the orbital surface of the right frontal lobe and the pons, and was reported to be a recovered developmental stutterer prior to his CVA. The patient in the present study had indeterminate and presumably more diffuse brain damage, since Reye's syndrome is an infectious disease. He was more disfluent and reportedly did not stutter prior to his hospitalization.

Perhaps individual variation in response to altered auditory feedback was a factor. Ingham, Moglia, Frank, Ingham, and Cordes (1998) found considerable variety in responses of stutterers to frequency-altered feedback.

Systematic investigation of the effects of fluency enhancing conditions, including frequency-altered feedback, may serve to increase our understanding of the differences between developmental stuttering and neurogenic stuttering, as well as variations in neurogenic stuttering patterns.

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