



## A preliminary investigation of daily variability of stuttering in adults



Christopher D. Constantino<sup>a,\*</sup>, Paula Leslie<sup>a</sup>, Robert W. Quesal<sup>b</sup>,  
J. Scott Yaruss<sup>a</sup>

<sup>a</sup> School of Health and Rehabilitation Sciences, University of Pittsburgh, Pittsburgh, PA, United States

<sup>b</sup> Department of Communication Sciences and Disorders, Western Illinois University, Macomb, IL, United States

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### ABSTRACT

**Purpose:** Variability in frequency of stuttering has made the results of treatment outcome studies difficult to interpret. Many factors that affect variability have been investigated; yet the typical range of variability experienced by speakers remains unknown. This study examined the day-to-day variability in the percentage of syllables containing stuttered and nonstuttered disfluencies in the speech of six adult speakers in three spontaneous speaking situations and two reading tasks.

**Methods:** The frequency of moments stuttering during the tasks were compared within and between speakers and days to document the degree of variability in stuttering frequency and explore whether there were any consistent patterns. The Stuttering Severity Instrument-Fourth Edition (SSI-4) and Overall Assessment of the Speaker's Experience of Stuttering for Adults (OASES-A) were also tested for day-to-day variability. Correlations between frequency, severity, and life impact were made.

**Results:** The primary result of this study was the large range over which frequency of stuttering varied from day to day for the same individual. This variability did not correlate with any measures of stuttering severity but did correlate with life impact as measured by the OASES-A. No global pattern was detected in variability from day to day within or between participants. However, there were significantly more nonstuttered disfluencies present during the spontaneous speaking tasks than during the reading tasks. The day-to-day variability in the life impact of the disorder (OASES-A) was less than the day-to-day variability in observable stuttering behavior (percentage of syllables stuttered and SSI-4).

**Conclusion:** Frequency of stuttering varies significantly from situation to situation and day to day, with observed variability exceeding the degree of change often reported in treatment outcomes studies from before to after treatment. This variability must be accounted for in future clinical and scientific work.

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\* Corresponding author at: The University of Memphis, School of Communication Sciences and Disorders, Community Health Building, 4055 North Park Loop, Memphis, TN 38152, United States.

E-mail address: [cnstntn@memphis.edu](mailto:cnstntn@memphis.edu) (C.D. Constantino).

<sup>1</sup> Christopher D. Constantino is now at the School of Communication Sciences and Disorders, The University of Memphis, Memphis, Tennessee, United States.

## 1. Introduction

### 1.1. Variability

Stuttering is variable: the frequency of a speaker's disfluencies, as well as their intensity and duration, vary markedly from situation to situation and from day to day (Bloodstein & Bernstein Ratner, 2008; Costello & Ingham, 1984; Yaruss, 1997a). People who stutter may find variability discouraging because they do not always know when a moment of stuttering will occur. They are given false hope when they experience moments of increased fluency and are disheartened when they are more disfluent (Bobrick, 2011; Carlisle, 1986; Corcoran & Stewart, 1998; Jezer, 1997). Observers see people who stutter speaking fluently in one moment or situation and stuttering in the next. This may give the impression that speakers only need to “try harder,” “slow down,” or “stop being nervous” in order to speak fluently. As individuals who stutter routinely report, this is not the reality of the situation (Bobrick, 2011; Carlisle, 1986; Corcoran & Stewart, 1998; Jezer, 1997). Clinicians are also affected by variability because they do not know if their measurements of a speaker's stuttering behaviors are representative of the speaker's overall experience with the disorder. The stuttering behaviors observed in the clinic are not representative of the client's fluency in general (Ingham, 1975, 1980; Ingham & Lewis, 1978; Johnson, Karrass, Conture, & Walden, 2009). Moreover, when treating a person who stutters, clinicians cannot be certain whether any observed change in stuttering frequency is due to their treatment or to the variability of the speaker's stuttering (Bloodstein & Bernstein Ratner, 2008).

One way to measure the effectiveness of intervention is to compare outcome measures collected at the conclusion of therapy to the same measures collected at baseline (Baxter et al., 2015; Bothe, Davidow, Bramlett, Franic, & Ingham, 2006; Bothe, Davidow, Bramlett, & Ingham, 2006; Ingham & Riley, 1998; Johnson et al., 2015). The variability of stuttering makes this difficult. If an individual's stuttering was particularly mild during baseline testing and particularly severe during post-treatment testing, it could appear that a perfectly valid treatment technique was ineffective. The opposite could also occur, where variability makes an invalid treatment seem successful. This may actually be more likely, if a speaker acclimates to the treatment environment and therefore stutters less at follow-up testing. Some reassurance can be obtained by conducting a large number of repeated baseline measures for each patient prior to treatment and following treatment (Costello & Ingham, 1984); however, even then, it can be difficult to differentiate improvement from normal variability. Stuttering is a complex disorder and not all treatment outcome measures should be based on frequency measures (Yaruss & Quesal, 2004). Counting observable disfluencies is only one way of evaluating the changes a client may experience in treatment. Other measures of treatment outcome, such as quality of life (Craig, Blumgart, & Tran, 2009; Yaruss, 2010), locus of causality (Lee, Manning, & Herder, 2011), life impact (Yaruss & Quesal, 2010), and self-efficacy (Manning, 1994) may also vary, though prior research has not explicitly examined whether this is the case.

### 1.2. Factors affecting variability

Researchers and clinicians have long studied the variability of stuttering, and numerous sources of variability have been identified. Although textbooks and review papers often refer to variability, there is limited information available about the magnitude and meaning of this variability (Bloodstein & Bernstein Ratner, 2008; Conture & Curlee, 2007; Guitar, 2013; Manning, 2010). Researchers have been able to document phenomena that increase or decrease stuttering frequency. Past occurrences of stuttering have been shown to somewhat predict future occurrences of stuttering in repeated readings of a passage (i.e., the “consistency” effect, see Johnson & Innes, 1939; Johnson & Knott, 1937). The occurrence of stuttering is also strongly affected by linguistic factors (Bernstein, 1981; Brown, 1937; Howell, Au-Yeung, & Sackin, 1999; Johnson & Brown, 1935; Taylor, 1966; Yaruss, 1999), as well as paralinguistic factors, such as speaking rate (Costello, 1983; Johnson, 1961a; Kelly & Conture, 1991, 1992; Yaruss, 1997c). Stuttering frequency is affected by various phenomena such as the adaptation effect, the white noise effect, altered auditory feedback, the metronome effect, and the use of novel speaking patterns (see review in Bloodstein & Bernstein Ratner, 2008). Still, none of these discoveries has allowed researchers to completely predict the occurrence of stuttering, for stuttering does not always occur in cycles or follow regular patterns (Pittenger, 1940; Taylor & Taylor, 1967).

The situation in which a person is communicating can also affect their fluency. Differences in the frequency of disfluencies across situations are seen in both nonstuttering children (Silverman, 1971; Wexler, 1982) and children who stutter (Ingham & Riley, 1998; Martin, Kuhl, & Haroldson, 1972). Children who stutter show significantly greater variability between different speaking situations than within a single speaking situation (Yaruss, 1997a). Additionally, reading aloud has been shown to produce less stuttering than spontaneously generated speech (Young, 1980). Frequency of stuttering varies with emotion and stress (Blood, Wertz, Blood, Bennett, & Simpson, 1997; Vanryckeghem, Hylebos, Brutten, & Peleman, 2001). Stuttering has also been shown to vary over time: children can demonstrate large changes in stuttering frequency from one clinic visit to the next (Gutierrez & Caruso, 1995; Throneburg & Yairi, 2001). Thus, situational, emotional, linguistic, and paralinguistic factors all contribute to the variable nature of stuttering behaviors.

Johnson et al. (2009) investigated whether this variability is large enough to alter the diagnosis of fluent children and children who stutter. The literature recommends diagnosing stuttering only after speech samples have been collected in multiple conditions; however, clinicians often do not have access to other speaking partners, locations, or contexts (Johnson et al., 2009). Speech samples are regularly collected in what Johnson et al. call the *typical clinical condition*, which is a

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