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Speech disfluencies of preschool-age children who do and do not stutter

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ABSTRACT

Purpose: The goals of the present study were to investigate whether (1) the speech disfluencies of preschool-age children are normally distributed; (2) preschool-age children who do (CWS) and do not stutter (CWNS) differ in terms of non-stuttered disfluencies; (3) age, gender, and speech-language ability affect the number and type of disfluencies children produce; and (4) parents' expressed concern that their child stutters is associated with examiners' judgments of stuttered disfluency.
Method: Four hundred and seventy two children participated, of which 228 were CWS (56 girls), and 244 CWNS (119 girls). Participants provided conversational speech samples that were analyzed for frequency of occurrence of (a) stuttered disfluencies, (b) non-stuttered disfluencies, and (c) total disfluencies.
Results: Results indicated that the underlying distributions of preschool-age children's stuttered and non-stuttered disfluency counts followed a negative binomial distribution (i.e., were not normal), with more children "piling up" at the low end [none or few disfluencies] and fewer children scoring in the upper [more severe stuttering] end of the distribution. Findings also indicated that non-stuttered disfluencies significantly predicted CWS/CWNS talker group classification, information that may be helpful to augment, but not supplant, talker group classification criteria based on stuttered disfluencies. Moreover, expressed parental concern about stuttering was strongly associated with frequency of stuttered disfluencies.
Conclusion: Findings suggest that the entirety of preschool-age CWS' speech disfluencies – non-stuttered as well as stuttered – differs from that of their CWNS peers and that because these disfluencies are not normally distributed statistical analyses assuming normality of distribution are not the most appropriate means to assess these differences. In addition, certain "third-order" variables (e.g., gender) appear to impact frequency of children's disfluencies and expressed parental concerns about stuttering are meaningfully related to examiners' judgments of stuttered disfluencies.

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Learning outcomes: The reader will recognize differences in speech disfluencies of preschool-age children who do and do not stutter. The reader will recognize whether age, gender and speech-language ability affect the number and type of disfluencies children produce. The reader will describe whether parental concern about stuttering is associated with examiners' judgments of stuttering.

1. Introduction

During the late 1950s, Johnson et al. (1959) provided normative data regarding the speech disfluencies of children who do and do not stutter. These researchers obtained their data from assessments of audio recordings of children's speech disfluencies. Since then, several others based on similar recordings of speakers of English (e.g., Ambrose & Yairi, 1999; Pellowski & Conture, 2002; Yaruss, LaSalle, & Conture, 1998) and speakers of other languages (e.g., Boey, Wuyts, Van de Heyning, Bodt, & Heylen, 2007; Carlo & Watson, 2003; Martins & Andrade, 2008; Natke, Sandrieser, Pietrowsky, & Kalveram, 2006), have contributed data to the foundation laid down by Johnson and colleagues in the 1950s. Combined, these empirical investigations, studied 908 children who stutter (CWS) and 258 children who do not stutter (CWNS). Although the nature of the samples differed (e.g., some involved the child talking to an experimenter, others the child talking to a caregiver, and some collected the data within research whereas others within a clinical setting), this accumulated dataset represents one of the largest repositories of information presently available regarding the speech disfluencies of CWS and CWNS.

There are, however, some issues relating to this body of knowledge that bear further consideration. First, there is the issue of how underlying characteristics of stuttered (i.e., sound-syllable and monosyllabic whole-word repetitions and sound prolongations) and non-stuttered (i.e., interjections, phrase repetitions and revisions) disfluencies may impact data analysis. For example, are the distributions of such disfluencies Gaussian or normal? Second, is the issue of whether, in addition to stuttered disfluencies, "non-stuttered," "other" or "normal" disfluencies are salient to our understanding and/or classification of developmental stuttering in preschool-age children. Third, is the issue of misattribution of effect, that is, do third-order variables (e.g., age, gender or speech-language status) confound our understanding of between-group differences in speech disfluency. Fourth, is the issue of whether there is an association between parents/caregivers' expressed reports of concern that their child is or is suspected to be stuttering and examiners' measurement of the child's instances of stuttered disfluencies? Below, we briefly examine each of these issues.

The first issue, the distribution of speech disfluencies, has received little attention in data analyses, with a few exceptions. For example, Johnson, Darley, and Spriestersbach (1963) noted that the frequency distributions of speech disfluencies "are considerably skewed or "long-tailed in one direction" with "piling up of scores toward the low end of the distribution" (p. 252). Similar descriptions were also reported by Davis (1939) and Jones, Onslow, Packman, and Gebski (2006). Johnson and colleagues further speculated that from such distributions "we may draw the generalization that there are more relatively mild than relatively severe stutterers" (p. 252). Interestingly, however, researchers assessing between-group differences in speech fluency (e.g., Yaruss, LaSalle, et al., 1998; Yaruss, Max, Newman, & Campbell, 1998) have typically employed parametric inferential statistical analyses that assume normality of distribution (e.g., analysis of variance, *t*-tests, etc.). Unfortunately, despite the observations of Johnson and colleagues, as well as Davis and others, there is little empirical evidence in the literature that the underlying distributions of reported speech disfluencies (e.g., stuttered disfluencies, non-stuttered disfluencies and so forth) are normally distributed. If the distributions of (non)stuttered disfluencies assume a non-normal or non-Gaussian form (e.g., strong positive skew), then the use of parametric inferential statistics may be problematic. If the assumption of normality cannot be met, then the assumption of ordinary least squares regression or analysis of variance is violated, possibly leading to the rejection of the null hypothesis when in fact it is true. If such violation is the case, it leads to the suggestion that researchers' consider employing analytical statistical models that better fit the data's actual distribution.

A second question concerns the frequency of stuttered disfluencies and non-stuttered or normal disfluencies exhibited by children who do and do not stutter. Many studies of developmental stuttering, and reasonably so, have classified the two talker groups based on frequency of instances of "stuttering" (e.g., Ambrose & Yairi, 1999; Anderson & Conture, 2001; Logan & LaSalle, 1999; Sawyer & Yairi, 2006; Watkins & Yairi, 1997). It should be noted that that some differences do exist across various studies in the way stuttered disfluencies are described as well as what constitutes a stuttered disfluency (for further review, see Einarsdottir & Ingham, 2005). At present, however, some have classified children as stuttering if the child exhibits 3% or greater stuttered disfluencies in their conversational speech sample (e.g., Conture, 2001; Yairi & Ambrose, 2005). Similarly, Boey et al. (2007), based on a large sample of Dutch-speaking children ($n = 772$), reported that the "3% rule" has high specificity (true negative CWNS classifications) and high sensitivity (true positive CWS classifications). However, to the present writers' knowledge, specificity and sensitivity of the "3% rule" have never been assessed in a large sample of English-speaking children.

Although frequency of stuttered disfluencies is often used to diagnose and classify stuttering in children, there is less certainty regarding the salience of "non-stuttered," "other," or "normal" disfluencies to the diagnosis and/or understanding of developmental stuttering. Some studies have reported that CWS produce significantly more non-stuttered disfluencies than CWNS (Ambrose & Yairi, 1999; Johnson et al., 1959; Yairi & Ambrose, 2005) whereas others did not find any significant difference (Logan, 2003; Pellowski & Conture, 2002; Yairi & Lewis, 1984). One may ask, therefore, whether non-stuttered