ABSTRACT: Purpose: The purpose of this study was to assess the intratest scatter (variability) on standardized tests of expressive language by preschool-age children who do (CWS) and do not stutter (CWNS).

Method: Participants were 40 preschool-age CWS and 46 same-age CWNS. Between-group comparisons of intratest scatter were made based on participants’ responses to the Expressive subtest of the Test of Early Language Development, Third Edition (TELD–Exp; Hresko, Reid, & Hamill, 1999) and the Expressive Vocabulary Test, Second Edition (EVT–2; Williams, 2007). Within-group correlational analyses between intratest scatter and stuttering frequency and severity were also conducted for the CWS.

Results: For the CWS, categorical scatter on the EVT–2 was positively correlated with their stuttering frequency. No significant between-group differences in intratest scatter were found on the TELD–Exp or the EVT–2.

Conclusion: Consistent with earlier findings, variability in speech-language performance appears to be related to CWS’ stuttering, a finding taken to suggest that an underlying cognitive–linguistic variable (e.g., cognitive load) may be common to both variables.

KEY WORDS: stuttering, scatter, dissociations, attention, language
and/or imbalanced language abilities possibly result in fewer cognitive–linguistic resources available for speech fluency (see Hall, 2004). Further, the act of stuttering itself appears to be correlated with several linguistic variables. For example, CWS are more likely to stutter on utterance-initial words, function words, or utterances of higher complexity (e.g., Buhr & Zebrowski, 2009; Richels, Buhr, Conture, & Ntourou, 2010). Ntourou, Conture, and Lipsey’s (2011) meta-analytical study of language and childhood stuttering indicated that CWS, on average, score 0.5 SD below CWNS on a variety of standardized measures of language (cf. Nippold, 2012). Although none of these studies proves that disruptions in language processes cause developmental stuttering, they do suggest that language is associated with stuttering and that the nature of this association warrants further empirical study. Given these studies, it also seems reasonable to posit that cognitive–linguistic unevenness may not be evident only between tests of different speech-language domains, but also within a single test of speech-language.

Consistent with this notion, Walden et al. (2012) reported a significant correlation between the frequency of disfluency and expressive language unevenness in CWS, as measured by the presence of “scatter” on the Expressive subtest of the Test of Early Language Development, Third Edition (TELD–Exp; Hresko, Reid, & Hamill, 1999). Walden et al. operationalized scatter on the TELD–Exp as the presence of multiple basal runs of correct items separated by one or more incorrect items. Intratet scatter has been broadly defined as an inconsistent pattern of response to items within a hierarchically organized test (Lezak, 1995), such that “a child who fails some easy items and then passes more difficult items may be considered to have intrasubtest scatter” (Dumont & Willis, 1995, p. 272). Furthermore, there is some neuropsychological research suggesting that intratet scatter may be a valid measure of certain attentional or cognitive constructs (see Godber, Anderson, & Bell, 2000).

Thus, there is some evidence that unevenness in the association between language and stuttering may be assessed by means of both intertest dissociations (Anderson et al., 2005; Coulter et al., 2009) and intratet scatter (Walden et al., 2012). Moreover, it seems likely that scatter may emerge not only within the TELD–Exp but also on other tests of expressive language such as the Expressive Vocabulary Test, Second Edition (EVT–2; Williams, 2007).

The present study was designed to objectively assess the intratet scatter of CWS and CWNS on standardized tests of expressive language abilities. In addition, we examined the relation among intratet scatter, stuttering frequency, and severity for CWS.

First, we assessed whether CWS and CWNS significantly differed in their expressive intratet scatter on the TELD–Exp and EVT–2. We hypothesized that CWS would exhibit significantly more intratet variability than CWNS on both measures. Second, we conducted within-group analyses for the CWS, relating intratet scatter scores to the frequency and severity of stuttering in order to address the hypothesis of a positive correlation between intratet scatter and stuttering frequency.

**METHOD**

**Participants**

Participants were monolingual speakers of English, including 40 CWS (30 males and 10 females, $M_{\text{age}} = 46.7$ months, $SD = 6.4$) and 46 CWNS (32 males and 14 females, $M_{\text{age}} = 46.3$ months, $SD = 7.3$). All of the participants were preschool-age (3:0 [years:months]–5:3), with no significant between-group differences in age. $\chi^2(1, N = 86) = 0.3$, $p = .58$, or chronological age, $t(84) = 0.26$, $p = .41$.

The participants’ data were collected as part of a large-scale empirical investigation of linguistic and emotional contributions to developmental stuttering (e.g., Arnold, Conture, Key, & Walden, 2011; Choi, Conture, Walden, Lambert, & Tumanova, 2013; Clark, Conture, Walden, & Lambert, 2013; Coulter et al., 2009; Karrass et al., 2006; Ntourou, Conture, & Walden, 2013; Walden et al., 2012). All were paid volunteers whose parents either (a) learned of the study from an advertisement in a free, monthly parent magazine that was circulated throughout middle Tennessee, (b) were contacted from Tennessee state birth records, or (c) were referred to the Vanderbilt Bill Wilkerson Hearing and Speech Center for speech evaluation. Informed consent by parents and assent by children were obtained.

The Hollingshead Four-Factor Index of Social Position (Hollingshead, 1975) was used in the present study to provide a descriptive/demographic measure classifying participants’ socioeconomic status (SES). This index takes into account parents’ self-reported education levels, occupation, gender, and marital status. Possible scores range from 8 to 66, with a higher score indicating a higher SES.

**Classification and Inclusion Criteria**

In order to minimize the possibility that the study results might be confounded by clinically significant speech-language-hearing deficits, all of the participants were administered standardized measures of
articulation, expressive/receptive language skills, and hearing ability. Participants were excluded from the study if they scored below the 16th percentile (i.e., 1 SD below the mean) on any of the following: Receptive and Expressive subtests of the TELD–3 (TELD–Rec and TELD–Exp, respectively; Hresko et al., 1999), Peabody Picture Vocabulary Test, Fourth Edition (PPVT–4; Dunn & Dunn, 2007), EVT–2, and the Sounds in Words subtest of the Goldman-Fristoe Test of Articulation, Second Edition (GFTA–2; Goldman & Fristoe, 2000). Participants were also excluded if they did not perform within normal limits on a bilateral pure-tone hearing screening (American Speech-Language-Hearing Association, 1994). Furthermore, in order to provide an independent test of the relation between scatter and expressive language performance, participants were excluded from the present investigation if they had served as participants in the Walden et al. (2012) study.

A child was assigned to the CWS talker group if he or she met both of the following criteria, as determined by a speech-language pathologist’s assessment of the first 300 words in an unstructured conversation sample: (a) three or more stuttered disfluencies (i.e., sound/syllable repetitions, sound prolongations, and monosyllabic whole-word repetitions) per 100 words of conversational speech (Conture, 2001), and (b) a score of 11 or greater (i.e., severity of at least mild) on the Stuttering Severity Instrument—Third Edition (SSI–3; Riley, 1994). A child was assigned to the CWNS talker group if he or she (a) exhibited two or fewer stuttered disfluencies per 100 words of conversational speech (Zebrowski & Conture, 1989) and (b) received a score of 10 or lower (i.e., severity of less than mild) on the SSI–3.

Measures

**Intratext scatter of expressive language.** The TELD–Exp measured the child’s overall expressive language abilities, and the EVT–2 exclusively targeted expressive vocabulary. Patterns of response within these (sub)tests were evaluated for variability, discussed here as *intratext scatter*. As shown in Table 1 and described immediately in the following paragraphs, two methods for evaluating intratext scatter were applied to participants’ responses on the TELD–Exp and EVT–2.

The first, a *categorical* measure of scatter, was operationalized as the presence/absence of multiple basal runs of correct items separated by one or more incorrect items. This method divides participants into two groups: children with scatter and children without scatter (Walden et al., 2012). The TELD–Exp has a basal rule of three correct consecutive responses, and the EVT–2 has a basal rule of five correct consecutive responses, defined by respective test developers as psychometrically significant (Hresko et al., 1999; Williams, 2007). For example, on the TELD–Exp, a child would be categorized as exhibiting scatter after scoring correctly (1) on three consecutive items, scoring incorrectly (0) on one or two, and then scoring correctly on another three consecutive items before later reaching the ceiling of three consecutive incorrect responses (e.g., 1, 1, 1, 0, 1, 1, 1, 0, 0, 0; see Table 1 for further examples).

The second method we used to evaluate intratext scatter was an *ordinal* measure, which is a means of ranking participants’ scatter scores by the amount of response variability. Kaplan, Fein, Morris, and Delis (1991) quantified scatter by determining the absolute difference between consecutive item scores on a test (“scatter points”). Because items on the TELD–Exp and EVT–2 are scored as correct (score of 1) or incorrect (score of 0), scatter points on these tests are equivalent to the number of shifts from correct to incorrect consecutive responses given by the examinee. For example, on the TELD–Exp, if a child passes the first three items and subsequently reaches the ceiling (1, 1, 1, 0, 0, 0), the child’s scatter score would equal one (i.e., one change or shift from 1 to 0 or from 0 to 1). If, however, a child passes the

<table>
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<tr>
<th>Type of scatter</th>
<th>Reference</th>
<th>Example</th>
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| Categorical: Presence/absence of multiple basal runs of correct items separated by one or more incorrect item(s) | Walden et al., 2012 | Child A→ 1, 1, 1, 1, 0, 0, 0 = no scatter  
Child B→ 1, 1, 1, 0, 1, 1, 1, 0, 0 = scatter |
| Ordinal: Absolute difference between consecutive item scores on a test | Kaplan et al., 1991 | Child A→ 1, 1, 1, 1, 0, 0, 0 = 1 scatter point  
Child B→ 1, 1, 1, 0, 1, 0, 1, 1, 1, 0, 0 = 5 scatter points |
first three items and then fails the fourth item, passes the fifth and sixth, and only then reaches the ceiling (1, 1, 1, 0, 1, 1, 0, 0, 0), the scatter score would be three (i.e., three changes from 1 to 0 or from 0 to 1; see Table 1).

**Stuttering frequency and severity.** The frequency of stuttering was calculated as the mean number of stuttered disfluencies (i.e., per 100 words of conversational speech from the first 300 words of an unstructured conversation with the experimenter; Conture, 2001). Overall stuttering severity was assessed using the SSI–3, which considers stuttering frequency, physical concomitants, and stuttering duration.

**Procedure**

Caregivers were interviewed for relevant information regarding family SES, history of children’s speech-language disorder, and concerns about children’s speech-language abilities. Simultaneously, another examiner administered standardized tests of speech and language and bilateral pure-tone screenings to each participant. An unstructured conversation sample was also obtained. As mentioned above, results of this conversation sample were used to help determine each participant’s talker group membership (i.e., CWS or CWNS).

**Measurement Reliability for Stuttering and Intratest Scatter**

Approximately 20% of the final data corpus of each talker group (eight age-matched CWS and nine age-matched CWNS) was selected at random to assess the inter- and intrajudge reliability of the measurements of stuttering and intratest scatter. To assess interjudge reliability for stuttering frequency, the first author’s measurements were compared with those of four trained graduate students of speech-language pathology. Comparisons among the coders’ assessments of stuttering frequency indicated strong interjudge reliability, with Spearman’s rank-order correlations (ρ) ranging from ρ = .76 to ρ = .85, with $M_ρ = .81$. Comparison of the first author’s initial measurements of stuttering frequency with subsequent remeasurements, taken at least 1 month later, also indicated strong intrajudge reliability, ρ = .88.

To assess the interjudge reliability of the first author’s intratest scatter measurements (categorical and ordinal), a speech-language pathology graduate student assessed categorical and ordinal scatter in the reliability sample. The reliability coder was unaware of the talker group category. Comparisons for intratest scatter (average of results for TELD–Exp and EVT–2) indicated strong interjudge reliability for categorical scatter, $M_ρ = .95$, and ordinal scatter, $M_ρ = .94$. Comparison of the first author’s initial scatter measurements with subsequent remeasurements, taken at least 1 month later, indicated strong intrajudge reliability for categorical scatter, $M_ρ = .89$, and ordinal scatter, $M_ρ = .99$.

**RESULTS**

**Pre-analytic and Analytic Considerations**

Pre-analytic assessment, by means of histograms, indicated normal distributions for standard scores on all of the tests of receptive and expressive language (i.e., TELD–Rec, TELD–Exp, PPVT–4, EVT–2). Similar assessment indicated nonnormality of distribution for standard scores and measurements of demographics (i.e., SES and age), speech sounds (i.e., GFTA–2), and fluency (i.e., SSI–3 scores, stuttering frequency). For variables with normal distributions, appropriate parametric statistics were employed (e.g., independent-samples $t$ tests). Conversely, for variables with nonnormal distributions, appropriate nonparametric statistics were employed (e.g., Mann–Whitney $U$ test, Spearman’s $r$).

**Demographic and Descriptive Information**

**SES and demographics.** The parents of most of the participants ($n = 77$, 90% of total participants) provided SES information using the Four-Factor Index of Social Status (described earlier; Hollingshead, 1975). Based on calculated family averages for these SES scores (see Table 2), there was no significant difference in SES between the CWS ($M = 42.7$, $SD = 12.3$) and the CWNS ($M = 44.9$, $SD = 10.5$), $U(86) = 467.5$, $p = .34$, $d = –0.19$.

The race of each participant was also obtained via parental interview. The CWS and CWNS participants were identified as follows: Caucasian ($n = 41$), African American ($n = 10$), multiracial ($n = 1$), and no response provided ($n = 34$).

**Stuttering/speech disfluencies.** As expected based on the aforementioned talker group criteria, results of a Mann–Whitney $U$ test (see Table 2) indicated that the CWS ($M = 8.6$, $SD = 4.9$) exhibited significantly more stuttering than the CWNS ($M = 1.3$, $SD = 0.7$), $U(86) = 0.00$, $p < .001$, $d = 2.09$. Likewise, another Mann–Whitney $U$ test indicated that the CWS ($M = 18.9$, $SD = 5.8$) scored significantly higher on the SSI–3 than the CWNS ($M = 7.1$, $SD = 1.9$), $U(86) = 0.00$, $p < .001$, $d = 2.70$.

**Speech and language abilities.** As shown in Table 2, there were no significant between-group
The present study failed to detect significant talker group differences for the TELD–Rec, TELD–Exp, PPVT–4, EVT–2, and GFTA–2 standardized tests of speech and language.

Measures of Intratest Scatter

To assess the first hypothesis that the CWS would exhibit significantly greater intratest scatter than the CWNS, we analyzed categorical and ordinal measures of scatter separately for the TELD–Exp and the EVT–2.

Categorical scatter. Figures 1 and 2 illustrate the percentage of categorical scatter found in each talker group. Categorical scatter was analyzed with a chi-square test, with results indicating no significant between-group differences on the TELD–Exp, $\chi^2(1, N = 86) = 1.9, p = .16$, or on the EVT–2, $\chi^2(1, N = 86) = 2.6, p = .11$.

Ordinal scatter. Mann–Whitney U tests were performed for the TELD–Exp and EVT–2, $U(86) = 899, p = .85$, $d = -0.03$ and $U(86) = 910, p = .93$, $d = -0.03$, respectively. Results indicated no significant between-group differences. Hence, the hypothesis that predicted talker group differences was not supported for either categorical or ordinal scatter.

Despite the present study’s relatively large $N$ (CWS = 40; CWNS = 46), its power to reject a false null hypothesis is relatively low (i.e., $1 - \beta = 0.61$), as assessed by GPOWER freeware (Erdfelder, Faul, & Buchner, 1996). To increase power to detect at least a “medium” effect size ($d = 0.5$), $1 - \beta = 0.80$, $d = 0.5$, this study would have required an $N$ equal to or greater than 134 (see Cohen, 1992).

Correlational Analyses

Stuttering and intratest scatter. To assess the second hypothesis, that greater stuttering would be related...
to more intratest scatter, we assessed the categorical and ordinal measures of scatter on the TELD–Exp and EVT–2 separately with respect to stuttering in CWS. Nonparametric point biserial analysis was used for categorical scatter, and Spearman’s rho correlation analysis was used for ordinal scatter. For preschool-age CWS, a significant positive relation was found (\(\rho = .33, p = .04\)) between the total number of stutterings and categorical scatter on the EVT–2, providing support for the second hypothesis. However, no significant correlation was found between stuttering and categorical scatter on the TELD–Exp, nor between stuttering and ordinal scatter on either test (see Table 3). Stuttering severity, as measured by the SSI–3, was correlated with categorical scatter on the EVT–2, \(\rho = .28, p = .08\).

Ancillary scatter analyses. Prior studies of scatter have indicated possible relations between intratest scatter and other variables relating to test performance, such as age and overall test score. To investigate these relations, we assessed categorical and ordinal measures of scatter on the TELD–Exp and EVT–2 separately in relation to standard scores on each test, total number of items administered, and chronological age. Nonparametric point biserial analysis was used for categorical scatter, and Spearman’s rho correlation analysis was used for ordinal scatter.

Results (see Table 4) indicated a significant positive correlation between scatter and TELD–Exp standard scores for CWS (for categorical scatter, \(\rho = .41, p < .01\); for ordinal scatter, \(\rho = .51, p < .01\)) but not for CWNS (for categorical scatter, \(\rho = .28, p = .06\); for ordinal scatter, \(\rho = .19, p = .20\)); however, a Fisher transformation indicated no significant difference between the two groups’ correlations for categorical or ordinal scatter and standard score, \(Z = 0.66, p = .51\), and \(Z = 1.65, p = .10\), respectively.

To assess whether the number of test items administered may have impacted any between-group differences in scatter, Mann–Whitney \(U\) tests were conducted. These tests indicated no significant between-group differences in the number of test items given on the TELD–Exp, \(U(86) = 744, p = .60, d = -0.1\), or on the EVT–2, \(U(86) = 656, p = .35, d = -0.3\). No significant correlations were found for age and scatter.

DISCUSSION
The present study investigated two main hypotheses. First, we hypothesized that preschool-age CWS, when compared to their CWNS peers, would exhibit significantly more intratest scatter on the TELD–Exp and EVT–2. Results did not support this hypothesis, indicating no significant between-group differences in intratest scatter. Second, we hypothesized that measures of intratest scatter would have a positive correlation with stuttering frequency for CWS. Results indicated that, for CWS, categorical intratest scatter on the EVT–2 was significantly correlated with stuttering frequency.

No Significant Between-Group Differences in Scatter
No significant between-group differences in intratest scatter were found on either test of expressive

<table>
<thead>
<tr>
<th>Scatter measure</th>
<th>SSI–3 score</th>
<th>Mean # stutterings</th>
</tr>
</thead>
<tbody>
<tr>
<td>TELD–Exp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Categorical scatter, (\rho (p))</td>
<td>.01 (.94)</td>
<td>-.12 (.44)</td>
</tr>
<tr>
<td>Ordinal scatter, (\rho (p))</td>
<td>-.05 (.78)</td>
<td>-.03 (.87)</td>
</tr>
<tr>
<td>EVT–2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Categorical scatter, (\rho (p))</td>
<td>.28 (.08)</td>
<td>.33 (.04)*</td>
</tr>
<tr>
<td>Ordinal scatter, (\rho (p))</td>
<td>.02 (.89)</td>
<td>-.02 (.91)</td>
</tr>
</tbody>
</table>

*Significant at \(p < .05\).
language, contrary to our first hypothesis. Using a similar measure of ordinal scatter (“scatter points”) on the Wechsler Adult Intelligence Scale—Revised (WAIS–R; Wechsler, 1981), Godber et al. (2000) found no significant differences between children with and without cranial irradiation treatment, although their measure of scatter points correlated highly with other ordinal measures of scatter, including a more sensitive computer-assisted measure derived from item response theory. Current findings of a significant relation between stuttering frequency and scatter on the EVT–2 suggest that the present methods are a valid option for quantifying scatter in CWS. Discrepancies between findings for categorical and ordinal scatter highlight the need to better understand and standardize intratest scatter.

The psychometric properties of the TELD–Exp and EVT–2 may have contributed to the lack of difference between the two talker groups on intratest scatter. For example, the TELD–Exp and EVT–2 include many different types of test items. The TELD–Exp consists of a particularly varied sequence of both semantic and syntactic items. Specifically, the test includes a mixture of naming tasks, sentence repetition tasks, grammatical completion tasks, and various other expressive language tasks. Although the EVT–2 attempts to solely target semantic knowledge, it presents a variable sequence of prompts, progressing from the more straightforward item-label prompt, “What do you see?” to questions requesting synonyms, such as “What’s another word for ‘printing’?” interspersed with the item-labeling questions. Although these variable test items and prompts would seem to challenge young children’s cognitive–linguistic processes, the absence of significant test-related time pressure may, at least in part, compensate for the impact of attentional, emotional, or cognitive difficulties, if indeed they are present. Perhaps scatter would be better examined using a more homogenous, continuous, and rapidly changing task, such as the Conners’ Continuous Performance Test II (Conners & MHS Staff, 2000) or the Attention Network Test (Fan, McCandliss, Sommer, Raz, & Posner, 2002).

**Correlation Between CWS’ Stuttering Frequency and Categorical Scatter on the EVT–2**

For the preschool-age CWS, categorical scatter on the EVT–2 was significantly positively related to their stuttering frequency. This finding may be taken to suggest that CWS exhibit subtle disturbances in their developing speech-language systems, with more frequent stuttering associated with greater vulnerabilities related to the planning and production of expressive language. Consistent with this speculation, Ntourou et al. (2011) suggested that, “when planning/formulating sentences, CWS may experience subtle but important difficulties in quickly and efficiently encoding and retrieving lexical items” (p. 174). These difficulties may manifest as intratest scatter in a testing context and may be associated with instances of stuttering in a conversational context.

Consistent with present findings, Walden et al. (2012) also reported that stuttering frequency was correlated with categorical scatter, albeit on the TELD–Exp. Those findings were not replicated in the present study for the TELD–Exp, but were observed for the EVT–2. In the present study, the degree of scatter in both talker groups was found to be greater on the EVT–2 than on the TELD–Exp (see Figures 1 and 2). This is probably due to the fact that the EVT–2 has a higher ceiling requirement of five missed items (rather than three) and is normed for a much broader age range than the TELD–Exp. Ancillary analysis indicated significant positive correlations between the number of items administered and the scatter within tests, which may support this notion. However, further empirical study will be required to...
better understand these differences in scatter between the EVT–2 and the TELD–Exp.

General Discussion
As indicated by Dumont and Willis (1995), intrastest scatter must be interpreted cautiously and should not be the sole basis for clinical decision making. Ancillary analyses for both talker groups revealed a positive correlation between intrastest scatter and the overall number of items administered during testing, indicating that scatter scores are linked to other variables such as test form, individual ability, and test length (see Godber et al., 2000). Other means for assessing scatter may be preferred, such as analyzing responses to semantic and syntactic items on the TELD–Exp to identify possible dissociations of language domains. It is also possible that a longitudinal, rather than cross-sectional, study of scatter and stuttering will better reveal expressive language variability with respect to CWS' and CWNS' speech-language development. Such longitudinal assessment, it is suggested, should help researchers identify the relevant linguistic, cognitive, attentional, and/or emotional confluences that may influence the course of stuttering. Other aspects of speech and language may also be considered (e.g., receptive language) independently (e.g., intrastest scatter for other measures) or collectively (e.g., intertest scatter, cf. Anderson et al., 2005; Coulter et al., 2009).

Researchers may also profit from considering the possible relation between intrastest scatter and attention focusing, disengaging, shifting, and reengaging (Eggers, De Nil, & Bergh, 2012; Felsenfeld, van Beijsterveldt, & Boomsma, 2010; Johnson, Conture, & Walden, 2012). Standardized measures of speech and language require the test taker to adequately focus attention on specific items, as well as to shift his or her attention from one test item to the next (Leonard et al., 2007). CWS have been shown to differ from CWNS with respect to their attentional processes (Eggers, De Nil, & Bergh, 2010, 2012; Felsenfeld et al., 2010; Heitmann, Asbjornsen, & Helland, 2004; Karrass et al., 2006; cf. Johnson et al., 2012). Moreover, Riley and Riley (2000) reported that pretreatment attentional difficulties were the single best predictor of poor fluency treatment outcomes for CWS, regardless of stuttering severity prior to treatment. If the attentional resources of preschool-age CWS are less robust than those of their CWNS peers, it is possible that such differences may contribute to “uneven” performances by CWS on standardized measures of speech and language. Finding an inverse correlation between attention regulation and intrastest scatter would be compelling evidence for further considering scatter as a result of broader cognitive–linguistic processes.

Caveats
Although no significant between-group differences were found in the age or gender of the study participants, it is possible that these variables indirectly and/or subtly influenced the present findings. Also in the present study, the total number of items administered for each test was correlated with intrastest scatter. This potential confound suggests that future studies should consider scatter in relation to the quantity/quality of specific items to which the children have responded. Moreover, this study’s sample size (N = 86) had a relatively low power (1 – β = 0.61), indicating an increased probability of Type II error (i.e., increased chance of failing to reject a null hypothesis in error), suggesting the need for larger sample sizes in subsequent studies of scatter.

Conclusion
Whether measured by intrastest scatter (present study; Walden et al., 2012) or by intertest dissociation (Anderson et al., 2005; Coulter et al., 2009), uneven performance between and/or within various tests of speech and language appears to be associated with childhood stuttering. However, this association is not always manifest during such testing, and the nature of the association is not yet clear. Perhaps the observed association between uneven performance on speech-language tests and stuttering is due to the fact that both are related to a third variable, such as attention or cognitive load. By continuing to study this association and its possible relation to other variables, we may advance our understanding of the underlying processes involved with the onset, development, and maintenance of childhood stuttering.

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