Writing Errors of Children With Developmental Language Disorder

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The purpose of this study was to compare the types of morphological and syntactic errors in written simple and complex sentences produced by children with developmental language disorder (DLD) and children with typical language (TL). We analyzed the writing products of 30 children with DLD and 33 children with TL for morphological (e.g., past tense *-ed* and BE verbs) and syntactic (e.g., word omission and word order) errors in simple and complex sentences. We found that children with DLD produced more regular and irregular past tense errors and syntactic errors than children with TL. We also found that the number of total errors produced by children with DLD was not different in simple versus complex sentences. The findings reported can be used as a starting point for adding writing assessment to speech–language pathologists' tool kit for serving children with DLD. We recommend that clinicians begin with analysis of past tense and syntactic errors when evaluating narrative writing skills of children with DLD. **Key words:** *developmental language disorder*, *error analysis*, *simple and complex sentences*, *writing*

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WRITING is a complex literacy skill that is supported by an integration of motor, cognitive, and linguistic skills (Berninger, 2000). The Not-so-Simple View of Writing (Ahmed et al., 2022; Berninger & Winn, 2006) posits that writing is composed of transcription skills (e.g., handwriting and spelling), executive function skills (e.g., planning, self-regulation, and motivation), memory (e.g., working memory), and text generation skills. This article focuses on one component of the Not-so-Simple View of Writing—text generation. Writers use their linguistic knowledge, or semantic (i.e., the use of words to signal meaning), morphological (i.e., the use of morphemes that signal time, person, or number or signal a change in meaning), and syntactic knowledge (i.e., the use of phrases and clauses to express thoughts), to generate text (Dockrell et al., 2007; Kim et al., 2015).

Text generation can be a difficult task for children with developmental language disorder (DLD) because they present with language weaknesses. For example, children with DLD omit or substitute morphological markers that indicate tense and agreement and produce more syntactic errors in their

spoken language than their typical peers (Gillam & Johnston, 1992; Rice et al., 2004; Windsor et al., 2000). These spoken language weaknesses are mirrored in the writing skills of children with DLD (Windsor et al., 2000). However, language weaknesses, like morphological tense and agreement errors and high rates of syntactic errors, which may seem to be resolved or reduced in the spoken language of children with DLD, continue to occur in the writing of these children (Gillam & Johnston, 1992; Rice et al., 2004; Scott & Windsor, 2000; Windsor et al., 2000). Therefore, practitioners who work with children with DLD should gather text samples and analyze the text generation skills of children with DLD to document their continued language weaknesses.

Researchers have identified many metrics that characterize the text generation skills of children with DLD (e.g., Dockrell et al., 2007). For example, researchers may report scores for productivity by calculating the total number of sentences or the total number of words, for lexical diversity by calculating the number of different words, for grammatical complexity by calculating the number of clauses per sentence, and/or for accuracy by calculating the total number of grammatical errors or the number of grammatically correct sentences. For practitioners who work with children with DLD, analyzing all of these metrics could be a daunting task. Therefore, it is important that researchers identify the metrics that differentiate the writing skills of children with DLD and children with typical language (TL; Suddarth et al., 2012) to ease the process of analyzing text generation skills.

Researchers report that accuracy best differentiates the text generation skills of children with DLD from children with TL (Fey et al., 2004; Gillam & Johnston, 1997; Puranik et al., 2007; Scott & Windsor, 2000). Most researchers report accuracy as the total number of errors or the total number of correct sentences (e.g., Fey et al., 2004; Gillam & Johnston, 1997; Puranik et al., 2007; Scott & Windsor, 2000). Some researchers report accuracy as the correct and incorrect use of morphological and syntactic constructions that align with the spoken language weaknesses of children with DLD (Mackie & Dockrell, 2004; Mackie et al., 2013; Windsor et al., 2000). For example, children with DLD omit regular past tense *-ed* and BE verbs (i.e., *am*, *is*, *are*, *was*, *were* used as a copula or auxiliary verb) in their writing. Children with DLD also produce whole-word omission errors within phrases and clauses, like omitting pronouns or conjunctions. Analyzing accuracy by specific morphological and syntactic error types helps practitioners specify the accurate and inaccurate use of language to inform their remediation of the text generation skills of children with DLD. However, the emerging evidence that has examined specific error types has focused on regular past tense *-ed* and auxiliary BE verb usage and has not differentiated morphological errors from syntactic errors. Furthermore, the emerging evidence does not provide information about the types of errors children with DLD exhibit in simple *and* complex sentences. Therefore, the purpose of this study was to expand on the previous research by analyzing accuracy in both simple and complex sentences and by including all forms of past tense (i.e., regular and irregular past tense and *was* and *were* in simple, perfect, and progressive aspects).

TEXT GENERATION SKILLS OF CHILDREN WITH DLD

Many researchers have described the text generation skills of children with DLD (e.g., Gillam & Johnston, 1992; Koutsoftas & Gray, 2012; Puranik et al., 2007; Scott & Windsor, 2000; Williams et al., 2013). However, there is variability in the findings reported by the researchers across studies. Scott and Windsor (2000) reported on the text generation skills of 60 children (20 with DLD and 40 with TL matched for age and language ability). Children with DLD and children with TL matched for age were 11-year-olds, whereas the children with TL matched for language ability were 9-year-olds. Scott and Windsor reported that children with DLD wrote significantly fewer words and sentences (i.e., productivity), fewer total number of different words

(i.e., lexical diversity), and produced more errors (i.e., accuracy) than children with TL. However, children with DLD and children with TL did not have differences in the number of clauses per sentence (i.e., complexity). Koutsoftas and Gray (2012) reported the text generation skills of 26 children with DLD and 30 children with TL who were 10-year-olds. Similar to Scott and Windsor, Koutsoftas and Gray found that children with DLD and children with TL differed in their production of total number of words, total number of different words, and number of errors per sentence. However, Koutsoftas and Gray found differences in the children's use of the number of clauses per sentence (i.e., complexity). Williams et al. (2013) reported on 15 children with DLD and 30 children with TL matched for age and spelling ability. Children with DLD and children with TL matched for age were 9-year-olds, whereas children with TL matched for spelling ability were 7-year-olds. Williams et al. reported that children with DLD wrote significantly fewer total number of different words and their papers demonstrated weaker organization than children with TL; however, children with DLD did not differ from children with TL on the total number of words, grammar and usage (i.e., accuracy), sentence structure and variety (i.e., complexity), or number of ideas. Despite the variability in results, the majority of the studies have found that children with DLD produce less accurate, as measured by the total number of errors, written products than children with TL. Absent from these studies, though, is the analyses of accuracy across simple and complex sentences.

Gillam and Johnston (1997) completed the only study that analyzed accuracy within simple *and* complex sentences. Gillam and Johnston reported on the text generation skills of 40 children between the ages of 9 and 12 years. Ten of the children were identified as having DLD. Gillam and Johnston reported that children with DLD produced more errors in both simple and complex sentences than children with TL and complex sentences were more susceptible to error. Gillam and Johnson's results demonstrate that children with DLD attempt to write sentences with complex syntax in addition to simple sentences, but it was unclear in their study what types of errors were produced. Analyzing error types within simple and complex sentences will determine whether children with DLD make different types of errors in simple sentences compared with those in complex sentences, especially because Gillam and Johnston reported that complex sentences were more susceptible to error than simple sentences.

Accuracy within specific error types

Three studies, to our knowledge, report on the specific types of errors that children with DLD produce in their writing (Mackie & Dockrell, 2004; Mackie et al., 2013; Windsor et al., 2000). Windsor et al. (2000) compared the types of morphological errors produced by 20 children with DLD with 40 children with TL. The children with DLD and children with TL matched for age were 10–12 years old, and the children matched for language ability were 7–10 years old. Windsor et al. analyzed the children's production of regular past tense -*ed*, third person singular -*s*, BE verbs, plural -*s*, and articles, all morphological constructions. Windsor et al. reported that children with DLD made more errors on past tense -*ed*, third person singular -*s*, and BE verbs than plural -*s* and articles and that children with DLD made more past tense -*ed* and plural -*s* errors than children with TL. However, the groups did not differ in their error rate for BE verbs. Mackie and Dockrell (2004) reported on 11 children with DLD and 22 children with TL. The children with DLD and children with TL matched for age were 9–12 years old, and the children matched for language ability were 6–9 years old. Mackie and Dockrell analyzed children's use of errors as word usage (i.e., whole-word addition, omission, and substitution, including BE verbs) and word ending (i.e., morphological suffix addition, omission, and substitution). The word usage errors combined word-level syntactic errors (e.g., omission of a conjunction

or pronoun) and morphological errors (e.g., BE verbs). Children with DLD produced more whole-word addition, omission, and substitution errors than children with TL. Children with DLD made the most whole-word errors on BE verbs. Children with DLD were not significantly different from children with TL on word-ending omission errors. Interestingly, the error rate for word endings was calculated as the ratio between the number of word-ending omission errors and the total number of words, which was different from the error rate reported by Windsor et al. Mackie et al. (2013) reported on 46 children with DLD and 42 children with TL who were 10–11 years old. Mackie et al. analyzed omission of whole words, which included subject nouns, auxiliary verbs, and prepositions, and omission of inflected morphemes, which included plural *-s*, progressive *-ing*, and regular past tense *-ed*. Children with DLD omitted subject nouns, auxiliary BE verbs, regular past tense *-ed*, and progressive *-ing* more than children with TL.

The results of these three studies illustrate two interesting findings about the writing skills of children with DLD. First, children with DLD omit obligatory morphological markers that affect the overall accuracy of their writing. The morphological marker that is omitted the most is past tense *-ed*, suggesting that children with DLD continue to have language weaknesses related to tense in their written language, even though the omission of tense in their spoken language is resolved by third grade or approximately 8 or 9 years of age (Rice et al., 2004). Notably, regular past tense *-ed* was the only past tense marker analyzed across all three studies. Second, the use of BE verbs was not consistent. Windsor et al. (2000) did not find group differences, but Mackie and Dockrell (2004) and Mackie et al. (2013) did. The three studies did not report BE verbs used as a copula separate from auxiliary. So, it is not clear whether children with DLD omit one classification of BE verbs over another. None reported on the use of tense within the use of BE verbs. For example, we do not know whether children

with DLD continue to omit or substitute *was* and *were* past tense BE verbs for *am*, *is*, and *are* present tense BE verbs. This information will help determine whether the use of tense in BE verbs continues to be problematic like regular past tense *-ed* for children with DLD.

CURRENT STUDY

The current study extends the emerging data on the specific types of errors children with DLD produce in their writing by analyzing accuracy in both simple and complex sentences. To date, Gillam and Johnston (1997) is the only study to our knowledge to report on the use of accurate and inaccurate simple and complex sentences. We analyzed accuracy by identifying morphological tense errors and syntactic errors. Morphological tense errors included tense errors related to the use of *was* and *were* as a copula and auxiliary BE verb and the regular and irregular past tense. We coded for past tense errors because previous studies reported that children with DLD produced the most errors on past tense. We analyzed the use of past tense BE verbs (i.e., *was* and *were*) to add to what we know about the tense marking of children with DLD. Also, we coded for substitution of present tense for past tense because we use the narrative genre to gather the writing samples from the children in this study. A narrative is defined as a telling or retelling of a *past* experience (Boudreau, 2001); therefore, we wanted to account for children's use of present tense to represent a past experience. However, we also coded for future tense because it is also appropriate to use future tense when writing a narrative. Syntactic errors included omission, addition, or substitution of one word within a phrase or clause or multiple word errors within a phrase or clause.

We addressed the following research questions:

1. What are the percentages of morphological tense error types and syntactic error types that are produced in simple

and complex sentences by children with DLD and children with TL?

2. Do children with DLD produce proportionately more past tense errors than children with TL in simple and complex sentences?

3. Do children with DLD produce proportionately more syntactic errors than children with TL in simple and complex sentences?

4. Do children with DLD produce proportionately more errors in simple sentences than in complex sentences?

METHOD

Participants

Participants included 30 children with DLD and 33 children with TL. Participants were originally recruited for a larger study conducted by Krystal Werfel under the Vanderbilt University Institutional Review Board (Werfel et al., 2019). All participants attended public and private elementary schools in a southeastern U.S. state. The maternal education of the participants was on average 14.9 years ($SD = 4.9$) for children with DLD and 15.2 years ($SD = 1.9$) for children with TL. We did not collect race, ethnicity, or dialect use of the participants. Eligible participants spoke English as their primary language, passed a hearing screening bilaterally, and had nonverbal intelligence in the average or above-average range as measured by the Test of Nonverbal Intelligence–Fourth Edition (TONI-4; Brown et al., 2010). The Clinical Evaluation of Language Fundamentals–Fourth Edition (CELF-4; Semel et al., 2003) and the Peabody Picture Vocabulary Test–Fourth Edition (PPVT-4; Dunn & Dunn, 2007) were given to describe the participants' language skills. Children who scored below 85 on the Core Language Index subsection of the CELF-4 were classified as having DLD. The mean age of children with DLD was 9 years 4 months, with an overall SD of 13 months, and the mean age of children with TL was 8 years 7 months, with an overall SD of 11 months. Participants were in the second to fourth grades. See Table 1 for more detail.

Writing sample procedures

All assessments were conducted in quiet rooms at the participating students' schools. Testing sessions lasted no more than 2 hr for each participant, and all testing for each participant was conducted within 1 month. To complete the writing samples, each participant completed the Story Composition subtest from the Test of Written Language–Fourth Edition (TOWL-4; Hammill & Larsen, 2009). We utilized the narrative genre, a telling or retelling of a past experience (Boudreau, 2001), which is one way to elicit complex language (Nippold et al., 2014) and past tense verb forms (Boudreau, 2001). Following the published instructions, the examiner showed a picture scene, read a

Table 1. Participant descriptive information

Variable	Children With DLD ($n = 30$)		Children With TL ($n = 33$)	
	M	SD	M	SD
Age (months)	112.33	12.68	104.3	10.88
TONI-4 Nonverbal IQ	98.23	8.05	105.03	8.36
CELF-4 Core Language Score	71.13	9.97	106.82	10.42
PPVT-4 Receptive Vocabulary	88.33	12.65	111.39	14.22

Note. Test of Nonverbal Intelligence–Fourth Edition (TONI-4; Brown et al., 2010) was used to measure nonverbal IQ. The Clinical Evaluation of Language Fundamentals–Fourth Edition (CELF-4; Semel et al., 2003) was used to derive the core language score. The Peabody Picture Vocabulary Test–Fourth Edition (PPVT-4; Dunn & Dunn, 2007) was used to measure receptive vocabulary. DLD = developmental language disorder, TL = typical language.

corresponding fictional story, and described the necessary parts of a story. The modeled story was set in the past tense, meaning past tense verbs only were modeled. The examiner then displayed a new picture to the participant and asked the participant to write a story about the picture. Participants had 5 min to plan their story and 15 min to write their story.

Transcription and coding

Research assistants transcribed the writing samples word-for-word and separated the samples into T-units, a sentence with a main clause and all attached dependent clauses (Hunt, 1965), in Microsoft Word. Research assistants checked that the students' spelling was preserved. Spelling errors did not affect the coding. For example, if a child spelled past tense *-ed* with the letter "t," it was coded as marking the past tense. Then, the first author transferred the written samples into the Systematic Analysis of Language Transcripts (SALT; Miller et al., 2011) software to code for accuracy and complexity.

A coding manual was developed to standardize the procedures for coding morphological and syntactic accuracy and inaccuracy. This coding manual combined methods described by Scott and Windsor (2000) and Mackie and Dockrell (2004). Specifically, we incorporated the use of omission and substitution errors from Mackie and Dockrell and the morphological errors (e.g., past tense and BE verbs) from Scott and Windsor. We also coded copula and auxiliary BE verb errors as morphological errors based on previous research on the spoken language of children with DLD (e.g., Rice et al., 2004). First, research assistants coded T-units as simple or complex sentences. Simple sentences were defined as sentences with one clause. Complex sentences were defined as sentences with more than one clause, each with its own main verb. Second, research assistants coded for correct use of the following morphological markers: (1) past tense (i.e., *was/were*) BE verbs used as a copula or auxiliary; (2) regular and irregular past tense; and (3) fu-

ture tense. Research assistants also coded for incorrect use of the following morphological markers: (1) subject–verb agreement error where a past tense BE verb did not correspond to the subject (e.g., "They was at the store"); (2) substitution copula error where a present tense (i.e., *am*, *is*, *are*) BE verb was used in place of an obligatory past tense BE verb; (3) substitution auxiliary error where a present tense (i.e., *am*, *is*, *are*) BE verb was used in place of an obligatory past tense BE verb; (4) omission copula error where the BE verb was omitted; (5) omission auxiliary error where the BE verb was omitted; (6) regular and irregular past tense errors where the past tense *-ed* was omitted from the verb or the present tense of the irregular verb was used; (7) generalization error where the use of regular past tense *-ed* marked verb occurred in place of the correct irregular form of the verb; and (8) future tense error where the future tense (i.e., *will*, *will have*, or *will have been*) was omitted. Notably, participants did not make subject–verb agreement errors on present tense copula or auxiliary BE verbs. The subject–verb agreement error was coded in addition to the substitution copula or substitution auxiliary and past errors. Different codes were used to differentiate simple versus complex sentence morphological and syntactic accuracies and inaccuracies.

The uses of present tense BE verbs as a copula or auxiliary were coded as substitution errors for several reasons. First, fictional narrative discourse requires the use of past tense to designate that an event has already occurred (Boudreau, 2001). Second, the story that was modeled for participants was set in the past tense and the picture that was used to elicit the written sample included actions that had already occurred (i.e., a car that crashed into a fire hydrant). Finally, children with DLD have particular difficulty marking tense in their spoken and written language (Scott & Windsor, 2000); therefore, we were interested in determining the participants' use of past tense to mark events that already occurred.

In addition to coding for morphological errors, we coded for syntactic errors. These errors fell into two categories: (a) word-level errors where one word was omitted or substituted with another word that was the same part of speech (e.g., *you* for *your*, *me* for *I*); and (b) word-order errors where the ordering of words in phrases or clauses (or the ordering of phrase or clause units in the sentence) was ungrammatical, or multiple words were omitted or substituted and the substituted word was not the same part of speech (e.g., *Mac's friends went* [missing a phrase], *friend's house* [missing a verb]). Again, different codes were used to indicate word-level and word-order errors in simple and complex sentences. The coding manual is available as Supplement Digital Content 1 (available at: http://links.lww.com/TLD/A110).

Coding analysis training and reliability

Three undergraduate research assistants underwent training that the second author led. The coders did not have access to the assessment data to ensure that they were blind to the language status of the participants. The first and second authors provided the research assistants with a coding manual during the training that included definitions and examples and detailed the steps to code the writing samples. At the beginning of the training, the second author met with the research assistants weekly for 3 weeks to complete coding analysis as a group with the same writing sample. The research assistants and the second author completed an analysis of five writing samples as a group. After the training was completed, the research assistants were assigned to code new writing samples independently. The second author led biweekly meetings to answer questions related to coding until the coding was completed.

Each writing sample was coded independently by two research assistants. The second author checked the accuracy of the codes by comparing the codes on each writing sample from the two research assistants. The second author identified discrepancies and resolved

the coding errors by selecting the correct code. There were no instances where neither code assigned by the research assistants was correct.

Error percentage calculations

To answer the first research question, we calculated morphological error percentages based on correct and incorrect use in obligatory contexts for each participant when using the auxiliary, copula, past tense, and future tense correctly and incorrectly. For example, we calculated the error percentage for the omission of the auxiliary by dividing the number of omission errors by the total number of times each participant used an auxiliary BE verb correctly and incorrectly. We calculated these values separately in simple sentences and in complex sentences. We calculated the word error percentages and word-order error percentages based on each participant's total number of simple sentences and total number of complex sentences. For example, we calculated word-order errors by dividing the total number of word-order errors in simple sentences by the total number of simple sentences.

To answer the second research question, we calculated the total percentage of past tense errors by adding the number of copula substitution, copula omission, auxiliary substitution, auxiliary omission, and past tense errors divided by the total number of correct and incorrect uses of these categories. To answer the third research question, we calculated the total percentage of syntactic errors by adding the number of word errors and the number of word-order errors divided by the total number of simple or complex sentences.

Finally, to answer the fourth research question, we calculated the percentage total errors by adding the total number of subject–verb agreement, substitution copula, substitution auxiliary, omission copula, omission auxiliary, regular and irregular past tense, future tense, and word-level and word-order errors and dividing by the total number of simple sentences or complex sentences. See Tables 2 and 3 for the total number of obligatory

Table 2. Total number of morphological obligatory contexts by group and sentence type

Variable	Auxiliary		Copula		Past		Future	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Children with DLD								
Simple	0.73	1.11	1.23	1.14	2.50	1.89	0.03	0.18
	[0–3]		[0–4]		[0–7]		[0–1]	
Complex	0.30	0.54	0.63	0.81	2.80	3.35	0.17	0.38
	[0–2]		[0–3]		[0–12]		[0–1]	
Children with TL								
Simple	0.48	0.62	1.33	1.93	2.70	1.59	0.06	0.35
	[0–2]		[0–8]		[0–7]		[0–2]	
Complex	0.70	1.05	0.97	1.26	7.03	5.08	0.12	0.33
	[0–4]		[0–5]		[0–25]		[0–1]	

Note. Obligatory contexts represent the children's total use (i.e., correct and incorrect) of each morphological structure. The bracketed numbers are the minimum and maximum values. DLD = developmental language disorder, TL = typical language.

contexts and the total number of simple and complex sentences.

RESULTS

We used IBM SPSS Statistics for Windows Version 26 to analyze the data. To answer the first research question, we used descriptive statistics (i.e., means, *SD*s, and minimum and maximum values) to report the number of morphological tense error types and syntactic error types in simple and complex sentences. Children's total use of morphological structures and types of sentences (i.e., simple and complex) is important to take into consideration when analyzing percentage of error. Children in both groups did not use all of the morphological categories that were coded. Children with DLD produced the most obligatory contexts for past tense in simple (*M* = 2.50, *SD* = 1.89, range = 0-7) and complex sentences (*M* = 2.80, *SD* = 3.35, range = 0-12). They also produced more simple sentences (*M* = 4.77, *SD* = 3.09, range = 0-11) than complex sentences (*M* = 2.57, *SD* = 2.62, range = 0-11). Children with TL also produced the most obligatory contexts for past tense in simple (*M* = 2.70, *SD* = 1.59, range = 0-7) and complex sentences (*M* = 7.03, *SD* = 5.08, range = 0-25). Children with TL produced the same number of simple (*M* = 5.00, *SD* = 2.75, range = 0-12) and complex sentences (*M* = 5.03, *SD* = 3.56, range = 0-15). Percentages reflect only the

Table 3. Total number of simple and complex sentences by group

Variable	Simple Sentences		Complex Sentences	
	M	*SD*	*M*	*SD*
Children with DLD	4.77	3.09	2.57	2.62
	[0–11]		[0–11]	
Children with TL	5.00	2.75	5.03	3.56
	[0–12]		[0–15]	

Note. The total number of simple and complex sentences represents correct and incorrect use. The bracketed numbers are the minimum and maximum values. Two participants (one with TL and one with DLD) produced only complex sentences. DLD = developmental language disorder, TL = typical language.

participants who produced at least one occurrence of the morphological constructions and at least one simple or complex sentence. See Tables 2 and 3 for comparisons.

Children with DLD produced the highest percentage of errors on copula substitution (33% of obligatory contexts), on auxiliary substitution (21% of obligatory contexts), and on past tense (24% of obligatory contexts) in simple sentences. Children with DLD produced the highest percentage of errors on auxiliary substitution (33% of obligatory contexts) in complex sentences. Children with DLD produced word errors in 22% of simple sentences and 24% of complex sentences and word-order errors in 10% of simple sentences and 12% of complex sentences. Children with TL produced the highest percentage of errors on copula and auxiliary substitutions (21% and 21% of obligatory contexts, respectively) in simple sentences and on copula and auxiliary substitutions (15% and 7% of obligatory contexts, respectively) in complex sentences. Children with TL produced word errors in 2% of simple sentences and 40% of complex sentences and word-order errors in 4% of simple sentences and 2% of complex sentences. See Table 4 for details.

Before submitting the data to statistical testing, we analyzed them for normality by reviewing the skewness and kurtosis values and computing Levene's test for homogeneity of variance across groups (DLD and TL) for total past tense errors, syntactic errors, and total errors in simple and complex sentences. Levene's test was used to determine whether the variances of the dependent variables were equal in each group. For total past tense errors, the data were positively skewed. Levene's test was significant, which means that the variance of past tense errors was unequal in each group. For syntactic errors, the data also were positively skewed. Levene's test was significant, which means that the variances of syntactic errors were unequal in each group. Finally, we examined total errors in simple and complex sentences by children with DLD. The data were normally distributed for each sentence type, and Levene's test was

not significant. This suggests that the variances of total errors in simple and complex sentences were equal.

To answer the second research question, we used the independent-samples Mann–Whitney U test because the data were not normally distributed and groups did not have equal variances. The distribution of total past tense errors produced by children with DLD ($Mdn = 35.03$) was not significantly different from the distribution of total past tense errors produced by children with TL ($Mdn = 27.34$) in simple sentences, $U = 347.00$, $p = .05$, $r = .25$. This analysis came close to being significant. It is possible that our study was underpowered to adequately detect a significant difference. Similarly, the distribution of total past tense errors produced by children with DLD was not significantly different from the distribution of total past tense errors produced by children with TL in complex sentences ($Mdn = 29.80$; $Mdn = 24.85$, respectively), $U = 280.50$, $p = .19$. See Supplement Digital Content 2 (available at: http://links.lww.com/TLD/A111) materials for the distribution graphs.

After reviewing the percentages of tense errors in each category (i.e., number of copula substitution, copula omission, auxiliary substitution, auxiliary omission, and past tense errors), we observed that children with DLD and children with TL substituted copula and auxiliary BE at similar rates. These percentages suggest that substituting past tense BE verbs (i.e., *was* and *were*) for present tense BE verbs (i.e., *am*, *is*, and *are*) does not differentiate the use of past tense in children with DLD and children with TL. Therefore, we reanalyzed the data using the percentage of regular and irregular past tense errors only. The past tense error percentages were positively skewed, and Levene's test was significant. Therefore, we utilized a Mann–Whitney U test to compare the difference in the distribution of past tense errors across groups. The distribution of past tense errors produced by children with DLD ($Mdn = 33.19$) was significantly different from the distribution of past tense errors produced by

Table 4. Percentage of error types by group and sentence type

Variable	SVA M	SVA SD	Overgeneralize M	Overgeneralize SD	Copula Substitution M	Copula Substitution SD	Copula Omission M	Copula Omission SD	Auxiliary Substitution M	Auxiliary Substitution SD	Auxiliary Omission M	Auxiliary Omission SD	Past Tense M	Past Tense SD	Future Tense M	Future Tense SD	Error Word M	Error Word SD	Error Word Order M	Error Word Order SD
Children with DLD																				
Simple sentences (*n*)	*n* = 12		*n* = 27		*n* = 21		*n* = 21		*n* = 12		*n* = 12		*n* = 27		*n* = 2		*n* = 29		*n* = 29	
Simple sentences (M, SD)	0.06	0.19	0.01	0.04	0.33	0.46	0.06	0.22	0.21	0.40	0.05	0.13	0.24	0.35	0.00	0.00	0.22	0.26	0.10	0.17
Simple sentences (range)	[0.00–0.67]		[0.00–0.20]		[0.00–1.00]		[0.00–1.00]		[0.00–1.00]		[0.00–0.33]		[0.00–1.00]		[0.00]		[0.00–1.00]		[0.00–0.50]	
Complex sentences (*n*)	*n* = 9		*n* = 21		*n* = 15		*n* = 15		*n* = 9		*n* = 0		*n* = 21		*n* = 6		*n* = 23		*n* = 23	
Complex sentences (M, SD)	0.11	0.33	0.00	0.00	0.10	0.28	0.07	0.26	0.33	0.50	0.00	0.00	0.10	0.25	0.00	0.00	0.24	0.28	0.12	0.29
Complex sentences (range)	[0.00–1.00]		[0.00]		[0.00–1.00]		[0.00–1.00]		[0.00–1.00]		[0.00]		[0.00–1.00]		[0.00]		[0.00–1.00]		[0.00–1.00]	
Children with TL																				
Simple sentences (*n*)	*n* = 14		*n* = 30		*n* = 16		*n* = 16		*n* = 14		*n* = 14		*n* = 30		*n* = 1		*n* = 32		*n* = 32	
Simple sentences (M, SD)	0.07	0.27	0.01	0.06	0.21	0.39	0.03	0.13	0.21	0.43	0.00	0.00	0.06	0.14	0.00	0.00	0.02	0.06	0.04	0.08
Simple sentences (range)	[0.00–1.00]		[0.00–0.33]		[0.00–1.00]		[0.00–0.50]		[0.00–1.00]		[0.00]		[0.00–0.50]		[0.00]		[0.00–0.25]		[0.00–0.25]	
Complex sentences (*n*)	*n* = 14		*n* = 31		*n* = 17		*n* = 17		*n* = 14		*n* = 0		*n* = 31		*n* = 4		*n* = 30		*n* = 30	
Complex sentences (M, SD)	0.00	0.00	0.00	0.00	0.15	0.34	0.00	0.00	0.07	0.27	0.00	0.00	0.04	0.08	0.00	0.00	0.40	0.10	0.02	0.05
Complex sentences (range)	[0.00]		[0.00]		[0.00–1.00]		[0.00]		[0.00–1.00]		[0.00]		[0.00–0.20]		[0.00]		[0.00–0.40]		[0.00–0.22]	

Note. Percentages were calculated by dividing the number of errors in each category by the total occurrences within each category (i.e., obligatory context). The bracketed numbers are the minimum and maximum values. DLD = developmental language disorder; *n* = the number of participants who used the structure at least one time, either correctly or incorrectly, in each category; SVA = subject–verb agreement; TL = typical language.

children with TL (*Mdn* = 25.23) in simple sentences, *U* = 292.00, *p* = .02, *r* = −.30. However, the distribution of past tense errors produced by children with DLD was not significantly different from the distribution of past tense errors produced by children with TL in complex sentences (*Mdn* = 25.74; *Mdn* = 27.02, respectively), *U* = 341.50, *p* = .70. See Supplement Digital Content 2 (available at: http://links.lww.com/TLD/A111) for the distribution graphs.

To answer the third research question, we used the independent-samples Mann–Whitney *U* test because the data were not normally distributed and groups did not have equal variances. The distribution of syntactic errors produced by children with DLD (*Mdn* = 38.74) was significantly different from the distribution of syntactic errors produced by children with TL (*Mdn* = 23.98) in simple sentences, *U* = 239.50, *p* < .01, *r* = −.46. The same results were evident in complex sentences. The distribution of syntactic errors produced by children with DLD was significantly different from the distribution of syntactic errors produced by children with TL in complex sentences (*Mdn* = 33.15; *Mdn* = 22.28, respectively), *U* = 203.50, *p* < .01, *r* = −.37. See Supplement Digital Content 2 (available at: http://links.lww.com/TLD/A111) for the distribution graphs.

To answer the fourth research question, we used paired-samples *t* tests to analyze the differences between the total percentage of errors in simple sentences and in complex sentences by children with DLD. On average, children with DLD did not produce more errors in simple sentences (*M* = 0.53, *SD* = 0.53, *SE* = 0.11) than errors produced in complex sentences (*M* = 0.66, *SD* = 0.58, *SE* = 0.12), *t*(21) = −0.70, *p* = .49.

DISCUSSION

The purpose of this study was to evaluate the types of morphological and syntactic errors children with DLD produce in their writing in comparison with children with TL. We collected writing samples using the narrative genre to elicit the past tense. Our results demonstrate that children with DLD have difficulty using regular *-ed* and irregular past tense. Specifically, the children with DLD produced a higher percentage of regular *-ed* and irregular past tense errors than children with TL in simple sentences but not in complex sentences. It is possible that we did not find a difference in complex sentences because children with DLD did not write as many complex sentences as compared with children with TL. Therefore, there were fewer opportunities to commit a regular or irregular past tense error. When all past tense errors (i.e., past tense and omission and substitution of auxiliary and copula BE) were compared, we did not find that the distributions of the errors were different across the two groups. In fact, children with DLD *and* children with TL substituted present tense (i.e., *am, is*, and *are*) copula and auxiliary BE for past tense (i.e., *was* and *were*) copula and auxiliary BE at similar rates, and neither group omitted the past tense copula and auxiliary BE. We also reported word and word-order error types in simple and complex sentences. Children with DLD produced significantly more word and word-order errors than children with TL in simple and complex sentences. Therefore, analyzing the syntactic writing errors of children with DLD is a promising assessment tool that can be used to differentiate the text generation skills of children with DLD from those of children with TL. Finally, we found that children with DLD did not produce significantly more errors in simple sentences than in complex sentences.

Tense as a factor in the text generation skills of children with DLD

A hallmark feature of the spoken language skills of children with DLD is their inability to mark tense (Rice et al., 2004). However, by third or fourth grade, children with DLD correctly produce past tense in their spoken language at a rate of about 97% (Rice et al., 2004). Contrastively, children with DLD who are in the third and fourth grade continue to omit regular past tense *-ed* in their

written language (Mackie & Dockrell, 2004; Mackie et al., 2013; Windsor et al., 2000). Our results expand on the previous research by analyzing regular and irregular past tense. We found that the distribution of regular and irregular past tense errors in children with DLD was significantly different from that in children with TL. Children with DLD omitted past tense at a rate of 24% and 10% in simple and complex sentences, respectively, whereas children with TL omitted past tense at a rate of 6% and 4% in simple and complex sentences, respectively.

The use of tense, specifically regular and irregular past tense, is an important language skill for speaking and writing. Children with DLD who do not use past tense will have difficulty expressing ideas clearly and accurately in spoken and written language. Speech–language pathologists (SLPs) should analyze the use of regular and irregular past tense in text generation of children with DLD. This will help SLPs to document that children with DLD continue to have difficulty marking regular and irregular past tense even if they are producing little to no regular and irregular past tense errors in their spoken language. The use of past tense is particularly important for narrative discourse, which requires the use of past tense to convey past personal or fictional events (Boudreau, 2001). Children's ability to produce narrative discourse is important to their social and academic achievement (Spencer & Petersen, 2020). For example, "Tell a story or recount an experience with appropriate facts and relevant, descriptive details . . . " is a Common Core State Standard for second-grade children (CCSS, 2019). Speech–language pathologists can use narrative discourse to elicit and treat past tense verb usage.

We did not find that total past tense errors (i.e., past tense and omission and substitution of auxiliary and copula BE) committed by children with DLD were significantly different from errors committed by children with TL. We offer two explanations that may explain this finding. First, children with DLD and children with TL substituted past tense copula

and auxiliary BE for present tense copula and auxiliary BE at similar rates. This is a positive finding because the majority of children with DLD in the current study did not omit the copula and auxiliary BE verbs in their writing. However, substituting past tense BE verbs for present tense BE verbs was not a clear indicator of a difference in the use of past tense among children with DLD. This result is similar to that reported by Windsor et al. (2000), who also did not find differences in the use of BE verbs in children with DLD and children with TL. Although differences were not evident, SLPs can use this information to model how to use past tense copula and auxiliary BE in writing. It is important to highlight that, on average, children with DLD and children with TL did not use the copula and auxiliary BE verbs often. Therefore, the proportion of use could have affected the percentages of copula and auxiliary BE errors. Second, the children with DLD in the current study were a heterogeneous group, with some children producing many errors and others not producing any errors. However, we think that it is important to note that 12 of the children with DLD (40%) produced total past tense errors (i.e., past tense verbs and omission and substitution of auxiliary and copula BE) at a rate of 33% or greater, whereas six of the children with TL (18%) produced total past tense errors at a rate of 33% or greater in simple sentences. Seven children with DLD (23%) and two children with TL (6%) produced past tense errors at a rate of 33% or greater in complex sentences. Therefore, it is important that SLPs are aware that children with DLD may not present with all types of past tense errors in their writing, but it remains important to document past tense-related errors in the writing of children with DLD.

Errors in simple and complex sentences

Children with DLD produced significantly more word and word-order errors than children with TL in simple and complex sentences. These results suggest that SLPs can use syntactic errors to differentiate the text generation skills of children with DLD from

those of children with TL. Speech–language pathologists' text generation analysis can be part of their assessment battery to determine eligibility for special education services or to document how children's spoken language weaknesses affect their text generation skills. The production of syntactic errors by children with DLD affects their overall writing quality (Koutsoftas & Gray, 2012). Therefore, SLPs could use text generation analyses to support intervention strategies to improve the writing skills of children with DLD. This is important because writing is a necessary skill for achievement in school (Kim et al., 2015) and for success in the workplace (Conti-Ramsden et al., 2012, 2018).

We did not find that type of sentence (simple or complex) affected the errors produced by children with DLD. These results differ from those reported by Gillam and Johnston (1997), who found that complex sentences were more susceptible to error than simple sentences. Our results indicate, like Gillam and Johnston's results, that children with DLD are generating complex sentences. However, unlike Gillam and Johnston, both simple and complex sentences were equally susceptible to errors, suggesting that sentence complexity does not affect accuracy in the writing skills of children with DLD. Also, most researchers analyze accuracy and complexity separately (Fey et al., 2004) or only report on grammatically correct complex sentences when describing the complexity of the writing skills of children with DLD (e.g., Gillam & Johnston, 1997; Scott & Windsor, 2000). For example, Gillam and Johnston initially analyzed grammatically correct complex sentences. After reanalyzing their data with grammatically correct and incorrect complex sentences, Gillam and Johnston reported that children with DLD wrote more complex sentences than initially analyzed and that children with DLD wrote more complex sentences than produced in their spoken language. We believe that it is important to report both on accuracy and complexity by analyzing grammatically correct and incorrect simple and complex sentences because

children with DLD do use complex syntax in their writing. Importantly, SLPs can use the results of this study when assessing and treating the writing skills of children with DLD. For example, when assessing the writing skills of children with DLD, SLPs should report on all sentence types regardless of grammaticality. When treating the writing skills of children with DLD, SLPs should support children's production of simple and complex sentences and model and practice how to identify errors and correct the sentences.

Limitations and conclusions

This study's limitations provide opportunities for future research. We did not analyze other components of the Not-so-Simple View of Writing. Future studies should assess how other components of the model, like motivation, and factors, such as length of time provided to write and background knowledge of the topic, impact the text generation skills of children with DLD. The current study assessed writing in the narrative genre. The narrative genre was helpful to elicit the past tense; however, the results are limited to this genre. Future studies should analyze the production of errors in other genres, like persuasive or expository. We also restricted our analysis of morphemes to regular and irregular past tense and copula and auxiliary BE verbs. A future study should analyze the accurate and inaccurate use of derivational morphemes (e.g., morphemes that affect word meaning and grammatical category). This study also included children in the second through fourth grades. A future study should increase the number of participants across a greater age range to detect accuracy changes across development. Finally, the current study did not report the participants' dialect, race, and ethnicity. It is possible that the results could have been impacted by these factors. Specifically, the children's use of dialect variations, such as Southern White English and African American English, was not considered and thus not considering the use of dialect variation could have led to biased findings. Therefore, a future study

should include these variables in the description of the participants.

The purpose of this study was to evaluate the types of morphological and syntactic errors produced by children with DLD in narrative writing. We found that children with DLD exhibit, on average, more regular and irregular past tense errors and syntactic errors in their writing than children with TL, but that error rate was not affected by the complexity of the sentence. Given the linguistic basis of writing, assessing and treating writing should be standard for SLPs. However, Fallon and Katz (2011) reported that many SLPs do not provide written language services to children with DLD. The findings reported here can be used as a starting point for adding writing assessment to the SLP's tool kit for serving children with DLD. Speech–language pathologists can used norm-referenced assessments of writing, like the TOWL-4 (Hammill & Larsen, 2009), to determine the general strengths and weaknesses of children's writing. We also recommend that SLPs analyze the use of regular and irregular past tense and syntactic errors in both simple and complex sentences when evaluating the narrative writing skills of children with DLD.

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