Written verb use and diversity in children with Developmental Language Disorder: Stepping stones to academic writing

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Abstract

Verb use and the production of verb argument structure in the written texts of children in elementary school is a key stepping stone towards academic writing success that has remained relatively unexplored and is a notable gap in our understanding of writing development. To evaluate the role of verbs in the written narrative texts of children, we compared verb use in 10 year old children that had specific weaknesses in oral language, those with Developmental Language Disorder (DLD), and samples of children of the same age (CA) and the same raw scores on an oral language task (language ability or LA_b). Standardised measures of oral language, reading fluency, and spelling were completed. Participants then completed a standardised writing task and the texts were examined for verb argument structure, verb production and verb diversity. No between-group differences were found in the written narrative texts in relation to the production of verb argument structures. By contrast, the number of verbs produced, and the number of different verbs used differed significantly. The total number of verbs and number of different verbs produced by the children with DLD was commensurate with their LA_b peers but not their CA matched peers. All children relied on a small group of high frequency verbs in their writing, although there was evidence of greater verb diversity in the older typically developing children. Verbs produced and their diversity in narrative writing was predicted by both an oral language formulated sentences task and reading fluency, thus demonstrating the close links between expressive oral language, reading, and writing production in all children.

Keywords: Verbs; Writing; Developmental Language Disorder

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Introduction

The fluent production of written language is a complex task and becomes increasingly important in academic writing. The processes involved in writing build on the reciprocal relationships between oral language and writing itself (Dockrell & Connelly, 2016). A key component of the oral language system is vocabulary. Depth and breadth of vocabulary underpins the appropriate word choices in both oral language and written text generation (Beitchman et al., 2008; Castillo & Tolchinsky, 2018; Kim & Schatschneider, 2016). Vocabulary diversity has been found to be a unique predictor of narrative text quality (Olinghouse & Leaird, 2009; Olinghouse & Wilson, 2013). As children progress into secondary school, there is a greater use of low frequency words and increased diversity in vocabulary chosen resulting in more use of the "academic" words demanded by the various secondary school subjects. Advanced writing is associated with greater use of different words (Beard, 2000), low-frequency words (Roessingh, Elgie, & Kover, 2015), adjectives (Wells & Chang, 1986), and adverbs and adverbial phrases (Perera, 1984).

Moreover, there has been recent concern over the diversity of spoken and written vocabulary use in children entering secondary schooling and it has been argued that a "vocabulary gap" is holding back many children from achieving their full academic potential (Harley, 2018; Quigley, 2018). This is of particular concern for children who struggle with language (Connelly & Dockrell, 2015). Therefore, a clearer description of written vocabulary development is timely and, since the various types of words (nouns, adjectives, adverbs, verbs) demonstrate different developmental profiles in writing (Durrant & Brenchley, 2018), then a focus on specific word types is required. The current study focuses on a less

investigated aspect of written vocabulary development; verb use and verb argument structure in the written narrative texts of late elementary school aged children.

To evaluate the role of verbs in the written narrative texts of late elementary school aged children, we compare the type of verb argument structures and verbs used (the total number of verbs and number of different types of verbs) in two groups of Typically Developing (TD) children with a group who have specific weaknesses in the production and understanding of language, those with Developmental Language Disorders (DLD). This will allow us to examine if written verb use distinguishes the writing of late elementary school aged children with and without DLD. We also examine the relationships between verb argument structure, verb use and writing quality. Finally, we explore whether oral language, reading, and spelling skills are predictive of verb use in children's narrative writing. Thus, by focusing on verb use in narrative written texts, we aim to understand whether a limited use of verbs may constrain children's academic writing in narrative texts in elementary school.

The Importance of Verbs in Oral and Written Language

The production of well-formed utterances is essential for successful oral and written communication and verbs play an important role in determining the overall structure of utterances through the semantic and syntactic information they contain. Verbs not only convey meaning about the action, event or state described but also play a pivotal role in determining the overall structure of the sentence and the order of the words and phrases that may be combined with the verb. They have been called the "architectural centrepiece of the sentence" (Pulverman, Hirsh-Pasek, Golinkoff, Prudent, & Salkind, 2006, p.134). Research on verb use and verb argument structure in written language development is limited but, commensurate with studies of vocabulary generally, there is a gradual increase in the use of low frequency verbs as students progress through school (Durrant & Brenchley, 2018). To illustrate, there may be a gradual move away, during the ages of 11 to 24 years, from the use

of common verbs such as “think” and “know” to the use of more precise metalinguistic verbs (e.g., “argue”, “predict”) and metacognitive verbs (e.g., “assume”, “hypothesize”) (Nippold, Ward-Lonergan, & Fanning, 2005). Furthermore, the holistic quality of texts has been found to improve following interventions focused on improving verb diversity in writing for high school students (Fearn & Farnan, 2007). However, very little is known about written verb use and diversity in elementary school aged children.

Verb Argument Structure

A verb’s argument structure refers to the syntactic rules that govern the number of obligatory arguments (e.g., noun phrases) that are involved in the action, event or state that is referred to by the verb and their position in an utterance or in a written sentence. Verb argument structure also contains semantic information about the thematic roles that participants play in the action, event or state.

Verb argument structure can be categorised into three main types (see Table 1 for examples) depending on how many arguments the verb requires (see Levin (1993) for a comprehensive review of argument structures used in English). In English, most verbs are transitive and require two arguments. For example, in “John kicked the football”, the verb “kick” requires a Subject and an Object. In addition, the transitive verb “kick” requires the thematic roles of an Agent (who performs the action) and a Theme (the person or the object who is affected by the verb’s action, event or state), which is assigned to the syntactic positions of Subject and Object in the sentence.

Insert Table 1 here

One of the challenges for children learning the argument structure of verbs is that, whilst some verbs have only one argument structure, many verbs have more than one, as shown in Table 1 for the verb “to play”. Furthermore, verbs can also allow alternations that result in variations in the way in which the thematic roles can be mapped onto the syntactic

positions of Subject and Object. In the transitive structure "John broke the window," the Agent (John) is in the Subject position whilst, in the intransitive structure "The window broke," the Theme (the window) is in the Subject position.

Once children understand the role of verbs, it is likely they can then move on to using more complex sentence structures in their oral and written language and recognise that verbs can also function as nouns and as adjectives. The diverse use of verbs in writing would provide evidence that children are moving towards the more complex academic writing demanded in later schooling. There is evidence that high school students produce a range of specific verbs and use these more flexibly than they did previously (see Fang, 2006 and Silliman, Wilkinson & Brea-Spahn, 2018, for examples in the language of science). It appears likely that the functional role that verbs play in sentence construction provides an important stepping stone to developing successful academic writing in the mid-teenage years. Thus, the challenge faced by younger children at ages 9-13 has been summarised as "To engage effectively with disciplinary learning, students need to expand the repertoire of language skills they have developed during the early years of schooling, learning to recognize how language is used in different disciplines to present knowledge, give value, and create specialized texts" (Fang, 2012, p33).

Indeed, as children progress through elementary schooling the demands of the curriculum require children to produce a greater diversity of verbs and the use of more complex grammatical structures in their writing (see UK Department for Education, 2014 or the US Common Core State Standards, 2010). Yet developmental pathways in written verb production and their role in text quality remain underspecified in children at elementary school. Understanding how elementary school aged children use verbs in their writing and the skills that underpin their use is essential for developing pedagogy, determining the "stepping

stones" to success in written academic language use, and, ultimately, to further specifying models of writing development.

Children with Developmental Language Disorder

Children who struggle with the acquisition of oral language typically experience difficulties with the production of written text (Dockrell & Connelly, 2015). These children have been referred to using a range of different terminology including language impairment (LI), language disorder, specific language impairment (SLI) and language learning difficulties. In all cases the children's core challenges are with oral language. More recently, following the recommendations of the CATALISE Consortium[1] (Bishop et al., 2017), there has been a move to use a single term to refer to these children, DLD. We have followed this recommendation, and in this paper, we use DLD to refer to children with oral language difficulties. DLD is characterised by difficulties in the ability to acquire and use language. It is a heterogeneous disorder that can affect one or more components of language: syntax, morphology, phonology, pragmatics and vocabulary.

DLD, oral language and verbs. Studies of early lexical development in children with DLD have reported a limited number of verbs in their oral language and slower developmental trajectories, with a continued use of semantically less specified verbs (Rice & Bode, 1993; Conti-Ramsden & Jones, 1997; Kelly, 1997). These semantically less specified verbs have been referred to as General All Purpose (GAP) verbs (Rice & Bode, 1993) and include verbs, such as "do", "get", "go" and "want". Children with DLD have also been reported to have difficulties with oral verb argument structure, omitting obligatory verb arguments, particularly with verbs that have more complex argument structures (Grela &

[1] The Criteria and Terminology Applied to Language Impairments: Synthesizing Evidence (CATALISE) consortium consisted of an international panel of 59 experts in children's language disorders from a range of professional disciplines. The consortium was formed to try to reach consensus among professionals on how to identify and diagnose children's language difficulties. The project was conducted in two stages and used an on-line Delphi study that focused on the characteristics, diagnosis and terminology of language difficulties. The recommendation of the consortium was that the term "Developmental Language Disorder" should be used. (See Bishop (2017) for a summary).

Leonard, 1997; Grela, 2003; Thordarddottir & Ellis Weismer, 2002), and use fewer verb alternations (Thordarddottir & Ellis Weismer, 2002). It has been suggested that children with DLD are more likely to choose to use verbs and verb argument structures that they know and are familiar with, resulting in fewer complex sentences and less vocabulary diversity produced in speaking.

A comprehensive investigation of both verb argument structure and verb diversity in the spontaneous speech of a group of 50 children with DLD aged 5;5 to 9;8, was carried out by Thordarddottir and Ellis Weismer (2002; 2001). When compared with chronological age (CA) matched and Mean Length of Utterance (MLU) matched controls, the children with DLD did not differ significantly in the types of oral argument structure used. However, the children with DLD and their MLU matched controls used significantly fewer argument structures types and were more likely to use an alternating verb with only one of its argument structures than their CA matched controls (Thordarddottir & Ellis Weismer, 2002). A separate analysis of the same data (Thordarddottir & Ellis Weismer, 2001) for oral verb diversity found that children with DLD did not differ from their MLU or CA matched groups in their use of different verbs and that the use of a small group of high-frequency verbs (of which most were GAP verbs) was common in all groups. Thordarddottir and Ellis Weismer (2001) note that as children's language ability develops and their vocabulary widens, their use of more specific verbs increases. However, for children with DLD, there appears to be continued over reliance on non-specific GAP verbs. This could reflect their difficulties in accessing more semantically specific verbs that have more complex argument structures (Dockrell, Messer, & George, 2001).

DLD, written language and verbs. The studies cited above concerned oral language but difficulties with verbs have also been found in the written texts of children with DLD, with errors found in past tense marking and the omission of auxiliary verbs (Gillam &

Johnston, 1992; Mackie & Dockrell, 2004; Scott & Windsor, 2000). To date, studies examining verb argument structure and verb diversity in children's written texts have not been reported. It is not known if children with DLD differ from other children with regard to the use of different verbs or different verb argument structures when writing and if they rely on a small group of high-frequency verbs (such as GAP verbs) in their writing as reported in studies of their oral language.

A recent study examining the written language samples of typically developing children between the ages of 6 and 16 years reported that elementary school children's writing was characterised by extensive repetition of high frequency verbs but much less so in secondary schooling (Durrant & Brenchley, 2018). To our knowledge there are few other studies on the use of GAP verbs in writing and none with children with DLD. However, Hasselgren (1994), in a study of the written texts of Norwegian first year university and upper sixth-form students learning English as a second language, found that they favoured using high-frequency general verbs. For example, "get", a GAP verb, was used more than a specific verb such as "gain". Hasselgren called these familiar and high-frequency verbs "lexical teddy bears" suggesting that the students' relied on these because they chose "words and phrases closely resembling their first language or those learnt early or widely used" (Hasselgren, 1994, p.237). A disclaimer is that young adults learning English as a second language represent neither typical or atypical development in a first language . However, the use of a small set of "safe" high-frequency verbs or "lexical teddy bears" in older children who devote considerable cognitive resources to learning to write mirrors the findings of younger children reported by Durrant and Brenchley (2018) across a number of genres. Furthermore, a lack of verb diversity in oral language in children with DLD (Thordarddottir & Ellis Weismer, 2001) and their significant difficulties learning to write (Connelly &

Dockrell, 2015) would lead us to predict they may also struggle with producing verb diversity in written language.

To understand the factors which impact on children's writing, it is necessary to consider wider measures of reading and spelling to account for potential interactions with these skills. Reading skills in elementary school age children are strongly associated with superior writing (Abbott, Berninger, & Fayol, 2010). Recent evidence suggests that reading-to-writing conceptualisations are superior, especially for word and text levels of writing, but that the relationship can also be bi-directional at the sentence level (Ahmed, Wagener, & Lopez, 2014). Spelling skills have been consistently implicated in the quality of children's written texts (Abbott et al., 2010) and spelling difficulties may be reduced when children decide only to produce words they can spell in writing (Sumner, Connelly, & Barnett, 2016). Children with DLD struggle with reading (Tomblin, Zhang, Buckwalter, & Catts, 2000) and spelling (Joye, Broc, Olive, & Dockrell, 2019) and both reading and spelling have been implicated in the accuracy and quality of their writing (Connelly, Dockrell, Walter, & Critten, 2012; Dockrell, Lindsay, & Connelly, 2009; Mackie, Dockrell, & Lindsay, 2013). Therefore, any studies of verb use in children with DLD will have to include wider measures of reading and spelling to account for potential interactions.

Oral formulated sentence skills, tested with a standardised assessment, predict written text generation over time and across languages (Savage, Kozakewich, Genesee, Erdos, & Haigh, 2017) and predict, as well, written grammatical skills in children with DLD and Autism Spectrum Disorder (Dockrell, Ricketts, Charman, & Lindsay, 2014). Written sentence generation has been reported to be a sensitive and specific measure to identify struggling writers and is strongly predicted by oral sentence skills (Dockrell et al., 2019). However, these studies did not focus on children's verb use and so the way in which oral sentence skills underpin verb use in written sentences requires further clarification.

The Current Study

In this study, verb argument structure and diversity of verb use was examined in the narrative written texts produced by elementary school children in a standardised assessment of written narrative. Firstly, we compared the three groups of children, a DLD group, a chronological age matched peer group (CA) and a younger language ability matched peer group (LA_b) in their use of verbs and verb argument structures in their narrative writing. Including a group of language ability matched children provided the opportunity to uncover features of verb use that may be differentially diagnostic in writing for children with DLD.

It was hypothesised that the types of written verb argument structure in children with DLD would be significantly reduced in comparison to their CA matched peers (CA) but would be commensurate with LA_b matched children. To our knowledge this is the first study to examine whether the slower developmental growth of verb argument structure and verb use found in oral language in children with DLD (Thordarddottir & Ellis Weismer, 2002; 2001) is also captured in written language and, as such, develops our understanding of the associations between written and oral language skills (Dockrell, Lindsay, & Connelly, 2009; Dockrell, Lindsay, Connelly, & Mackie, 2007).

It was also hypothesised that children with DLD would produce less diverse verbs than their chronologically matched peers but would perform similarly to their LA_b matched peers. It was also expected, given the literature on oral language that the children with DLD and their LA_b peers would rely more on high frequency and GAP verbs than would the CA matched children in their writing. Previous work has demonstrated that children with DLD produce less diverse verbs in their oral language and show an over reliance on a small number of high frequency and GAP verbs. This study extends this work to examine verb diversity in the written narrative texts produced by children with DLD and TD controls.

We also examined relationships between verb use and verb argument structures, writing quality, and reading and spelling across all the children sampled. We considered the extent to which written verb use and diversity were related to oral language, spelling, and reading. Multiple linear regression was used to explore which factors predicted children's written use of verbs. Building on previous research (Dockrell, Connelly, & Arfè, 2019; Savage et al., 2017), it was hypothesised that oral language sentence measures and measures of single word reading and spelling would significantly contribute to children's written use of verbs.

Method

Participants

Participants were children recruited from mainstream elementary schools in Southern England as part of a larger study (N = 99) on writing development (Connelly, Dockrell, Walter and Critten, 2012; Dockrell & Connelly, 2015) and screened to ensure that they were performing within the average range on a measure of non-verbal ability (Standard Scores (SS) > 85). All children had English as their first language and were predominantly of white, British ethnicity. The Social Economic Status (SES) of the schools was in the average range, as indicated by the percentage of children receiving free school meals (an indicator of SES in the UK).

The final sample of children used in this study was selected to ensure that the two writing prompts used were balanced across each of the groups and so consisted of 90 children. The children comprised three groups: n = 30 children with a diagnosis of DLD (20 boys and 10 girls) with a mean age of 9;11 (range 9;5 to 10;6), n = 30 matched for CA with a mean age of 9:10 (range 9:6 to 10:5) and n = 30 LA_b group with a mean chronological age of 8:1 (range 6:8 to 8:10) who were matched with the DLD group for raw scores on an oral sentence production task. The measure of the ability to produce oral language sentences, the

Formulating Sentences subtest from the Clinical Evaluation of Language Fundamentals, fourth edition, UK standardisation (CELF-4 UK; Semel, Wiig, & Secord, 2006) was used to match participants for oral language given its demonstrated central role in written text generation in children of this age group (Dockrell, Connelly & Arfè, 2019).

The children with DLD had already been identified by accredited professionals as having a diagnosis of specific language impairment (consistent with the terminology in use at the time). These children were defined as (a) having a discrepancy between their level of functioning in the area of oral language and that which would be expected given the child's functioning in other areas and (b) experiencing significant language-based learning needs. The diagnosis of specific language impairment, now specified as DLD, was confirmed for all of the identified children in this study using the four core subtests of the CELF-4 UK (Semel et al., 2006) that were administered to each of the children with reported language difficulties. For a confirmatory diagnosis, children had to achieve a standard score of 75 or below (2 *SD*s below the mean). The matrices subtest from the British Ability Scales II (BAS II; Elliot, Murray, & Pearson, 1997) was also administered to establish that non-verbal abilities were within the average range.

The two groups of TD comparison children (the CA and LA_b groups) attended the same elementary schools as those identified with DLD to ensure that all children came from the same learning environments and were subject to the same national curriculum. The TD children were selected on the basis of average attainment on curriculum assessments and having no additional learning needs. The CA matched group were pairwise matched to the children with DLD within ±3 months. The LA_b control children were pairwise matched to the children with DLD to within one raw score on the *CELF-4* Formulating Sentences subtest. There were more TD children screened than selected and selection was on the basis of providing the best match on either age or Formulated Sentences. An independent *t*-test on

the raw score of the *CELF-4* Formulating Sentences of the DLD group (M = 31.23, SD = 3.87) and LA_b group (M = 31.50, SD = 4.13) was not significant, $t(58) = -.258$, $p = .797$, thus confirming the match.

Table 2 provides descriptive information about the groups for age, gender and the standardised test measures of non-verbal ability, oral language, reading and spelling. Z scores of standard scores are presented to allow comparison across tests. As expected, children with DLD performed significantly below their TD peers on measures of language, reading, and spelling with large effect sizes. For the DLD group, their language measures were significantly below their nonverbal ability scores (*CELF-4* formulating sentences: $t(29) = 14.438$, $p > .0005$; *CELF-4* recalling sentences: $t(29) = 11.391$, $p > .0005$; The British Picture Vocabulary Scales, second edition (*BPVS-2*; Dunn, Dunn & NEFR, 1997); and receptive vocabulary: $t(29) = 7.823$, $p < .0005$) confirming their diagnosis of DLD.

Insert Table 2 here

Measures

Non-verbal IQ was assessed using the Matrices subscale of the BAS-II (Elliott et al., 1997). Oral language was assessed in all children using two subtests from the CELF-4 UK (Semel et al., 2006). Children with suspected DLD completed all four subtests to confirm their diagnosis.

All children completed the BPVS-2 and two CELF-4 subtests: formulated sentences and recalling sentences. In formulated sentences the respondent formulates a sentence in response to an orally presented target word or phrase with a stimulus picture as reference. In the recalling sentences subtest respondents repeat orally presented sentences, which vary in syntactic complexity. The BPVS-2 (Dunn et al., 1997) is a measure of receptive vocabulary where respondents match an orally presented word to one of four pictures.

Reading and spelling was also assessed. The Test of Word Reading Efficiency (TOWRE; Torgesen, Wagner & Rashotte, 1999) was used to measure fluency in reading single words and nonwords. Spelling was measured by the spelling subtest in the BAS II, a single word spelling test (Elliott et al., 1997). Each target word to be spelled is spoken in isolation, then in an illustrative sentence.

To measure the quality of written language the UK standardised Weschler Objective Language Dimensions (WOLD; Rust, 1996) was used. The WOLD includes two alternate writing prompts to allow for repeated testing in an academic year. The manual provides details of the reliability and validity of the test. Both prompts elicit narrative style writing and are appropriate to the writing genres used in schools. The children were given 15 minutes in which to write a letter that outlined his or her ideal place or holiday. In each of the three groups, half of the children had the "place" letter prompt and the other half had the "holiday" letter prompt. The instructions for each prompt were as follows:

- Place prompt: Imagine that you could have someone to design a place for you to live in and create it to your exact wishes. Write a letter to that person. Describe how you want your ideal place to look. Be sure to include all the details the person would need to know about your ideal place.
- Holiday prompt: Imagine that you could go anywhere you wanted for one day. You could go anywhere at all, and you could take one friend along. Write a letter to that friend, inviting him or her to go with you. In the letter, tell your friend where you will go for this one day and what you will do there.

Procedure

Children were tested individually in a quiet room at school over three sessions. The first session involved a familiarisation with the researcher and an introduction to the project. Informed consent from schools, parents, and children was provided prior to any testing and children were allowed to terminate the session if they wished. Ethical approval was obtained through the first and second author's institutions. The oral language and nonverbal ability measures were administered in a first testing session, followed by the reading, spelling and writing measures in a second testing session.

All tests were administered using the standard procedures in the manuals. To prevent penalizing children who were poor spellers, all children were asked to read back their written texts and the tester noted any unclear words on a separate sheet.

Coding of the Written Texts

Coding written output on the WOLD Standardised writing measure. Scripts were typed to reduce rating bias. The quality of the written output was assessed analytically using six criteria: sentence ideas and development; organisation, unity and coherence; vocabulary; sentence structure and variety; grammar and usage; and capitalisation and punctuation. Each criterion is rated independently on a 4-point scale and then combined to obtain an overall total score (see Rust, 1996 for further details).

Reliability checks were performed for the six criteria of the analytical scoring scales of the WOLD on 10% of writing samples by two trained researchers using Cohen's kappa (Cohen, 1960). The prompts were equally represented in the reliability sample. The mean inter-rater agreement across the six criteria was 80% with a "good" Kappa score of .66 (Altman, 1991). In the case of an inter-rater disagreement, the scores were further discussed within the research team and informed the final scoring of the texts. There was 100% agreement between the raters for the spelling errors and the total number of words produced.

Coding of WOLD scripts for written verb diversity. The coding of the verbs used in the written texts was an adaption of the coding method used by Thordarddottir and Ellis Weismer (2002) for oral language samples. As a first step the written verbs were coded using all the original categories (see Thordarddottir & Ellis Weismer, 2002). However, most of these categories did not occur in the written texts. A simplified coding frame was created where the verbs produced in the children's writing were coded into three verb argument structures (intransitive, transitive, and di-transitive). Within each of these argument structures different argument types were produced and typical examples from the written texts of the children in this study can be found in Table 3. In addition, the total number of main verbs used, and number of different main verbs that each participant used was calculated. There was 100% agreement regarding argument structures with a second rater who examined 12 scripts from the sample with one disagreement of the 173 verbs classified.

Insert Table 3 here

The coding of the verbs was done manually using typed transcripts of the written samples. Inconsistent use of and/or lack of punctuation and capitalisation in the written samples, particularly in the DLD and LA_b groups, meant that sentence and clause boundaries were not always detectable. Sentence level units of analysis were determined based on the main verb and the intended meaning of the text. Questions and imperative utterances, where a subject was not required, were included. Consistent with Thordarddottir and Ellis Weismer (2002), auxiliary verbs (*to be, to have, to do*) were only included when they were used as a main verb. Semi-auxiliaries (*have to, going to*), modal verbs (*would, can*, *will, may* etc), infinitive verbs used as a complement to a main verb and units of analysis that were meaningless or illegible were not coded.

Approach to Data Analysis

We examined the differences between the three groups (independent variable) on both measures of language, non-verbal ability, and reading and spelling (control variables) and the dependent measures of verb argument structure, verbs produced and verb diversity using ANOVAs. Where ANOVAs were significant, post hoc tests were computed and results reported in the relevant tables. Effect size was measured using partial eta square where .02 is considered to be a small effect size, .13 a medium effect size, and .26 a large effect size. (Cohen, 1960). Frequency of written verbs from relevant corpora was used to explore verb usage.

Relationships were examined between verb use and verb diversity and the language, reading, and spelling measures using zero order correlations first. These correlations were further examined controlling for words produced. Regression analysis was used to predict performance on verb usage and verb diversity.

Results

The results are presented in two main sections. The first section considers differences in verb use and writing between the three groups of children. It compares children's performance on the writing tasks, examines patterns of performance in children's use of written verb argument structure, and looks at written verb use and diversity across the groups. In this analysis, the range and frequency of verb use are detailed and examples of children's written verb production are provided.

The second section examines relationships between verb production and written verb argument structures as well as the relationships among writing quality, oral language, reading, spelling, and written verb production and verb diversity. A multiple linear regression is used to predict written verb production and verb diversity based on oral language, spelling and reading.

Differences in Writing Performance, Verb Argument Structure, and Verb Use and Diversity

Writing performance. The means, standard deviations and statistical results for the analytic scoring of the WOLD are shown in Table 4.

Insert Table 4 here

The children with DLD were significantly poorer than both their LA_b and CA matched peers on the standardised score from the assessment of writing quality, and the effect size was large, demonstrating a significant delay in their writing development given their age. By contrast, analysis of the WOLD writing raw scores indicated that the performance of children with DLD was commensurate with their younger LA_b peers and confirmed previous research closely associating the rated writing quality with oral language performance (Connelly & Dockrell, 2015; Dockrell & Connelly, 2016). The large effect sizes indicated that the magnitude of differences across the writing subscales was meaningful, with sentence structure and variety demonstrating the largest effect size.

Verb argument structures. The written main verb argument structures produced in the WOLD written samples were coded as intransitive, transitive or di-transitive verb frames (see examples in Table 3). Due to the variability in the length of texts produced by the different groups of children, the three types of verb argument structures used are presented as a proportion of the total written verb arguments produced (see Table 5).

Insert Table 5 here

Table 5 shows that there was a similar pattern in the type of written verb argument structure used by each of the three groups. Transitive verb argument structures were produced most, followed by intransitive and then di-transitive verb argument structures. No significant differences were found between the written use of intransitive, transitive and di-transitive verb argument structures across the three groups of children. However, in all cases

the standard deviations were large, demonstrating significant variability within the groups in written argument structure usage.

Verb diversity, verb frequency, and verb use across the groups. In Table 6 the mean number of words produced in the written WOLD scripts are shown alongside the means for verb diversity (total verbs and total different verbs) for the children with DLD and their LA_b and CA matches.

Table 6 here

Table 6 shows that the children with DLD did not differ from their LA_b matched peers in the mean number of words in the WOLD written samples, the total number of verbs and the number of different verbs produced. However, the CA group differed significantly from both the DLD and LA_b groups on each of these measures producing longer written texts and using more verbs and different types of verbs than the children in the DLD and LA_b groups.

To examine the frequency of the written verbs produced, a full list of the frequency of the verbs produced in the writing samples was created and can be found as supplementary material online. The range in the number of total written verbs produced and the number of different verbs produced by individuals was large, with each group having some children who produced only one or a small number of verbs in their written texts. In total, the CA group produced 90 different verbs, whilst the DLD and LA_b groups produced 55 and 58 different verbs respectively. Analysis of the frequency of the different written verbs used by each group showed that the same five verbs accounted for more than 53% of the total verb usage in all three groups (see Table 7). These verbs were all high frequency verbs as measured by the Subtlex-UK database, Children's British Broadcasting Corporation (CBBC) corpus (Van Heuven, Mandera, Keuleers, & Brysbaert, 2014) and included the GAP verbs "to go" and "to want".

Insert Table 7 here

Three examples are shown in Figure 1 to illustrate the texts and the verbs produced by a child with DLD and their LA_b and CA matched peers. Both the child with DLD and the LA_b match produced four verbs in total, and the CA match produced a total of 12 verbs. However, of these 12 verbs the verb "to like" was used six times.

Insert Figure 1 here

Reliance on the repeated use of a verb was common in all groups. This is illustrated in Figure 2 where use of the verb "to like" is illustrated in the text samples of a child from each of the three groups. However, despite the similarity between all three children in their use of "to like", for both the child with DLD and the child from the LA_b group, the lack of sentence structure, punctuation, and spelling errors reduced the overall quality of the written narrative.

Insert Figure 2 here

Although less typical, some children produced a higher number of verbs in their texts. Figure 3 shows examples of scripts from each group that have a higher number of verbs and a greater variety of different verbs.

Insert Figure 3 here

Section summary. There were no significant differences in the types of verb argument structures used in the written texts of the three groups. By contrast, there were significant differences in the number of verbs produced and the number of different verbs produced between the CA group and the LA_b and DLD group, but no differences between the LA_b and DLD groups. Children with DLD were performing at a level commensurate with their oral language matched peers. Across all groups there was significant variation in both the numbers of verbs produced and the diversity of verbs produced in written texts. However, there was evidence that repetitive use of the same verbs in written texts was a common pattern across children in all groups.

Relationships among Verb Production, Verb Argument Structure, Verb Diversity, and Quality of Written Language.

Relationships between written verb production and verb argument structure were examined using correlations that controlled for total words produced in the texts. As expected, in all cases written verb production and diversity was associated with increased production in verb argument structure (total number of verbs produced and transitive argument structure r = .402, intransitive argument structure r = .769, and di-transitive argument structure r = .397; number of different verbs produced and transitive argument structure r = .675, intransitive argument structure r = .272, and di-transitive argument structure r = .393).

Zero order correlations were computed between the number of written verbs produced, number of different verbs produced, the sum of the WOLD analytical scoring scales and the independent raw score measures of oral language, spelling and reading to investigate underlying relationships between written verb use and wider measures of general academic language. As Table 8 shows the number of written verbs produced was significantly associated with all measures, except receptive vocabulary, while the number of different written verbs produced was associated with all measures except receptive vocabulary and single word spelling. The pattern of results did not differ when WOLD subscales were examined.

Insert Table 8 here

To control for the confound of numbers of written words produced in the narrative texts, partial correlations were computed. Significant relationships remained between oral formulated sentences and total numbers of written verbs produced (p. <.05) and word reading (p<.05) but all other associations were no longer significant. By corollary, partial correlations controlling for words produced and number of different written verbs revealed a significant

correlation with oral formulated sentences (p = .017) but none of the other measures. In sum, independent of the length of the texts produced, oral sentence formulation and word reading skills were significantly associated with written verb production.

Multiple linear regression analysis was used to examine the independent contribution of measures of oral language, spelling, and reading on total written verbs produced and the number of different written verbs produced for the total sample. Age was entered first in the model, to control for developmental differences, followed by the oral language measures and, finally, spelling, and reading. The final model for number of written verbs produced included both oral sentence formulation and word reading *(F (5, 89) = 5.58, p < .001, R^2 = .25, $R^2_{Adjusted}$* = .21) as significant predictors, while the final model for number of different written verbs had only oral sentence formulation as a significant predictor *(F (5, 89) = 5.56, p < .001, R^2 = .25, $R^2_{Adjusted}$* = .20). Table 9 presents the results of the final model.

Section summary. In summary, the number of written verbs produced and the number of different written verbs were significantly predicted by children's performance on the oral formulated sentences measure and their real word reading fluency, but not by their spelling.

Insert Table 9 here

Discussion

Verb argument structure, the production of verbs, and verb diversity were examined in the written narrative texts of children with DLD and their CA and LA_b matched peers. Whilst previous research has looked at lexical diversity, to our knowledge no studies to date have specifically focused on elementary school children's use of verbs in their writing and children with DLD in particular.

Firstly, we found no difference in the use of verb argument structures between the groups of children, contrary to our first hypothesis. In fact, the variety of verb argument structures found in oral language was not evident in the children's written language. As such, the written analysis needed to be restructured and reduced to three forms of verb argument structure: transitive, intransitive and di-transitive sentences. All three groups of children produced examples of these structures but no differences in frequency of use were found between the groups.

By contrast, the number of written verbs produced and written verb diversity differed by group confirming our second hypothesis. The older typically developing CA group outperformed both of the other groups. However, the performance of the children with DLD was commensurate with their LA_b peers, a finding that is consistent with the literature on writing where oral language ability has been found to be closely tied to writing ability in children with DLD (Dockrell & Connelly, 2015). Dissimilarities in written verb use were not differentially diagnostic for the writing of children with DLD and our examination of high frequency and GAP verbs showed that a limited use of written verbs was common across all groups disconfirming our third hypothesis.

Both oral sentence formulation and reading fluency for single words were predictors of the numbers of written verbs produced and the number of different verbs produced, demonstrating that both oral language and oral reading fluency support the number and diversity of written verb use in a bi-directional or reciprocal nature. This confirmed our fourth hypothesis except that spelling was not a significant predictor. Furthermore, the overall writing quality of the narratives was not predicted by verbs produced or the number of different verbs in the text once the length of the texts was controlled for.

Verb Argument Structures

The oral language of children with DLD has previously been shown to include fewer verb argument structure types than their same age peers in oral narratives (Thordardottir & Ellis Weismer, 2002). In the current study this was not replicated in the written domain and there was no difference in the use of written verb argument structures between groups. The reason for this lack of difference is unclear but it is notable that there is generally a large difference in number of words produced between oral and written tasks in children of similar age (Scott & Windsor, 2000; Sumner et al., 2016). Additionally, previous work eliciting oral samples from children, with and without DLD, used a variety of different prompts (i.e., describe a book, movie, school activity, vacation, or another special topic) and employed more prompting of further speech when the children stopped talking (Thordardottir & Ellis Weismer, 2001). The significant cognitive demands of producing written text may also account for the lack of argument structures compared to oral language (see Donaldson & Cooper, 2013 for a similar finding in relation to verb phrase anaphora for younger children). Scott and Windsor (2000) speculated that there is a gradual transition between the middle elementary school years and secondary schooling whereby writing becomes more linguistically complex than speech. Until then, oral language transcripts tend to be longer and grammatically more complex than written transcripts. The current data support this gradual transition illustrating that verb argument structure does not differentiate performance between either the younger or older typically developing children or from the children with DLD.

Differences in verb argument structure may emerge later, perhaps hidden by a floor effect due to the small amount of text and verb structures produced by all children in the sample. Further investigation of the writing curriculum in schools may be warranted to see if this explains some of this lack of verb production. Scott and Windsor (2000) did not measure verb argument structures or verb production in their oral and written samples for the slightly older children they sampled but they did measure written verb errors in their sample. They

found that the children with DLD performed more poorly than controls but this may have been confounded with spelling difficulties (Windsor, Scott & Street, 2000).

A final point is that oral verb vocabulary typically is not assessed in vocabulary tests and could be compared in relation to written verb use in future studies. This would allow for the identification of developmental patterns of oral and written verb use and the identification of any developmental differences, an important topic since some children in both the CA and LA_b group in the current study showed indicative evidence of a wider verb vocabulary in their writing.

Verb Diversity

The number of verbs and the number of different verbs produced by the children did not account for significant variance in writing quality once overall text length was controlled for. However, of interest are the relatively small number of different verbs produced by children with DLD and their LA_b peers and the reliance on a small group of high frequency verbs across all three groups. The same five verbs (*go, be (copula), have, want* and *like*) accounted for over half of the total verbs produced across all groups. This pattern paralleled the use of GAP verbs in spoken language and the report of the repetition of high frequency verbs in the writing of typically developing children in elementary school (Durrant & Brenchley, 2018).

Thordarddottir and Ellis Weismer (2002) suggested that high frequency verbs in oral language may act as semantic and syntactic prototypes that can be used to simplify information without losing its meaning. The same could be true in writing. Work with adolescents and young adults learning English as a Second Language found that some students persisted in relying on a similarly small set of written verbs in their English texts (their “lexical teddy bears”), and these actually had a negative impact on writing quality (Hasselegren, 1994; Altenberg & Granger, 2001). A similar limitation in the oral language

skills of children with DLD in their first language may also explain the difficulties they experience; the similarities in limited verb use between the children with DLD and their LA_b peers would support this conclusion compared to the wider range of verbs in the older typically developing group. Writing connected discourse and making diverse word choices may "compete" for children's limited cognitiveresources, especially those children with language difficulties, such as DLD (Berninger, 2000).

For both the number of verbs produced and verb diversity, the oral formulated sentences measure accounted for significant variance. The oral formulated sentences task may be a good predictor of written verb production since it requires children to produce oral language in a specific semantic and contextually constrained situation perhaps in a similar way demanded when responding to a written prompt (Savage et al., 2017).

The number of verbs produced was also explained by the children's reading fluency. This was not unexpected as when children become better readers their linguistic input changes in significant ways (Stanovich, 1986). They will access more complex sentence constructions and variety in vocabulary through their reading than through speaking. Furthermore, children experiencing difficulties with oral language and reading are less likely to read and to engage with texts thus limiting opportunities for vocabulary extension and exposure to more complex sentence structures that may be important for writing. The significant role played by reading in children's writing performance highlights the fact that while writing shares some of the same processes with oral language there are important differences (Shanahan, 2016).

Limitations

The current study highlighted the importance of examining verb diversity and verb argument structure as potential semantic, syntactic and thematic stepping-stones to the various types of general academic writing. However, there were limitations, which highlight

the need for further research. Firstly, the narrative writing task and the prompts used might have led to reliance on a small number of high frequency verbs. Unfortunately, there are no studies at this time examining written verb use in elementary children's writing using different prompts in order to examine this hypothesis. Some recent work sampling children's written work across a wide range of elementary children's texts (Durrant & Brenchley, 2018) reported that, on average, children used a consistently small set of high frequency verbs when writing in elementary school. However, the study did not differentiate by type of text at the different ages sampled.

Secondly, as with all correlational studies, the results cannot provide causal explanations but the findings do give guidance about academic writing development generally. The number and diversity of verbs used was smaller than had been expected, even in the TD children. However, the use of a small set of high frequency written verbs was common across all groups and was also consistent with findings in oral language.

Thirdly, the assessment and measurement of written language was subject to a number of limitations and we did not have lengthy written language samples to calculate the more typically used measures of vocabulary diversity. Other studies examining diversity in writing have utilized different measures of lexical diversity, for example, Type Token Ratios (TTR) or D (see Owen & Leonard, 2002 for discussion of measures and use of D). However, a minimum sample size of 50 words is needed to calculate D (Yu, 2009) and the written texts in the current study varied in length from 15 to 266 words and 1 to 30 verbs. Future studies need to ensure that a suitable sample size of written text is obtained to allow for measures of verb lexical diversity to be calculated.

Increasing the numbers of texts for inter-rater reliability would have further strengthened the study. We completed reliability checks on 10 per cent of the original sample

and, while not an unusual percentage, it could have been larger (Babayigit, 2015; Dockrell, Connelly, Walter, & Critten, 2015; Kim, Al Otaiba, Wanzek, & Gatlin, 2015).

Finally, our study was limited to a narrow age group tested at a single point in time, which limits generalisability. It is likely that a single writing sample is not fully representative of a student's writing performance, but this is an issue with much of the research on writing (e.g., Troia, Harbaugh, Shankland, Wolbers, & Lawrence, 2012). Nonetheless, we selected an age group where teachers likely expect pupils to demonstrate competence in using verbs in their narrative writing and where the curriculum demands a certain level of skill. While it is difficult to compare across investigations, we also chose a task that is widely used in writing research to allow some comparisons across studies. The topic and situation influence how much children write and the WOLD prompts elicited narratives that could vary from the traditional sense (fictional or non-fictional experience); but we have demonstrated via the standardised scores from the WOLD that our control samples were scoring within the typical range for their age.

Conclusion

Verbs are a key aspect of vocabulary and syntax and, as such, important for the production of written text and the development of academic writing. In this study we examined the production of verb argument structures and the production and diversity of the verbs in the written narratives of typically developing children and children with DLD. All children were limited in the verbs and verb argument structures used in their written narratives. Unexpectedly, we found no differences between the groups in their production of verb argument structures, although verb diversity was reduced in children with DLD in comparison to their CA matched peers. Verbs produced and verb diversity were underpinned by children's oral language skills as assessed in an oral sentence formulation task. Future work should explore why some children go beyond their "lexical teddy bears" and whether

this is related to the ability to structure more complex oral or written language sentences. Writing interventions might consider a focus on developing a wider range of written verbs that can more subtly and appropriately match the intended message of the writer to the reader. Such interventions have been effective in improving writing quality in a small sample of US high school students (Fearn & Farnan, 2007) but it remains to be explored how effective such work would be in children of a younger age.

It may be that many typically developing children in elementary school will remain limited in their verb use until challenged by the varied disciplinary writing typically demanded of them in their schoolingonce beyond the age of ten years. The different linguistic requirements of content-based subjects like science or history can demand that verbs take on different roles in writing, including acting as nouns and adjectives. However, given their limited ability to produce verbs in writing, children with DLD risk being metaphorically “left behind” clutching their “lexical teddy bears” on the riverbank, unable to jump onto the stepping-stones of academic written language that are required to get them to the “other side” in order to master disciplinary writing. By contrast, those children, who display a diversity of written verb use at late elementary school, underpinned by strong reciprocal oral language and reading skills, will have already leaped ahead on these stepping-stones to academic writing.

References

Abbott, R. D., Berninger, V. W., & Fayol, M. (2010). Longitudinal relationships of levels of language in writing and between writing and reading in grades 1 to 7. *Journal of Educational Psychology*, *102*, 281-298.

Ahmed, Y., Wagner, R. K., & Lopez, D. (2014). Developmental relations between reading and writing at the word, sentence, and text levels: A latent change score analysis. *Journal of Educational Psychology*, *106*, 419-434.

Altenberg, B. & Granger, S. (2001. The grammatical and lexical patterning of MAKE in native and non-native student writing. *Applied Linguistics*, 22, 173–195. https://doi.org/10.1093/applin/22.2.173

Altman, D.G. (1991). *Practical Statistics for Medical Research*. Chapman and Hall, London.

Babayigit, S. (2015). The dimensions of written expression: Language group and gender differences. *Learning and Instruction*, 35, 33-41. doi:10.1016/j.learninstruc.2014.08.006Beard, R. (2000). *Children's writing in the primary school*. Sevenoaks: Hodder & Stoughton.

Beitchman, J. H., Jiang, H., Koyama, E., Johnson, C. J., Escobar, M., Atkinson, L., . . . Vida, R. (2008). Models and determinants of vocabulary growth from kindergarten to adulthood. *Journal of Child Psychology and Psychiatry, 49*, 626-634. doi:10.1111/j.1469-7610.2008.01878.x

Berninger, V. W. (2000). Development of language by hand and its connections with language by ear, mouth, and eye. *Topics in Language Disorders,* 20, 65-84. doi:https://psycnet.apa.org/doi/10.1097/00011363-200020040-00007

Bishop, D. V.M. (2017). Why is it so hard to reach agreement on terminology? The case of developmental language disorder (DLD). *International Journal of Language & Communication Disorders*, 52: 671-680. doi:10.1111/1460-6984.12335

Bishop, D. V.M., Snowling, M. J., Thompson, P. A., Greenhalgh, T. and the CATALISE-2 consortium (2017). Phase 2 of CATALISE: a multinational and multidisciplinary Delphi consensus study of problems with language development: Terminology. *Journal of Child Psychology and Psychiatry,* 58, 1068-1080. doi:10.1111/jcpp.12721

Castillo, C., & Tolchinsky, L. (2018). The contribution of vocabulary knowledge and semantic orthographic fluency to text quality through elementary school in Catalan. *Reading and Writing, 31*, 293-323. doi:10.1007/s11145-017-9786-5

Cohen, J. (1960). A coefficient of agreement for nominal scales. *Educational and Psychological Measurement*. 20 (1): 37–46. doi:10.1177/001316446002000104.

Common Core State Standards (2010). National Governors Association and Council of Chief School Officers. Retrieved November 2018, from: http://www.corestandards.org/ELA-Literacy/W/

Connelly, V & Dockrell, J.E. (2015). Writing development and instruction for students with learning disabilities: Using diagnostic categories to study writing difficulties. In C MacArthur, S. Graham, J. Fitzgerald (Eds) *Handbook of Writing Research, 2nd Edition*. (pp. 349-363). New York: Guildford Publications.

Connelly, V., Dockrell, J. E., Walter, K., & Critten, S. (2012). Predicting the quality of composition and written language bursts from oral language, spelling, and handwriting skills in children with and without specific language impairment. *Written Communication*, *29*, 278-302.

Conti-Ramsden, G., & Jones, M. (1997). Verb use in specific language impairment. *Journal of Speech, Language, and Hearing Research*, 40, 1298-1313. doi:10.1044/jslhr.4006.1298

Department of Education (2014). National curriculum in England: English programmes of study. Updated 16 July 2014.

Dockrell, J. E., & Connelly, V. (2015). The role of oral language in underpinning the text generation difficulties in children with specific language impairment. *Journal of Research in Reading, 38*, 18-34. doi:10.1111/j.1467-9817.2012.01550.x

Dockrell, J.E. & Connelly, V. (2016). The relationships between oral and written sentence generation in English speaking children: the role of language and literacy skills. In J. Perera, M. Aparici, E. Rosado, & N. Salas (Eds). *Written and Spoken Language Development across the Lifespan*. (pp 161-177) London. Springer International Publishing.

Dockrell, J. E., Connelly, V., & Arfè, B. (2019). Struggling writers in elementary school: Capturing drivers of performance. *Learning and Instruction*, 60, 75-84. doi:10.1016/j.learninstruc.2018.11.009

Dockrell, J. E., Connelly, V., Walter, K., & Critten, S. (2015). Assessing children's writing products: the role of curriculum based measures. *British Educational Research Journal, 41*(4), 575-595. doi:10.1002/berj.3162

Dockrell, J. E., Lindsay, G., & Connelly, V. (2009). The impact of specific language impairment on adolescents' written text. *Exceptional Children, 75*, 427-446.

Dockrell, J. E., Lindsay, G., Connelly, V., & Mackie, C. (2007). Constraints in the production of written text in children with specific language impairments. *Exceptional Children, 73*, 147-164.

Dockrell, J. E., Messer, D., & George, R. (2001). Patterns of naming objects and actions in children with word finding difficulties. *Language and Cognitive Processes, 16*, 261-286.

Dockrell, J. E., Ricketts, J., Charman, T. & Lindsay, G. (2014) Exploring writing in products in students with language impairments and autism spectrum disorders. *Learning and Instruction*, 32, 81-90. doi: https://doi.org/10.1016/j.learninstruc.2014.01.008

Donaldson, M. L. & Cooper, L. S. (2013), Developmental relationships between speech and writing: Is verb phrase anaphora production a special case? *British Journal of Educational Psychology*, 83, 521-534. doi:10.1111/j.2044-8279.2012.02078.x

Dunn, L.M., Dunn, L.M., & NEFR. (2009). *British Picture Vocabulary Scale 3* (rev. edn). Windsor: NFER-Nelson.

Durrant, P., & Brenchley, M. (2018). Development of vocabulary sophistication across genres in English children's writing. *Reading and Writing*, 1-27.

Elliott, C. D., Murray, D. J., & Pearson, L. S. (1997). *British Ability Scales II: Matrices*. Windsor, England: NFER-Nelson.

Fang, Z. (2006). The language demands of science reading in middle school. *International Journal of Science Education*, 28, 491–520.

Fang, Z. (2012). Language correlates of disciplinary literacy. *Topics in Language Disorders*, 32, 19-34.

Fearn, L., & Farnan, N. (2007). When is a verb? Using functional grammar to teach writing. *Journal of Basic Writing*, 26, (1), 63-87.

Gillam, R., & Johnston, J. (1992). Spoken and written language relationships in language/learning-impaired and normally achieving school-age children. *Journal of Speech and Hearing Research, 35,* 1303–1315.

Grela, B. (2003). The omission of subject arguments in children with specific language impairments. *Clinical Linguistics and Phonetics*, 17, 153-169.

Grela, B. & Leonard, L., (1997). The use of subject arguments by children with specific language impairment. *Clinical Linguistics and Phonetics*, 11, 443–453.

Harley, J. (Ed.). (2018). *Why closing the word gap matters: Oxford language report*. Oxford: Oxford University Press.

Hasselgren, A. (1994). Lexical teddy bears and advanced learners: A study into the ways Norwegian students cope with English vocabulary. *International Journal of Applied Linguistics*, *4*, 237-258.

Joye, N., Broc, L., Olive, T., & Dockrell, J. (2019) Spelling performance in children with developmental language disorder: A meta-analysis across European languages, *Scientific Studies of Reading,* 23, 129-160, DOI: 10.1080/10888438.2018.1491584

Kelly, D. (1997). Patterns in verb use by preschoolers with normal language and specific language impairment. *Applied Psycholinguistics,* 18, 199-218.

Kim, Y. S., Al Otaiba, S., Wanzek, J., & Gatlin, B. (2015). Toward an Understanding of Dimensions, Predictors, and the Gender Gap in Written Composition. *Journal of Educational Psychology, 107*(1), 79-95. doi:10.1037/a0037210

Kim, Y.S. G., & Schatschneider, C. (2016). Expanding the Developmental Models of Writing: A Direct and Indirect Effects Model of Developmental Writing (DIEW). *Journal of Educational Psychology*, 109, 35-50 doi:10.1037/edu0000129

Levin, B. (1993). *English Verb Classes and Alternations: A Preliminary Investigation*, Chicago, IL: University of Chicago Press.

Mackie, C., & Dockrell, J. E. (2004). The nature of written language deficits in children with SLI. *Journal of Speech, Language, and Hearing Research*, 47, 1469-1483.

Mackie, C. J., Dockrell, J.E., & Lindsay, G. (2013). An evaluation of the written texts of children with SLI: the contributions of oral language, reading and phonological short-term memory. *Reading and Writing, 26*, 865-888. doi:10.1007/s11145-012-9396-1

Nippold, M. A., Ward-Longerman, J. M., & Fanning, J. L. (2005). Persuasive writing in children, adolescents, and adults: A study of syntactic, semantic, and pragmatic development. *Language, Speech, and Hearing Services in Schools*, 36, 125-138.

Olinghouse, N. G., & Leaird, J. T. (2009). The relationship between measures of vocabulary and narrative writing quality in second- and fourth-grade students. *Reading and Writing*, 22, 545–565.

Olinghouse, N. G., & Wilson, J. (2013). The relationship between vocabulary and writing quality in three genres. *Reading and Writing*, 26, 45-65. http://dx.doi.org/10.1007/s11145-012-9392-5

Owen, A.J. & Leonard, L.B. (2002). Lexical diversity in the spontaneous speech of children with specific language impairment: Application of D. *Journal of Speech, Language, and Hearing Research*, 45, 927-937. doi:10.1044/1092-4388

Perera, K. (1984). *Children's writing and reading: Analysing classroom language*. Oxford: Basil Blackwell.

Pulverman, R., Hirsh-Pasek, K., Golinkoff, R. M., Pruden, S., & Salkind, S. J. (2006). Conceptual Foundations for Verb Learning: Celebrating the Event. In K. Hirsh-Pasek & R. M. Golinkoff (Eds.), *Action meets word: How children learn verbs* (pp. 134-159). New York, NY, US: Oxford University Press.

Quigley, A. (2018). *Closing the vocabulary gap*. Abingdon: Routledge.

Rice, M. & Bode, J. (1993). GAPS in the verb lexicons of children with specific language impairment. *First Language, 13,* 113-131.

Roessingh, H., Elgie, S., & Kover, P. (2015). Using lexical profiling tools to investigate children's written vocabulary in Grade 3: An exploratory study. *Language Assessment Quarterly, 12*, 67-86. doi:10.1080/15434303.2014.936603

Rust, J. (1996). *The manual of the Wechsler Objective Language Dimensions (WOLD*): UK edition. London: Psychological Corporation.

Savage, R., Kozakewich, M., Genesee, F., Erdos, C., & Haigh, C. (2017). Predicting writing development in dual language instructional contexts: exploring cross-linguistic relationships. *Developmental Science*, 20(1), e12406.

Scott, C.M. & Windsor, J. (2000). General language performance measures in spoken and written narrative and expository discourse of school-age children with language learning disabilities. *Journal of Speech, Language and Hearing Research*, 43, 324-39

Semel, E., Wiig E. H., & Secord, W. A. (2006). *Clinical Evaluation of Language Fundamentals, fourth edition: UK standardisation (CELF-4 UK).* London: Psychological Corporation.

Shanahan, T. (2016). Relationships between reading and writing development. In C.A. MacArthur, S. Graham & J. Fitzgerald (Eds.) *Handbook of writing research*, 2nd Edition. (pp. 349-363). New York: Guildford Publications.

Silliman, E. R., Wilkinson, L. C., & Brea-Spahn, M. (2018). Writing the science register and multiple levels of language: Implications for English learners. In A. L. Bailey, C. A. Maher, & L. C. Wilkinson, *Language, literacy, and learning in the STEM Disciplines: How language counts for English learners* (pp. 115-139). New York: Taylor and Francis. https://doi.org/10.4324/9781315269610

Stanovich, K. E. (1986). Matthew effects in reading: Some consequences of individual differences in the acquisition of literacy. *Reading Research Quarterly*, 21, 360-407. http://dx.doi.org/10.1598/RRQ.21.4.1

Sumner, E., Connelly, V., & Barnett, A. L. (2016). The influence of spelling ability on vocabulary choices when writing for children with dyslexia. *Journal of Learning Disabilities*, *49*, 293-304

Thordardottir, E. & Ellis Weismer, S. (2001). High frequency verbs and verb diversity in the spontaneous speech of school-age children with specific language impairment. *International Journal of Language & Communication Disorders*, 36, 221-244

Thordardottir, E. & Ellis Weismer, S. (2002). Verb argument structure weakness in specific language impairment in relation to age and utterance length. *Clinical Linguistics and Phonetics*, 16, , 233-250

Tomblin, J. B., Zhang, X. Y., Buckwalter, P., & Catts, H. (2000). The association of reading disability, behavioral disorders, and language impairment among second-grade children. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 41, 473-482.

Torgesen, J. K., Wagner, R. K., Rashotte, C. A. (1999). *Test of Word Reading Efficiency* (TOWRE). Austin, TX: Pro-Ed.

Troia, G., Harbaugh, A., Shankland, R., Wolbers, K., & Lawrence, A. (2012). Relationships between writing motivation, writing activity, and writing performance: effects of grade, sex, and ability. *Reading and Writing*, 26, 17-44.

Van Heuven, W.J.B., Mandera, P., Keuleers, E., & Brysbaert, M. (2014). Subtlex-UK: A new and improved word frequency database for British English. *Quarterly Journal of Experimental Psychology*, 67, 1176-1190.

Wells, G. & Chang, G. (1986). From speech to writing: Some evidence on the relationship between oracy and literacy. In A. Wilkinson (Ed.), *From speech to writing: Some evidence on the relationship between oracy and literacy*. (pp. 109–131). Milton Keynes: Open University Press.

Windsor, J., Scott, C. M., & Street, C. K. (2000). Verb and noun morphology in the spoken and written language of children with language learning disabilities. *Journal of Speech, Language, and Hearing Research*, 43, 1322-1336.

Yu, G. (2009). Lexical diversity in writing and speaking task performances. *Applied Linguistics*, 31 236-259.