Contributions of Oral Language and Word-Level Literacy Skills to Elementary Writing in First and Second Language Learners

by

Christina Perkins

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Dr. Gina Harrison, Department of Educational Psychology and Leadership Studies
Supervisor

Dr. John Walsh, Department of Educational Psychology and Leadership Studies
Departmental Member

Dr. Todd Milford, Department of Curriculum and Instruction
Outside Member

Abstract

Second language (L2) learners are a growing population in Canadian school systems, and acquisition of literacy skills is critical to their success in Canadian society. While much research has been devoted to writing development in first language (L1) learners, text-level writing remains relatively underexplored in L2 populations. The present study sought to address this gap by considering the relative contributions of component oral language and word-level literacy skills to writing in elementary students speaking English as a first (EL1) or second (EL2) language. A sample of 124 kindergarten students (56 EL1, 68 EL2) and 112 grade three students (51 EL1, 61 EL2) completed a battery of standardized measures assessing oral language, word-level literacy, and writing skills. An ordinary least squares (OLS) regression-based mediation path analysis was used to test associations among oral language, word-level literacy, and writing skills in each group. Results indicated that word-level literacy skills had a significant direct effect on writing in all groups, but that oral language had no significant direct effect on writing in any groups. Instead, the effect of oral language on writing was significantly mediated by word-level skills in the kindergarten EL1 and EL2 groups, and the grade three EL1 group. The indirect effect of oral language on writing through word-level skills was not significant in the grade three EL2 group. Despite this, no significant differences in variable associations were found between EL1 and EL2 groups in either grade. Oral language skills were additionally found to have a significant effect on word-level literacy skills in the kindergarten EL1 and EL2 groups and the grade three EL1 group; the significance of this effect in the grade three EL2 group was unclear. Results of this study are discussed in relation to existing literature, and existing theories of L1 and L2 writing.

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Dedication

Throughout this degree I have thought, over and over, about the phrase “it takes a village”. Community is as much a part of how we do good work as it is a part of how we teach our children. It is how we learn, how we strive, and how we grow.

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Introduction

The study of second language literacy is critically important for Canadian education. In recent years, Canada has become an increasingly multilinguistic society. More than 7.7 million Canadians reported an immigrant mother tongue on the 2016 census; 81.5% of the Canadian population's first language is one of 22 immigrant languages spoken by more than 100,000 individuals across the country (Statistics Canada, 2017). The retention rate of these languages, or the rate at which immigrant mother tongues are spoken in the home, is very high. Twenty-one of the above-mentioned immigrant languages are retained at rates of 50% or higher; sixteen of them are retained at rates above 80%. The critical implication of these retention statistics is that children born into these homes are likely to be raised speaking a first language other than French or English. Because Canadian schooling is provided in one of the official national languages, however, these children will need to learn French or English as a second language upon entering the school system in kindergarten. Thus, the rise in Canadian linguistic diversity is likely to lead to an increase in the number of second language students in the Canadian school system.

The Canadian Charter of Rights and Freedoms (1982) guarantees equal benefit of the law regardless of national or ethnic origin. Implicit in this statement, and operationalized in many provincial educational policies, is equal access to educational curriculum for all students—implementation of quality, evidence-based educational practices which are suitable to address the needs of a diverse population of children. Such diverse needs arguably include the increasing linguistic diversity of young Canadians, who may come to school with limited proficiency in either of the national languages. Educators must be prepared to provide equal access to curriculum for these students by supporting development of second language proficiency within their educational program.

Developing proficiency in a second language includes development of both oral language and print-based language, or literacy. Literacy skills are critical to success in Canadian society. Beyond their obvious role in childhood academic success, literacy skills are positively correlated with level of educational attainment (e.g. years of schooling or level of schooling completed), annual income, health status, and employability (see Jamieson, 2006 for a review). Accordingly, development of literacy skills is a central goal of Canadian education (e.g., British Columbia Ministry of Education, n.d.). Much is known about first language literacy development, and how education can support children in learning to read and write in their first language with evidence-based practice. Unfortunately, the same cannot yet be said of second language literacy—the existing research base is meager in comparison. It is for this reason that the present study was initiated. The rising linguistic diversity in Canadian culture is leading to an increase in second language students in Canadian schools, who require the same quality of educational practice as first language students. Expansion of the research base to second language literacy is critical for educators to formulate and provide such evidence-based practice.

The present study seeks to contribute to the existing research base on second language literacy by investigating the component skills which impact writing outcomes for first and second language students in the early elementary grades. Specifically, it considers the relative impact of oral language skills (such as vocabulary and grammar) and print-based language skills (such as word reading and spelling) on writing in kindergarten and grade three. Consistent with the above-cited statistics, second language learners in the present study are considered to be those students whose first language (the language they grew up speaking) is an immigrant language which differs from the national language in which they receive their education—in this case, English. These second language (L2) students differ from their first language (L1) peers in

terms of exposure to oral, colloquial English at home, but tend to have similar exposure to written English as literacy instruction occurs mainly in the schooling context which the two language groups share (c.f. Schoonen et al., 2002).

What follows is a four-part overview of the existing literature on L1 and L2 learners' writing. The first portion of the review operationally defines relevant literacy skills and provides necessary background on the connection between reading and writing in L1 and L2 learners. The second portion of the review addresses the theories of writing which were used to identify relevant component skills involved in L1 and L2 learners' writing. The third portion of the review considers what has been established regarding these component skills and the fourth portion considers how these components are linked to writing outcomes specifically in L2 learners. Following this literature review, the goals and research questions of the present study will be presented. The methodology of data collection and statistical analysis used to address these questions will be discussed next. Results will then be presented and, finally, their interpretations and implications discussed.

Background

Broadly speaking, literacy refers to the complex system of skills involved in reading, writing, and understanding printed language (Larson, 2018). This includes, at minimum, the skills of reading and writing and, at maximum, a diverse array of processes involved in understanding and interacting with varying forms of information successfully (Larson, 2018). In the context of L2 learning, it is helpful to conceptualize literacy as the subset of language skills that involve interaction with printed text. While language is experienced as a unitary phenomenon, language behavior actually consists of four distinct functional systems: language by ear (listening), language by mouth (speaking), language by eye (reading) and language by hand (writing) (Berninger, 2000; Berninger, Abbott, Abbott, Graham, & Richards, 2002). The former pair involve receptive and expressive interactions with oral language—listening and speaking, respectively—while the latter pair involve receptive and expressive interactions with printed language—reading and writing, respectively. For the purposes of this paper, literacy is operationally defined as reading and writing; the latter two aspects of language behavior which involve interaction with printed text. This conceptualization is intended to create a clear demarcation between print-based language skills (i.e., literacy) and oral language skills (i.e., spoken language).

Each of these functional language systems exhibits its own developmental trajectory and internal organization but interacts with other systems to varying degrees across development (Berninger, 2000). Typically, development of the oral language systems precedes development of the print language systems, though the four develop in "parallel, overlapping waves" (Berninger, 2000, p. 66). Oral language development begins first, as infants learn to listen and then to produce their own speech sounds. Reading follows, as children learn to process the

written language system and, finally, writing development begins as they learn to produce it. In L1 learners, all four of these functional systems develop in the same cultural language. Development of the four functional language systems in L2 learners, however, is somewhat more nuanced in that: a) the first language in which they acquire oral language skills is likely to differ from the first language in which they acquire literacy skills and, b) they acquire oral and print language skills in their new language simultaneously upon entering school, rather than in the usual sequence of overlapping developmental waves. These nuances are important to keep in mind when considering the interplay of oral language and literacy skills in L2 learners.

After defining literacy as the print-based systems of reading and writing, literacy skills can be further subdivided into prereading skills, word-level skills, and text-level skills (August & Shanahan, 2006). Prereading skills include concepts of print and alphabetic knowledge which serve as prerequisites to reading and writing development. Word-level skills include decoding, word reading, pseudoword reading, and spelling. Text-level skills include fluency, reading comprehension, and writing composition skills. Both reading and writing can therefore be conceptualized as representing a combination of word and text-level skills. Reading includes individual word reading at the word level and reading comprehension and reading fluency at the text level; writing includes spelling at the word level and writing composition (quality) and fluency (number of words written) at the text level.

Relations Between Reading and Writing

Reading and writing are inherently related processes (Berninger et al., 2002; Fitzgerald & Shanahan, 2000). While they act as distinct functional language systems and represent separate literacy constructs, they are consistently linked at the word level from an early age and become increasingly linked at the text level as children get older (Berninger, 2000; Berninger et al.,

2002). Berninger and colleagues (2002) found that reading and writing were consistently and bi-directionally related at the word level in students in grade one through six. Word recognition exhibited a consistently significant direct effect on spelling and spelling exhibited a consistently significant direct effect on word recognition in all grades assessed. Abbott, Berninger, and Fayol (2010) also found that the longitudinal path from word reading to word spelling was significant across all grades from one to seven when looking at the association between variables from one year to the next. The reverse path from word spelling to reading was also found to be significant from grades two through seven indicating that, from the second grade onwards, the association between word-level reading and writing skills is consistent and bidirectional (Abbott et al., 2010). These word reading and spelling relations are observable as early as kindergarten (Ritchey, 2008) and, as will be discussed below, appear to be consistent between L1 and L2 learners (Arab-Moghaddam & Sénéchal, 2001; Ball, 2003; Chiappe, Siegel, & Wade-Woolley, 2002; Ford, Cabell, Konold, Invernizzi, & Gartland, 2013; Lesaux, Koda, Siegel, & Shanahan, 2006).

Reading-writing relations at the text level are somewhat more complex. Berninger and colleagues (2002) found that, while reading comprehension exhibited a consistently significant direct effect on writing compositional quality across grades one through six, compositional quality was not observed to significantly impact reading comprehension until grades four to six. In this way, the text-level association between writing and reading becomes bidirectional only after grade three; it is unidirectional and asymmetrical early in development. Berninger and colleagues (2002) concluded from these findings that an intermediate level of compositional skills may be necessary before writing begins to impact reading at the text level. Abbott and colleagues (2010) found similar longitudinal relations between text-level reading and writing

skills, with significant paths from text comprehension to text composition across grades two through six, but significant paths from text composition to text comprehension only in grades three to five.

Perhaps the best way to summarize this association is to note that, while reading and writing are inherently related processes, their asymmetrical connection indicates that they are not inverses of each other (Berninger et al., 2002; Abbott et al., 2010). Word-level writing skills such as spelling and handwriting tend to exert a stronger influence on word-level reading skills (such as word recognition) than vice versa, and text-level associations shift from unidirectional to bidirectional throughout development (Berninger et al., 2002). It is also of note that, with one exception, Abbott et al. (2010) found no associations from the word to text level which crossed between the reading and writing domains. Grade two word reading was observed to significantly impact grade three composing, but it otherwise appears that reading and writing skills interact within the word and text levels, but not across them. Abbott and colleagues (2010) aptly summarize that, "…it is easier for developing writers to forge connections across (a) levels of language within the same domain and (b) across domains within the same level of language." (p. 295). Thus, despite their close associations at the word and text level, reading and writing retain some independence as constructs. This is important to the present investigation in that it justifies the study of writing independently of reading. Given that reading and writing are not immediate inverses of each other, associations observed in reading research cannot simply be inverted and generalized to writing—they must be observed in L1 and L2 students' writing directly.

Shared cognitive knowledge. Reading and writing depend on shared sources of cognitive knowledge across four domains (Fitzgerald & Shanahan, 2000). The first of these is metaknowledge about written language, including pragmatics, functions of text, interactions

between reader and writer, and monitoring of one's own comprehension and production strategies. The second is domain knowledge, often thought of as prior or world knowledge; it includes knowledge of semantics, vocabulary, and comprehension or construction of meaning through the context of connected text. The third domain is knowledge of universal text attributes, which includes a range of skills categorized as graphophonics (letter and word knowledge such as phonological, grapheme, and morphological awareness), syntax (rules of grammar for ordering words and using punctuation to produce meaningful sentences), and text format (syntactical organization of larger chunks of text). Finally, procedural knowledge, or the ability to negotiate reading and writing, includes a shared understanding of how to access, use, and generate knowledge in the above three domains, via automatic processes as well as intentional use of strategies to integrate processes smoothly.

These shared domains of cognitive knowledge again highlight the closeness with which reading and writing are associated. They also highlight the important role of oral language skills in literacy knowledge across both reading and writing, implicating vocabulary and syntax in domains two and three respectively. The third domain is of additional interest because the shared reliance on text attributes such as graphophonics is directly related to the above-described closeness between word reading and spelling—both word reading and spelling processes depend on such letter-sound knowledge and, therefore, it is unsurprising that they are so closely linked.

The central point of considering this reading-writing association is to show that word-level relations between reading and writing merit the consideration of word reading and spelling together, but asymmetrical interactions across time merit the consideration of text-level skills independently. Where word reading and spelling are consistently and bidirectionally related because of their shared reliance on graphophonic knowledge, the two overarching constructs of

reading and writing are not direct inverses of each other and, therefore, the overall constructs of reading and writing must be investigated separately. For this reason, the following discussions turns to separate considerations of, first, what is known about L2 learners' reading skills and, second, a more detailed investigation of what is known about L2 learners' writing skills.

Reading and Writing in L2 Learners

While reading and writing are both integral skills for children acquiring literacy in any language, the majority of L2 literacy research to date has focused exclusively on reading development, with a particular emphasis on word-level reading and predictors of early literacy development. As will be discussed in more detail below, it is generally accepted that L2 students perform comparably on word-level measures of reading as their L1 peers (Lesaux et al., 2006). Evidence regarding text-level reading skills of L2 students, particularly reading comprehension, is less conclusive. Lesaux and colleagues (2006) suggest that reading comprehension is an area of difficulty for L2 learners as early as the second grade, and research to date offers mixed results in support of this this proposition. The existing research base does, however, offer stronger support for the notion that the factors influencing reading comprehension in L2 learners are the same as in their L1 peers (Lesaux et al., 2006). Empirical evidence supports the notion that oral language skills significantly contribute to reading comprehension in both language groups across the elementary grades (Babayiğit, 2015; Ball, 2003; Bowyer-Crane, Fricke, Schaefer, Lervåg, & Hulme, 2017). This is of interest to the present study because it suggests that the factors underlying text-level reading skills may be consistent between language groups, such that lower oral language skills in L2 students impact reading comprehension outcomes. Given that oral language skills play a similarly important role in text-level writing (discussed

below), there is reason to expect that lower oral language skills in L2 learners may impact their writing outcomes in a similar fashion.

Research on L2 learners' text-level writing, however, has not been as extensive as research on L2 learners' text-level reading. Where Lesaux and colleagues (2006) concluded that reading comprehension appeared to be an area of difficulty for L2 learners, they also determined that it was not yet possible to draw substantive conclusions about writing development or the factors which influence it in L2 students. Spelling has begun to receive more attention in L2 learners, as will be discussed below, but text-level writing skills continue to be an area of neglect in the literature. Few conclusions can be drawn about how L2 learners' writing performance compares to their L1 peers, let alone the ways in which component skills of writing impact their writing throughout development. It is for this reason that the present investigation turns now to a review of what is known about writing in L1 and L2 students.

Section Summary

Literacy refers to the print-based language systems of reading and writing, which can each be segmented into word- and text-level skills. Reading and writing skills interact primarily within the word or text levels, and within the reading or writing domains, but not across domain and level simultaneously. Word-level reading and writing skills are consistently and bidirectionally intertwined from an early age, whereas text-level reading and writing skills are more asymmetrically linked, only exhibiting bidirectional interactions after grade three. In this way, reading and writing are not inverses of each other. They rely on shared sources of cognitive knowledge but retain sufficient independence as constructs for research to consider them separately. L2 research to date has considered word-level skills in some depth and is beginning

to address text-level reading skills, but has hardly investigated text-level writing skills in L2 learners.

Theories of Writing

Establishing the theoretical basis of the present study is important on two fronts. The first is on an analytical level. Specification of a path model, as required of this study's main analyses, must be based on theorized associations between the intended constructs rather than exploration of patterns in the present data (Hancock & Schoonen, 2015; Keith, 2015). The second is in regards to situating the present study within the field: new multilingual writing research makes a more substantial contribution to the existing evidence base when it is solidly grounded in writing theory and can therefore further theory construction and improve instructional practices (Fitzgerald, 2006). Accordingly, discussion of the theoretical basis on which the present study is founded is intended to both justify choices made in analysis and situate results within the field of L2 writing.

Processes Involved in Writing

Theories of writing can be divided more or less into two camps: models of the writing *process* and models of the writing *product* (Abbott & Berninger, 1993; Schoonen, van Gelderen, Stoel, Hulstijn, & de Glopper, 2011). Arguably the most influential model of the writing process is Hayes and Flower's (1980) model of skilled writing. According to this model, skilled writing consists of three cognitive processes—planning, translating, and reviewing—which operate recursively (rather than sequentially) within long term memory (Hayes & Flower, 1980). The planning process incudes the subprocesses of generating ideas, organizing, and goal setting, the translation process utilizes the plan held in the writer's memory to produce written language, and the reviewing process includes re-reading and editing subprocesses which serve to improve the quality of translated text (Hayes & Flower, 1980). While the planning and reviewing processes of writing were clearly defined and differentiated in Hayes and Flower's original model, the

translation process was left relatively open; translation was defined only as the process of taking material in memory (designed by the planning process) and transforming it into acceptably written sentences.

Translation, however, is arguably the most central process to children's beginning writing (Abbott & Berninger, 1993; Berninger et al., 1992). Hayes and Flower's model is one of skilled writing, and elementary age children are hardly skilled writers yet. Higher level processes such as planning and reviewing can only begin to explain children's writing after lower-level developmental skills have been acquired. As Abbott and Berninger (1993) aptly summarize, "children are authors before they are editors" (p. 480). To analyze beginning writing then, researchers need to focus on the translation process. Berninger and colleagues (1992) expanded Hayes and Flowers' definition of the translation process by breaking it into two component subprocesses: text generation and transcription. In this view, text generation is the higher-level process of translating ideas into linguistic (oral language) representations in working memory. Transcription involves the lower-level translation of these oral language representations into written text output. These two translational processes form the basis for the simple view of writing (Abbott & Berninger, 1993).

The Simple View of Writing

The present study is guided primarily by the simple view of writing, as defined by Abbott and Berninger (1993) and Berninger and Amtmann (2003). In this view, writing can be conceptualized as a triangle of three linked components—transcription, text generation, and executive functions—which are coordinated within working memory (see Figure 1). Transcription and executive functions are at the base of the triangle supporting the writing process, and text generation is at the vertex. Each of these three component processes, and the

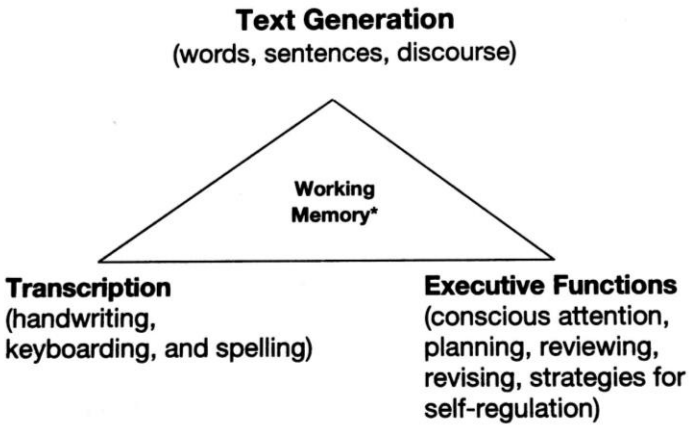

Figure 1. The Simple View of Writing. *Activates long-term memory during composing and short-term memory during reviewing. From "Preventing Written Expression Disabilities Through Early and Continuing Assessment and Intervention for Handwriting and/or Spelling Problems: Research into Practice," by V. W. Berninger and D. Amtmann, 2003, *Handbook of Learning Disabilities*, p. 350. Copyright 2003 by The Guilford Press. Reprinted with Permission.

working memory environment in which they operate, is an area in which component skills can impact writing outcome.

Component skills of the simple view. The simple view of writing capitalizes on Berninger and colleagu**es'** (1992) two subprocess of translation. Within the simple view of writing, text generation is defined as the translation of ideas into oral language representations in working memory (Berninger & Amtmann, 2003). It is the higher level of the two translation processes, and depends on linguistic knowledge at the word, sentence, and discourse level. Transcription is the lower level translation process. It is defined as the translation of linguistic representations (held in working memory) into written text and depends on the mechanical skills of writing such as handwriting (or keyboarding), and spelling. Finally, executive functions are defined as those higher-level cognitive functions which help regulate the writing process. They include conscious attention and self-regulation strategies, and the planning, reviewing, and revising elements of the writing process which expand beyond translation alone.

Development of writing according to the simple view. Early in development, children's writing is constrained by their transcription skills. During writing acquisition, retrieval

and production of alphabet letters—the smallest units of writing—are most predictive of written output (Berninger et al., 1992). How much and how well children write is constrained by their spelling skills in primary grades[1] (Berninger et al., 2002). It is only when such transcription processes become automatized that attentional resources are available for the higher level text generation process (Abbott & Berninger, 1993). Unsurprisingly, it follows that spelling is the best predictor of text-level writing ability throughout the primary grades (Berninger et al., 2002).

Another way of considering the development of writing in this view is that children's writing is limited first by neurodevelopmental constraints, then by linguistic and subsequently by cognitive constraints (Abbott & Berninger, 1993; Berninger et al., 1992). In the primary grades, children's writing is thought to be constrained by neurodevelopmental skills involved in writing, such as the orthographic-motor integration of sensory input and motor output needed to produce alphabet letters. These lower-level skills are consistent with the transcription subprocess described above, and are reflected in (and predictive of) children's handwriting and spelling skills (Berninger et al., 1992).

Once written words can be produced reliably and automatically (e.g., once transcription skills are automatized), higher-level linguistic processes involved in text generation are thought to constrain writing (Abbott & Berninger, 1993; Berninger et al., 1992). These skills operate at the word, sentence, and discourse level; as will be discussed in more detail below, they rely on a child's emerging oral language skills such as vocabulary and syntactical knowledge. Thus, the role of oral language and linguistic skills becomes influential later in writing development, approximately in the intermediate grades, after transcription skills have been automatized in the primary grades. Cognitive skills which go above and beyond language (corresponding with the

[1] Primary grades include grades one through three; intermediate grades include grades four through six

executive functions corner of the simple view's triangle) are the final level of constraint, which is thought to have most influence in the junior high school years (Abbott & Berninger, 1993). Executive functions play an increasingly important role in writing over time, as the responsibility for regulation of the writing process shifts from other (e.g. parent or instructor) to self (Abbott & Berninger, 1993).

This succession of skills was originally hypothesized based on neurodevelopmental theory regarding the maturation of sensory-motor integration areas prior to language and cognitive regions, and has been confirmed in writing development by the prolific body of research produced Abbott, Berninger and their colleagues (Abbott & Berninger, 1993; Berninger et al., 1992, etc.). Where this succession of writing constraints is most important to the present study is in the changing impact of oral language and literacy skills on writing across time. As will be discussed in more detail below, the transcription subprocess is linked to word-level literacy skills, whereas the text-generation subprocess is linked more to oral language skills; the critical takeaway from this theory is that word-level literacy skills involved in transcription are more influential early in L1 writing than oral language skills. It is only after a certain degree of writing proficiency has been obtained that oral language skills begin to impact writing outcomes.

Abbott and Berninger's (1993) early investigations of the simple view of writing compared the role of reading skills and combined oral language and verbal reasoning skills within this context. Reading skills, in their study, included word and nonword decoding and passage comprehension; oral language/verbal reasoning was conceptualized as a combination of subword (phonological awareness), word (verbal fluency), sentence (syntactic structures), and discourse (verbal reasoning) level measures. Reading skills were found to play a significant role in composition fluency and quality in grades one through four, confirming the importance of

literacy skills to early writing development. The combined oral language/verbal reasoning factor, on the other hand, played a much more dynamic role in writing across time. Oral language/verbal reasoning significantly impacted compositional fluency in grades two to three, but impacted composition quality in grades one and six only. Abbott and Berninger (1993) interpreted these results to mean that oral language impacts writing fluency only after some initial letter-sound associations are acquired in grade one, again reinforcing the acquisition of word-level literacy knowledge (via letter-sound associations) in the early years of writing. This is consistent with the three-level constraint theory described above; once writing fluency is no longer constrained by transcription skills, it is constrained instead by oral language abilities. The results of this study would suggest this shift to occur around grades two-three in L1 learners. The role of oral language in the quality of written composition does not appear until much later, in grade six. The central point to be made here is that both reading and oral language skills are involved in writing to varying degrees across the elementary grades; based on these results, Abbott and Berninger concluded that the oral and written language systems contribute uniquely to written composition.

Conceptualization of the simple view in the present study. The simple view of writing arose from a theoretical consideration of the developmental skills children bring to the task of writing, and the ways in which their level of skill in these developmental domains may facilitate or constrain the writing acquisition process. In a similar vein, the present investigation of writing seeks to determine the degree to which oral language and word-level literacy skills constrain writing outcomes in L1 and L2 elementary age students. The current study will not test the simple view of writing directly; rather, it utilizes the simple view of writing as a framework to identify critical component skills which may constrain writing in L2 learners so that their impact can be observed. The two component areas of primary interest to the present study are word-

level literacy skills and oral language skills, as these have direct impacts on the processes of transcription and text generation respectively (Abbott & Berninger, 1993).

Word-level skills. Word-level literacy skills play a critical role in the transcription subprocess. Word reading and spelling provide insight into children's knowledge of letter-sound associations, which are directly related to transcription (Abbott & Berninger, 1993). Specifically, children's spelling ability is essential in the process of turning linguistic representations of their ideas into actual written text. As was discussed above, word reading and spelling are intimately interrelated from an early age (Abbott et al., 2010; Berninger et al., 2002). It is for this reason that the present investigation considers word reading and spelling together to investigate the role of word-level literacy skills in L1 and L2 learners' writing. Both word reading and spelling are critical early literacy skills which both L1 and L2 students acquire anew upon entering school in kindergarten.

Oral language skills. Oral language skills, in turn, play a critical role in the text generation process. Text generation requires representing language at the word, sentence, and discourse level (Abbott & Berninger, 1993; Berninger et al., 2002). Representing ideas in words requires sufficient vocabulary knowledge. Placing these words within grammatically and semantically meaningful sentences, in turn, requires sufficient syntactical knowledge. For this reason, the oral language skills of oral vocabulary and syntactical knowledge are of particular interest to the present investigation. Whereas students of both language backgrounds acquire word-level literacy skills anew upon beginning school, L1 and L2 children's exposure to oral language differs. L1 students have already acquired English oral language skills prior to entering school in kindergarten; L2 students must acquire English oral language skills concurrently with literacy skills when they enter school.

Other evidence for the simple view. Several studies have tested the relative roles of transcription and oral language skills in L1 learners' writing in a similar fashion as this study will in L2 learners. For example, Kim et al. (2011) used structural equation modeling (SEM) to confirm that oral language and transcription skills (namely handwriting and spelling) make unique and positive contributions to writing at the end of kindergarten. Similarly, Kim, Gatlin, Al Otaiba, and Wanzek (2018) used SEM to confirm that transcription and oral language contribute to writing fluency in grade three, which is strongly linked to writing quality. It is noteworthy that in the second study, Kim and colleagues (2018) did not find the same association between oral language and writing fluency in grade two as they did in grade three. These results are consistent with Abbott and Berninger's (1993) findings that oral language does not impact writing fluency until after automatization of transcription skills in grade one; it may be that children in this study did not automatize their transcription skills until grade two and, therefore, that the influence of oral language did not emerge until grade three. Regardless, these studies provide evidence that oral language plays a significant role in kindergarten and grade three writing alongside transcription skills, even when oral language is considered as an independent construct (rather than a part of the larger text generation construct).

Schoonen's Componential Model

Schoonen and colleagues' (2002) componential model of writing offer another helpful theoretical perspective in which to contextualize the present study. According to this model, writing proficiency can be decomposed into three categories of constituent subskills: linguistic knowledge, speed or fluency of processing linguistic knowledge, and metacognitive knowledge. The first constituent, language or linguistic knowledge, includes knowledge of vocabulary, grammar, and orthography (specifically spelling). The second, speed or fluency of processing

linguistic knowledge, refers to how quickly the writer is able to retrieve this linguistic information in order to utilize it in the composing process. Specifically, it includes the speed of word retrieval and sentence building. Such fluent access to linguistic knowledge resources contributes to writing quality by lowering the cognitive processing load for the writer, allowing for cognitive resources to be devoted to additional aspects of the writing process more easily. Finally, the third constituent subskill, metacognitive knowledge, includes knowledge of text organization and writing strategies.

The particular value of Schoonen and colleagues' (2002) model for the present study lies in the inclusion of L2 learners alongside L1 learners in the initial model evaluation. Contrary to expectations, Schoonen and colleagues (2002) found that there were no significant differences in the way this model fit native (L1) and non-native (L2) Dutch speaking students in grade eight. The model was found to explain 51% of variance in writing outcome across groups. Schoonen et al. additionally found that the two retrieval speed variables (word retrieval and sentence building), while highly correlated with writing performance, contributed no unique variance to the prediction of writing. Instead, grammatical knowledge and metacognitive knowledge were found to make the largest contribution to the prediction of writing, and vocabulary knowledge was found to have a significant but suppressed impact on writing. Thus, in both L1 and L2 students, the three constituent model was found to fit similarly, with grammar and metacognitive knowledge offering the strongest impacts on writing outcomes.

While Schoonen and colleagues' (2002) model considers writing from a different perspective than the simple view of writing, it retains some of the same critical elements. Vocabulary and grammar are again suggested to play important roles in writing proficiency, as is spelling. Thus, the oral language and word-level constructs hypothesized above can be supported

by the componential model as well as the simple view of writing—no matter the theoretical perspective taken, vocabulary, syntax, and word-level spelling skills are implicated in the writing process. Perhaps most importantly, Schoonen and colleagues' componential model appears to be valid in L2 populations as well as L1, supporting the selection of oral language and word-level constructs in the present investigation of L2 learners' writing. It is of course worth noting that the componential model was validated in a student population substantially older than the early elementary ages considered here; the relative role of component skills in writing may differ drastically between kindergarten and grade eight and, correspondingly, this study may have implications for the extension of the componential model to younger populations. However, the componential model offers the only theoretical framework validated in L2 populations. Furthermore, the subskills of the componential model align well with the components which have been established to impact writing in elementary grades according to the simple view. It therefore remains appropriate to consider the relative roles of word-level skills (word reading and spelling) and oral language skills (vocabulary and syntax) in L2 writing.

Section Summary

Writing involves planning, translating, and reviewing processes which operate simultaneously. The translation process is most central to children's beginning writing and can be further subdivided into lower-level transcription and higher-level text generation subprocesses. The former relies on word-level skills such as word reading and spelling, and the latter relies on oral language skills such as vocabulary and syntactic knowledge. Both subprocesses are central to the simple view of writing, which postulates that writing involves the integration of transcription, text generation, and executive functions within a working memory framework. Early in development, children's writing is constrained primarily by the transcription

subprocess as letter-sound associations are being learned. In the intermediate grades, once transcription processes are automatized, writing is instead constrained by linguistic processes. Thus, both word-level skills (such as spelling) and oral language skills (such as vocabulary and syntactical knowledge) play critical roles in children's writing across development. Spelling, vocabulary, and grammatical knowledge are also implicated in L2 learners' writing development by Schoonen et al.'s (2002) componential model. Accordingly, word-level skills including word reading and spelling, and oral language skills including oral vocabulary and syntactical knowledge, are considered to be the most important component skills of L2 learners' writing in the present study. They are reviewed alongside writing outcomes in L2 learners below.

Components of Writing in L2 Learners

The following section addresses what is known about the two components of writing (word-level skills and oral language skills) in L2 learners relative to their L1 peers.

Word-Level Skills and Writing

As was discussed above, the primary word-level skills of interest to the present study are word reading and word spelling. In L1 learners, spelling is known to constrain how much and how well children in primary grades write, and to predict later writing ability at both the word and text level across grades one through seven (Abbott et al., 2010; Berninger et al., 2002). Spelling is also known to be strongly linked to word reading, manifesting the important word-level associations between the functional reading and writing systems (Abbott et al., 2010; Berninger et al., 2002).

Similar associations between word-level skills have been observed in L2 as L1 learners. It is generally accepted that word reading and spelling skills are highly correlated in L2 students (see Lesaux et al., 2006, for a review). Ball (2003) offers a particularly strong investigation of the word and text-level associations between reading and writing in grade three and grade five/six students in Canada, which found that word-level reading and spelling skills were significantly correlated at both ages for L2 students as well as L1 students. Similar results have been found in kindergarten and grade one (Chiappe et al., 2002; Ford et al., 2013) and grade two and three (Arab-Moghaddam & Sénéchal, 2001) L2 learners, indicating that the word level reading-writing association is consistently present across early elementary grades in these students.

Word-level skills in L1 vs. L2 learners. There is ample evidence available to suggest that word-level skills do not differ between L1 and L2 learners. Word reading and spelling have

been found not to differ between L1 and L2 students in kindergarten, (Chiappe et al., 2002; Harrison, Ogle, & Keilty, 2013), grades one through four (Babayiğit, 2015; Geva & Yaghoub-Zadeh, 2006; Harrison et al., 2016; Jongejan, Verhoeven, & Siegel, 2007; Wade-Woolley & Siegel, 1997) or grades four through six (D'Angiulli, Siegel, & Serra, 2001; Jean & Geva, 2009). This result seems to be consistent across a variety of measures of word reading and spelling, although timed measures of reading are less commonly used in L2 research (Lesaux et al., 2006). Additionally, the spelling patterns of L2 students have been found to exhibit similar performance profiles and error patterns as L1 students in elementary years; L2 students are more prone to mistakes mimicking the orthographic rules of their first language, but errors unrelated to other-language orthographies do not differ between language groups in grades two/three and five/six (Fashola, Drum, Mayer, & Kang, 1996; Wade-Woolley & Siegel, 1997).

The occasional study has found that spelling is significantly lower in L2 than L1 students in kindergarten, but this difference consistently disappears by grade two or three (Lesaux & Siegel, 2003; Lipka & Siegel, 2007). Lipka and Siegel's study used a combined measure of early literacy rather than comparing measures of word reading and spelling alone, which may explain the incongruent finding. Lesaux and Seigel (2003) found that the between group difference disappeared in kindergarten when not-at-risk L2 readers were considered separately from at-risk readers, and further found not-at-risk L2 students to outperform L1 students on measures of spelling in grade two. This finding of an L2 advantage over L1 learners on word reading and spelling also appears in Bowyer-Crane et al. (2017), with L2 learners performing better on measures of word reading and spelling skills as early as preschool and kindergarten. Unfortunately, this result is confounded with the selection of an L1 comparison group with low oral English proficiency, so conclusions about an actual L2 word-level advantage in kindergarten

cannot be drawn. Regardless, the existing literature clearly indicates that L2 students perform, at minimum, on par with their L1 peers on measures of word reading and spelling throughout the elementary years.

Oral Language Skills and Writing

Oral language skills appear to play an important role in writing development in L1 learners. As discussed above, oral language makes a unique contribution to composition in the simple view of writing, via the word, sentence, and discourse levels of text generation (Abbott & Berninger, 1993; Berninger & Amtmann, 2003). More generally, oral language and writing are closely related in the sense that children with better oral language skills tend to write better (Shanahan, 2003). While there are a variety of ways in which oral language skills can be defined, measures of vocabulary and grammar (syntax) are most relevant to the present study given their direct role in text generation. It is worth noting that vocabulary can be measured both expressively and receptively, and syntax can be assessed orally, in-text, or with sentence repetition tasks, but trends in the role oral language plays in writing appear consistent regardless of measurement tool. Olinghouse and Leaird (2009) offer particularly strong evidence for the role of vocabulary in L1 learners' writing, finding that vocabulary contributed significant unique and shared variance to narrative writing in grades two and four. Castillo and Tolchinsky (2018) offers similar results in L1 Catalan speaking students, finding that vocabulary had a significant influence on writing productivity and structure in grade one, three, and six students. Olinghouse and Leaird (2009) are quick to point out that such results cannot necessarily be generalized to other genres of writing, but this evidence for a specific role of vocabulary in L1 learners' writing provides a useful baseline against which to compare the role of vocabulary in L2 learners' writing.

Oral language skills in L1 vs. L2 learners. The oral vocabulary and syntactic skills of L2 students consistently and significantly lag behind those of their L1 peers. This appears to be true across all elementary grades, from kindergarten (Bowyer-Crane et al., 2017; Harrison et al., 2013; Lesaux & Siegel, 2003; Lipka & Siegel, 2007) through grade four (Babayiğit, 2015; Babayiğit, 2014; Chiappe et al., 2002; Geva, Yaghoub-Zadeh, & Schuster, 2000; Jongejan et al., 2007) and on into middle school (Ball, 2003; D'Angiulli et al., 2001; Da Fontoura & Siegel, 1995; Jean & Geva, 2009). This gap appears consistently regardless of the measure used to assess vocabulary and syntax, even when the second language being learned is not English (e.g. Jongejan et al., 2007). Only one exception was found in the literature in which the difference between L1 and L2 learners' receptive vocabulary and syntactical judgement did not reach statistical significance in third grade students, though the L2 students still trended towards underperformance (Ball, 2003).

The difference in oral language skills of L2 compared to L1 learners has several interesting features. The first is that it persists despite ongoing development in L2 learners' oral language skills between grades. The second is that, in some studies which used low English proficiency L1 speakers as comparison groups, an L2 specific gap in oral language skills still appeared. For example, Bowyer-Crane and colleagues (2017) found that, even though the control group was monolingual English students selected on the basis of low oral language performance, the L2 group still underperformed on measures of expressive vocabulary and expressive grammar. This finding indicates that the nature of low oral proficiency in L1 and L2 students may differ in some way; the underperformance observed in L2 students is somehow greater than that in low proficiency L1 students. Da Fontura and Siegel (1995) suggest that the gap in L2 language skills arises from limited exposure to the second language, rather than features of the

first language. They found that syntax errors of L2 students in grades four to six paralleled errors of younger typically developing L1 English speakers, rather than features of the L2 students' first language which may indicate interference or confusion of the two languages. Interviews with parents confirmed that no English was spoken in the home, such that L2 students experienced less exposure to oral English than their L1 peers. This provides evidence for what is an otherwise rather intuitive explanation—L2 students receive less exposure to oral English than their L1 peers. It naturally follows that their knowledge of oral English will be not be as expansive as their L1 peers, even those who struggle with oral language proficiency.

Interactions Between Word-Level and Oral Language Skills

Few studies have reported on the associations between oral language and word-level skills in L2 students. The bulk of the available evidence, however, seems to suggest that oral language and word-level skills are closely related in L2 leaners. Bowyer-Crane and colleagues (2017) found that associations between literacy and language skills at preschool entry were stronger in L2 than L1 students, although L1 students were selected on the basis of oral English proficiency deficits. Vocabulary knowledge has been shown to be significantly correlated with word reading and spelling in L2 learners in grades two and three, even contributing significant additional variance to spelling and reading (Arab-Moghaddam & Sénéchal, 2001). Syntax skills have been found to be significantly correlated with L2 word reading and spelling in grades four to six (Da Fontoura & Siegel, 1995). Babayiğit (2015) found additional evidence for significant interactions between oral language and word-level latent variables in approximately grade four-aged students[2]; these interactions again appeared to be stronger in L2 than L1 learners, though the difference did not reach statistical significance.

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[2] No grade reported; mean participant age = 115 months, corresponding with UK year 5/Canadian grade 4

Though these results are a patchwork of findings across various populations of various ages, they suggest that an association between word-level skills and oral language skills exists in L2 learners across the elementary grades (or at least in preschool and grades two through six). The only notable exception to this trend is Ball (2003), who reports that word reading and spelling were not significantly correlated with any oral language measures in grade three or grade five/six L2 learners, despite significant correlations with vocabulary and syntax in L1 students. Certainly, further evidence for the nature of interactions between word-level and oral language skills in L2 learners is needed. Consistent longitudinal evidence would be of particular value. However, the existing evidence indicates that the oral language and word-level literacy components of writing investigated in the present study do not exist independently of one another in L2 learners; this is consistent with their being part of distinct but related oral and print-based language systems. Furthermore, it suggests that the interactions between oral language and word-level skills may differ between L1 and L2 learners, justifying comparison of these associations between language groups.

Growth in L2 Learners' Component Skills

L2 students exhibit consistent growth in literacy and language skills throughout elementary school. Word reading and recognition skills have been observed to improve in L2 learners from kindergarten to grade one (Chiappe et al., 2002), grade one to two (Geva et al., 2000), and grade two to three (Arab-Moghaddam & Sénéchal, 2001), with the growth from grade one to two appearing more pronounced in L2 learners than their L1 peers. Spelling skills have also been found to improve from grade two to three (Arab-Moghaddam & Sénéchal, 2001), and grade two to six (Fashola et al., 1996) in L2 learners. Vocabulary skills have been observed to improve in L2 students from grades one to two (Geva et al., 2000), and grades two to three

(Arab-Moghaddam & Sénéchal, 2001), with the latter change more pronounced than in their L1 peers. Finally, syntactic skills have been observed to improve from kindergarten to grade one (Chiappe et al., 2002) and across grades one to four, with a non-significant decrease in the gap between L1 and L2 students from grades three to four particularly (Jongejan et al., 2007). While these results are no substitute for a proper longitudinal study of how component writing skills change across time in L2 students, they do offer promising evidence that L2 students exhibit growth in word-level and oral language skills throughout the early elementary grades.

Section Summary

L2 learners exhibit consistent growth in their word-level and oral language skills across the elementary grades. Word-level skills exhibit similar associations in L2 learners as in L1 learners, and both language groups perform similarly on measures of word reading and spelling. Oral language skills differ between L2 and L1 learners, in that L2 learners perform consistently and significantly lower than their L1 peers on measures of oral vocabulary and syntactic knowledge. This gap appears uniquely related to limited oral English exposure and persists across development, even as L2 learners' oral language skills continue to improve. It appears that there is a consistent association between word-level and oral language skills in L2 learners across the elementary grades, but further evidence is needed to confirm the nature of this association and whether it differs between language groups.

Writing Outcomes in L2 Learners

Certainly, L2 writing research deserves more attention than it has received to date. Fitzgerald (2006), Lesaux et al. (2006) and Miller and McCardle (2011) all observe in their reviews of writing that quality, foundational research on L2 writing and associated instructional approaches for L2 students is necessary. Miller and McCardle point out that, even before turning to L2 writing, writing research in L1 learners has been neglected in favor of reading and oral language research. Of the limited L2 research available, it is even harder to find studies which offer solid quantitative analyses of writing components and outcomes. Fitzgerald (2006) offers a helpful summary of criteria for evaluating the rigor of L2 writing studies, and accurately notes that very few studies meet them.

Writing Outcomes in L1 vs. L2 Learners

Overall, it appears that L2 learners' writing outcomes are lower than L1 learners' writing outcomes on some measures of writing quality but not others. The bulk of studies which draw these conclusions are investigations of writing alone, however, which seek to deconstruct various aspects of written output rather than analyze the factors impacting writing as a unitary construct (as in the present study). Such results cover a diversity of writing measures beyond the scope of the present investigation; in the interest of simplicity, therefore, the evidence reported below is categorized as either addressing mechanics of writing (such as spelling, number of words written, and grammatical errors) or content and complexity of writing (such as structure, organization, and other higher-level concerns).

Mechanics of writing. Relative performance on measures of writing mechanics varies greatly between language groups depending on the manner in which mechanics are assessed. Productivity, or number of words written, appears to be consistent between language groups

across grades one through six (Carlisle, 1989; Woolpert, 2016). In-text spelling also appears to be consistent between language groups across grades one through four (Verheyden, Van den Branden, Rijlaarsdam, Van den Bergh, & De Maeyer, 2010; Woolpert, 2016), which fits above-described similarities in word-level spelling skills of L1 and L2 learners. Where writing productivity and in-text spelling skills tend to be consistently similar between language groups when measured in isolation, however, composite measures of writing mechanics yield slightly more variable results. Combined measures of mechanical accuracy, including orthographic, morphological, and lexical errors made, have been found to be lower in grade one to four L2 students (Woolpert, 2016). Interestingly, the particular difference between groups observed in Woolpert (2016) disappeared when vocabulary differences were controlled for, indicating that errors were perhaps more oral language than mechanics based. Other combined measures of mechanical accuracy offer variable results. Both Ball (2003) and Silverman et al. (2015) used a version of the contextual conventions subtest of the Test of Written Language—Fourth Edition (TOWL-4) to assess writing mechanics between language groups. This subtest scores students' writing samples on a basis of various spelling, grammatical conventions, and other lower level writing skills. Using this measure, Ball (2003) found no significant differences between grade three and grade five/six L1 and L2 students. On the contrary, however, Silverman and colleagues (2015) found significant differences between language groups in grade three to five students, with L2 students underperforming their L1 peers. Finally, written syntax appears to be consistent between L1 and L2 learners in grades four to six when assessed independently, but this result has not been replicated (Carlisle, 1989).

Content of writing. Results regarding higher-level writing skills, such as complexity and coherence of content, are equally variable. Individual measures of writing content and

complexity have been found to be significantly lower than L1 students in samples of grade three and four Dutch L2 students (Verheyden et al., 2010) and grade four to six English L2 students (Carlisle, 1989), but comparable to L1 students in a mixed sample of grade one to four English L2 learners (Woolpert, 2016). While it is possible that these differing results are due to differing sample age groups, there is insufficient evidence to draw conclusions about higher-level writing skills. Measures which provide an overall content score for a writing sample, such as the story composition subtest of the TOWL-4, offer slightly more consistent results. Both Ball (2003) and Silverman et al. (2015) found that L1 and L2 students performed comparably on this story composition subtest, indicating no differences in the overall quality of narrative writing content (such as plot development and organization).

Conclusions. It is very difficult to make comparisons between results and draw clear conclusions about L2 writing outcomes when writing outcome measures vary so drastically from study to study. The only emerging consistencies in the literature appear to be that L2 students do not differ from L1 students in terms of amount written (productivity; Carlisle, 1989; Woolpert, 2016) and spelling (Verheyden et al., 2010; Woolpert, 2016). L2 students appear to underperform their L1 peers on some other measures of mechanical accuracy (Silverman et al., 2015; Woolpert, 2016), but not all (Ball, 2003; Carlisle, 1989). Higher-level content of narrative writing seems to be impacted in L2 more often than it is not but, again, results are extremely inconsistent.

Given that the above-discussed studies all consider writing samples by students between grades one to six, the lack of consistent trends in L2 writing is alarming. It is possible that consistent use of a single composite score of L2 writing rather than individual scores of various writing elements may offer more consensus. Babayiğit (2014) is the only study to date which

compares writing outcomes between L1 and L2 students using a composite score of writing consistent with the present study. This study of grade four-aged students in England found that L2 students underperformed on a paragraph writing task relative to their L1 peers. Interestingly, this is inconsistent with previous findings on the present data set, which indicate that writing outcomes do not differ significantly between L1 and L2 learners in kindergarten or grade three (Harrison et al., 2013; Harrison et al., 2016). It is possible that these results are inconsistent because the student populations vary in age and native language. Again, however, this provides inconclusive evidence regarding L2 writing performance. The only conclusion that can be drawn about L2 writing outcomes at present is that there is not yet enough quality literature available for proper conclusions to be drawn.

Growth in L2 Learners' Writing Outcomes

Few studies offer insight into the way L2 learners' writing outcomes change across time. Davis, Carlisle, and Beeman (1999) made an interesting discovery in L2 Hispanic students, in that productivity and linguistic complexity of writing, among other measures (including spelling, discourse, and number of long words) increased from grades one to two, but not two to three. This is perhaps explained by the shift in children's writing which occurs once their transcription skills are automatized—rather than being limited by how much they are able to write, children instead are able to focus on the quality and organization of their writing (using text generation and higher-level planning processes). Davis et al. is the only notable study to date which offers insight into changes in writing outcomes over time but, unfortunately it provides insufficient evidence to draw conclusions about the nature of this change in relation to component skills.

Contribution of Oral Language and Word-Level Skills to Writing

Few studies to date have specifically investigated the contributions of oral language and word-level skills to writing in L2 students. As mentioned above, significant literature has been dedicated to oral language and word-level literacy skills in isolation, but analysis of their association with writing is rare, and comparisons between L1 and L2 speaking groups is even rarer.

Word-level skills and writing outcomes in L2 learners. Very few studies have examined the predictive role L2 word-level skills play in L2 learners' writing outcomes. Babayiğit (2014) found that word-level skills (including word reading, word spelling, and in-text spelling accuracy) had a significant effect of moderate size on writing quality in both L1 and L2 grade four-aged students in England. Davis and colleagues (1999) also found that English reading, as measured by a word identification and reading comprehension test, was significantly correlated with five different measures of English writing in first through third grade L2 students in Chicago. Both of these studies assessed writing using prompted paragraph writing samples scored for various elements of text-level writing composition. Thus, both offer holistic measures of writing outcome consistent with the conceptualization of writing in the present study. Davis and colleagues did rely on standard scores when analyzing their L2 literacy measures, which is inadvisable as L2 students may appear to score lower relative to the L1 only normative sample. However, Babayiğit (2015) used raw scores in her statistical analysis of a close age group and found similar results. While these are, at present, the only two studies investigating the role of word-level literacy in L2 learners' writing, the limited evidence they provide suggests that L2 learners' word reading and spelling skills do impact their writing in a manner consistent with the L1 derived hypotheses of the simple view of writing.

Oral language skills and writing outcomes in L2 learners. The studies to date which have addressed the role of oral language skills in L2 learners' writing outcomes vary greatly in their choice of measures, student populations, and analytical approaches. Babayiğit (2014) found that a composite verbal skills factor (including vocabulary, verbal working memory, and semantic fluency) had a significant effect of moderate size on paragraph writing quality in both L1 and L2 grade four-aged students in England. This association between verbal skills and writing quality was consistent between L1 and L2 students, but because verbal skills were linked to writing as a combined verbal skills latent factor, it is difficult to parse out the effect of vocabulary individually. Ball (2003) also investigated the role of oral language in L2 learners' writing using a composite of oral language skills including receptive and expressive vocabulary, grammatical judgement, listening comprehension, and sentence memory. Ball found that, while oral language skills contributed significant variance to text-level writing skills in L1 learners, the same was not true of L2 students in grade three or grade five/six. None of the individual language skills were significantly correlated with writing outcome in L2 learners at either grade, while receptive and expressive vocab, listening comprehension, and sentence memory were all correlated with L1 learners' writing in the grade five/six sample. Contrary to Babayiğit (2014), then, Ball (2003) concluded that oral language skills do not contribute significant unique variance to text-level writing skills in L2 students, and that the association between oral language and writing skills differs between L1 and L2 students.

It is possible that the skills included in oral language composite measures impact the degree to which an association with L2 writing is or is not observed. Correspondingly, investigation of the role of individual oral language skills in writing is helpful. Silverman and colleagues (2015) observed the impact of vocabulary and syntactical skills on writing tasks in

grade three to five L2 students in the United States. They found that L2 learners' vocabulary skills were significantly related to scores on the TOWL-4 story composition subtest (an 11-item scoring system for children's narrative writing), and L2 learners' syntax skills were significantly related to scores on the TOWL-4 contextual conventions subtest (a 21-item scoring system for the same sample of children's writing). The association between vocabulary and story composition was similar across L1 and L2 groups, but L2 students who scored well on the syntax measures tended to perform more poorly on the contextual conventions writing task than did L1 students with comparable skills. Silverman et al. interpreted this finding to indicate that L2 students may have a harder time applying their syntactic knowledge to writing tasks. It is worth noting that the story composition subtest of the TOWL-4 scores word choice directly, and the TOWL-4 contextual composition task scores grammatical knowledge directly, such that observed associations may be due to multicollinearity (e.g. high correlations between similar variables) rather than true construct relations; however, the TOWL-4 story construction subtest is the same writing outcome measure used in Ball (2003), in which no association with oral language skills was found. Thus, Silverman et al. offers at least some evidence for an association between knowledge of oral vocabulary and syntax and writing outcomes in L2 learners.

Babayiğit (2014), Ball (2003), and Silverman et al (2015) are the only studies to date which offer investigations of relevant oral language skills in relation to L2 learners' writing. Each uses different methods of assessing oral language skills and findings are conflicting, leaving it unclear whether oral language has a significant impact on writing in L2 learners (as in Babayiğit, 2014; Silverman et al., 2015) or if this association is exclusive to L1 learners (as in Ball, 2003). The lack of consistency with which oral language is measured makes it difficult to draw conclusions about the role of oral language in L2 writing. It is unclear whether an

association exists between oral language skills and writing in L2 learners, or whether that association is consistent with L1 learners. However, clarification of the association between oral language and writing in L2 learners is critically important on two fronts: first, in that oral language is known to impact writing in L1 learners and, second, in that oral language skills are known to be lower in L2 than L1 learners. If relations between component skills and writing are the same in L2 and L1 learners, this would suggest that oral language skills have important impacts on L2 writing. Conversely, if the lower oral language skills of L2 learners do not impact their writing, this may indicate reliance on different component skills than L1 learners. Either way, clarification of the role of oral language in L2 writing is critical to supporting L2 learners' writing development in elementary school.

Contribution of writing components in L2 learners. Babayiğit (2014) is the only study to date which has considered the role of oral language and word-level skills in L2 learners' writing simultaneously, investigating the role verbal skills and word-level literacy skills play in nine to ten-year old L1 and L2 students' writing in England. Consistent with previous research, Babayiğit found that verbal skills, including vocabulary, verbal working memory, and semantic fluency, were significantly lower in L2 than L1 learners. Word-level skills, including single word spelling, in-text spelling error rate, and single word reading, were invariant between groups. Structural analysis revealed that paths from the verbal skills and word-level skills factors to overall writing quality were statistically significant and within the moderate effect size range, indicating that both verbal and word-level skills made independent and significant contributions to writing quality in nine to ten-year-old students. This model explained a moderate proportion of variance in writing quality in both L1 and L2 groups and, perhaps most interestingly, was consistent across L1 and L2 groups. While L2 learners were found to significantly underperform

on measures of writing quality relative to their L1 peers, the processes observed to underpin writing in both groups were invariant. It is interesting that the same model was found to fit both the L1 and L2 groups despite significant differences in verbal skills. Existing analysis of the present data set suggests that oral vocabulary is differentially related to L2 learners' writing compared to L1 learners' writing in grade three (Harrison et al., 2016). Yet, Babayiğit (2014) found literacy and language skills to be comparably involved in L2 and L1 learners' writing processes in approximately grade four. This finding is, in part, the motivation for the present study. Further investigation of the similarities and differences in how oral language contributes to writing in L1 and L2 learners is merited, particularly given the diverse ways in which oral language can be conceptualized, its' known pertinence to L1 learners' writing, and the known gap between L1 and L2 learners' oral language skills.

Section Summary

Existing evidence on writing outcomes in L2 learners relative to their L1 peers is extremely variable. It appears that L2 learners perform on par with L1 learners on measures of writing productivity and spelling, but it is unclear whether they differ from L1 learners on other mechanical aspects of writing or higher-level content and complexity of writing. While use of a single composite writing score might be expected to help resolve this confusion, findings using this method have been mixed as well. Several studies suggest that word-level skills may impact L2 learners' writing outcomes, but findings regarding the role of oral language in L2 learners' writing are inconclusive. At present, it is unclear whether oral language plays a significant role in L2 learners' writing and/or if this role differs between L1 and L2 students. There appears to be only one study to date which has considered the impact of word-level and oral language skills simultaneously: Babayiğit (2014) found that both oral language and word-level skills had

significant impacts on writing, and that these associations were consistent across L1 and L2 learners. It is this study to which results of the present study will be compared.

The Present Study

The present study was intended to address two gaps in the existing literature on L2 writing. First, it sought to address the existing paucity of research on text-level writing skills in L2 learners. Studies of L2 learners' text-level writing are few and far between, and those which do exist are inconsistent and limited in scope. As discussed above, there is presently not enough evidence available to draw conclusions about L2 learners' text-level writing performance relative to their L1 peers, or in relation to the component skills of writing. This is in contrast to the firm conclusions which have been drawn regarding L2 learners' word-level reading and spelling skills (which do not differ from L1 students), and the emerging conclusions which suggest that text-level reading comprehension is an area of difficulty for L2 learners (Lesaux et al., 2006). In order for L2 literacy research to consider the full range of literacy skills, text-level writing in L2 learners must be investigated as thoroughly as text-level reading skills and word-level reading and writing skills. The present study sought to address this gap by comparing writing between L1 and L2 learners and considering the ways in which oral language and word-level literacy skills impact text-level writing in elementary age L2 learners.

The second premise of the current study was to help clarify the role of oral language skills in L2 learners' writing. Oral language proficiency is known to impact writing in L1 learners (Abbott & Berninger, 1993; Shanahan, 2003). It is also known to be an area of consistently lower performance in L2 populations (Babayiğit, 2014; Bowyer-Crane et al., 2017; Chiappe et al., 2002; Geva, 2006; Lesaux et al., 2006, etc). However, there is scant evidence available which draws a clear link between the known role of oral language in writing and it's known lag in L2 learners. This study sought to clarify the role of oral language in elementary L2 learners' writing by determining the contribution it makes relative to word-level literacy skills

such as word reading and spelling. Such a focus was intended to provide insight into the relative impact of oral and print-based language skills on writing outcomes in L1 and L2 learners.

Research Questions

The overarching goal of the present study was to investigate the relative contributions of oral language and word-level literacy skills to writing achievement across language and age groups. Specifically, it examined data cross-sectionally to analyze associations between oral language skills, word-level literacy skills, and writing outcomes in kindergarten and grade three students for whom English was a first (EL1) or second (EL2) language. The specific research questions which guided the present study are as follows:

Kindergarten sample.

1) How do oral language skills (oral vocabulary, syntactic knowledge) and word-level literacy skills (early word reading, spelling) contribute to early writing in EL1 and EL2 students in kindergarten?
2) Do the contributions of oral language and word-level literacy skills to early writing differ between language groups in kindergarten?

Grade three sample.

3) How do oral language skills (oral vocabulary, syntactic knowledge) and word-level literacy skills (word reading, spelling) contribute to writing in EL1 and EL2 students in grade three?
4) Do the contributions of oral language and word-level literacy skills to writing differ between language groups in grade three?

Cross-sectional comparison.

5) Are there differences in the contributions of oral language and word-level literacy skills to writing between students in kindergarten and students in grade three?

Method

The present study was conducted on a subset of data obtained as part of a larger longitudinal study which followed EL1 and EL2 students throughout elementary school (kindergarten to grade five). An initial sample of participants was recruited and assessed in kindergarten. Three years later, a subset of these participants was re-assessed in grade three alongside a group of newly recruited grade three participants. As sample composition differed between grades, the present study considered the complete kindergarten and grade three samples separately. It investigated differences between language groups (EL1 or EL2) in the kindergarten and grade three samples concurrently and compared findings across grades cross-sectionally. Not all variables measured as part of the larger study were considered; a complete list of variables, data collection procedures, and initial results can be found for the kindergarten and grade three samples in Harrison et al. (2013) and Harrison et al. (2016) respectively. Analysis of the longitudinal subset of the data can be found in Perkins and Harrison (2018).

Participants

Participants were recruited from several schools within the same multi-ethnic suburban Canadian school district. Ethics approval for the study was obtained from the University of Victoria's Human Research Ethics Board prior to the first stage of data collection. Parents provided signed consent for their child's participation in the study in both kindergarten and grade three; consent forms were translated into EL2 parents' first language (Punjabi) when needed. Kindergarten participants were read a short script describing the purpose of the study and, based on this information, provided verbal assent to participate. Grade three students provided signed consent on a short informational form. None of the participating children had documented or

reported histories of neurological, developmental, or motor disorders, uncorrected visual deficits, or developmental delays.

Kindergarten sample. Participants included 124 kindergarten students (61 boys, 63 girls; *M* age = 68.00 months, *SD* = 3.66 months, range = 62-76 months) across seven schools in the above-mentioned suburban Canadian school district. The kindergarten English as a first language (kindergarten EL1) group consisted of 56 students (24 boys, 32 girls; *M* age = 68.61 months, *SD* = 3.73 months, range = 62-76 months) who were monolingual English speakers, with no exposure to a second language. The kindergarten English as a second language (kindergarten EL2) group consisted of 68 students (37 boys, 31 girls *M* age = 67.50 months, *SD* = 3.55 months, range = 62-74 months), who spoke a first language other than English at home. Punjabi was the first language of the majority of EL2 students (93%, *N* = 63); two of the remaining five students spoke Spanish, one Korean, one German, and one Vietnamese as their first language. Each child's language status was validated by teacher report and school file information. Language status was approximately equally distributed across schools (Harrison et al., 2013). There were no significant differences in age ($t = 1.69$, $p = .09$) or gender ($t = 1.28$, $p = .20$) between language groups. No formal demographic data was collected, but participating children lived in predominantly middle-class neighborhoods where median family incomes before taxes ranged from approximately $55,000 to $75,000 (Harrison et al., 2013). Thirty percent of parents in these neighborhoods had completed high school, and 10-20% of parents had a university degree.

Grade three sample. Participants included 112 grade three students (61 boys, 51 girls*;* *M* age = 104.13 months, *SD* = 3.57 months, range = 97-113 months) across five schools in the same above-mentioned Canadian school district. Fifty of the grade three participants had also

participated in data collection in kindergarten (21 EL1, 29 EL2). The remaining 62 students were newly recruited in grade three. The grade three English as a first language (grade three EL1) group consisted of 51 students (27 boys, 24 girls; *M* age = 104.55 months, *SD* = 3.43 months, range = 98-110 months) who were monolingual English speakers upon entering school in kindergarten. The grade three English as a second language (grade three EL2) group consisted of 61 students (34 boys, 27 girls; *M* age = 103.79 months, *SD* = 3.67 months, range = 97-113 months) who entered kindergarten speaking minimal or no English. Punjabi was the first language of the majority of EL2 students (90%, *N* = 55); three of the remaining six students spoke Korean, one Malayalam, one Urdu, and one Spanish as their first language. Each child's language status was validated by school record information. There were no significant differences in age ($t = 1.13$, $p = .26$) or gender ($t = .59$, $p = .77$) between language groups. No formal demographic data was taken, but the five schools were again situated in predominately middle-class neighborhoods with similar socioeconomic status based on family incomes before taxes and the highest educational levels obtained by parents (Harrison et al., 2016).

Procedures

Data collection for the kindergarten sample took place approximately halfway through the student's kindergarten year (2007-2008), such that students had been in school for approximately six months at the time of assessment. Data collection for the grade three sample occurred three years later, approximately halfway through the students' third grade year (2010-2011). Each child completed the tasks individually in a quiet room in their school, in one session that lasted 45 minutes to one hour. Measures were administered in a counter-balanced order across three blocks: Oral Vocabulary and Syntax, Reading and Writing, and Phonological Awareness in kindergarten, and Cognitive and Language, Reading, and Writing in grade three.

Tasks within each block were administered in a fixed order; the nonverbal reasoning measure was administered last in all cases. Data was collected by the principal researcher (Dr. Gina Harrison) and three trained graduate students who were supervised by the principal researcher and had received formal training in administration and scoring of the measures used.

Measures

Measures administered in the kindergarten and grade three samples are considered separately.

Kindergarten measures. Kindergarten participants completed a battery of standardized measures assessing oral language, word-level literacy, and writing skills. More constructs were assessed in the original study than are considered here; only measures relevant to the present study are reported below. A complete description of all measures administered in the kindergarten sample can be found in Harrison et al. (2013).

Kindergarten oral language skills.

Kindergarten oral vocabulary. The Peabody Picture Vocabulary Test–Fourth Edition (PPVT-4; Dunn & Dunn, 2007) was used to assess children's receptive oral vocabulary in kindergarten. Each item on this task required children to point to one of four pictures which best represented an orally presented word. Items were administered in sets of 12, with the difficulty of vocabulary words increasing each set. Standard administration and scoring procedures from the test manual were followed; basal and ceiling rules determined which items each student completed. Raw scores were calculated based on the total number of correct responses on the measure, such that higher scores reflected higher vocabulary knowledge. Standard scores were not used because the normative group did not include any L2 students (Dunn & Dunn, 2007). Internal consistency for the kindergarten sample was estimated at $\alpha = .88$ for the EL1 group and

α = .83 for the EL2 group, somewhat lower than values reported in the test manual (α = .95 to .97 for five to six-year-old students; Dunn & Dunn, 2007) but still adequate.

Kindergarten syntactic awareness. The Syntax Construction subtest of the Comprehensive Assessment of Spoken Language (CASL; Carrow-Woolfolk, 1999) was used to assess oral English syntactic awareness in kindergarten. Items on this task required students to complete sentences, repeat phrases, and respond to questions with a semantically and grammatically compatible word, phrase, or sentence. Standard administration and scoring procedures from the test manual were followed, and basal and ceiling rules were applied to determine which items participants completed. Raw scores represented the total number of correct responses made by the participant; standard scores were not used. Internal consistency for the kindergarten sample was estimated at α = .80 for the EL1 group and α = .78 for the EL2 group.

Kindergarten word-level literacy skills.

Kindergarten word reading. The Reading subtest of the Wide-Range Achievement Test—Third Edition (WRAT-3; Wilkinson, 1993) was administered to measure word-level reading skills in the kindergarten sample. This task required students to read aloud from an increasingly complex list of letters and words in isolation. It is untimed; basal and ceiling rules from the test manual determined subtest duration instead. Standard administration and scoring procedures from the test manual were followed. Raw scores captured word-reading accuracy: the number of letters and words a student read correctly. Standard scores were not used because the normative population did not include L2 students (Wilkinson, 1993). Internal consistency for the kindergarten sample was estimated at α = .88 for the EL1 group and α = .87 for the EL2 group,

consistent with values reported in the test manual for five to six-year-old students (α = .90 to .91; Wilkinson, 1993).

Kindergarten spelling. The Spelling subtest of the WRAT-3 (Wilkinson, 1993) was administered to assess word-level spelling skills in isolation in kindergarten. The first part of this subtest required participants to write the correct letter corresponding with a spoken letter name. The second part of this subtest required participants to spell increasingly complex words to dictation. Standard administration and scoring procedures from the test manual were followed. Raw scores reflected the number of letters and words spelled correctly. Standard scores were not used because the normative population did not include L2 students (Wilkinson, 1993). Internal consistency for the kindergarten sample was estimated at α = .87 for the EL1 group and α = .89 for the EL2 group, consistent with the values reported in the test manual for five to six-year-old students (α = .86 to .89; Wilkinson, 1993).

Kindergarten writing proficiency. Early writing ability in the kindergarten sample was assessed using a subset of tasks from the Oral and Written Language Scales (OWLS; Carrow-Woolfolk, 1996). Selected writing tasks from the Written Expression Scales of the OWLS required children to write their first and last names (name writing), copy two words in isolation (word copying), write three letters in response to dictated letter names (letter writing) and letter sounds (sound writing), select and write an appropriate word to describe each of three simple images (word writing), copy two sentences (sentence copying), and write two sentences to dictation (sentence writing). All tasks were administered and scored according to the procedures described in the test manual. Students' responses were scored on criteria which included a) the spelling accuracy of their first and last name, and capitalization of their last name, b) the accuracy of the letters produced in response to letter names and letter sounds, c) the spelling and

appropriateness of single words written to describe pictures, and d) the spelling, spacing, and punctuation of sentences copied and written to dictation. Raw scores represented the total number of points each student received based on these criteria, out of a total of 29 possible points; consistent with the above measures, standard scores were not used (Carrow-Woolfolk, 1996).

The OWLS were selected to measure writing in kindergarten because they offer sufficient floor and ceiling items to sensitively assess early writing in young children. The assortment of writing tasks administered address both procedural (relying on rote memory) and generative (relying on alphabetic and graphophonemic knowledge) aspects of children's writing, providing a balanced evaluation of text generation and transcription skills (Abbott & Berninger, 1993; Harrison et al., 2016). Split-half internal consistency coefficients of $\alpha = .75$ for the EL1 group and $\alpha = .76$ for the EL2 group were calculated for the kindergarten sample. Two raters scored each student's writing assessment, resulting in an inter-rater reliability estimate of $\alpha = .96$; this high estimate of reliability reflects high objectivity in item-scoring. It is worth noting that some students were not required to complete the final sentence writing task based on application of test ceiling rules; these students were given a score of zero on the sentence writing task, consistent with the score of students who attempted the task unsuccessfully, such that total raw scores were not impacted.

Grade three measures. Grade three participants also completed a battery of standardized measures assessing oral language, word-level literacy, and writing skills. All measures used to assess language and literacy skills in the grade three sample are consistent with those used in the kindergarten sample except for word reading and writing. As in kindergarten, more constructs

were assessed in the original study than are reported below. A complete description of all measures administered in the grade three sample can be found in Harrison et al. (2016).

Grade three oral language skills.

Grade three oral vocabulary. The PPVT-4 (Dunn & Dunn, 2007) was used to assess children's receptive oral vocabulary in grade three. The same administration and scoring procedures were used as in the kindergarten sample. Internal consistency for the grade three sample was estimated at $\alpha = .90$ for the EL1 group and $\alpha = .95$ for the EL2 group, consistent with the values reported in the test manual for eight to nine-year-old students ($\alpha = .94$ to .97; Dunn & Dunn, 2007).

Grade three syntactic awareness. The Syntax Construction subtest of the CASL (Carrow-Woolfolk, 1999) was used to assess oral English syntactic awareness in grade three. The same administration and scoring procedures were used as in the kindergarten sample. Internal consistency for the grade three sample was estimated at $\alpha = .80$ for the EL1 group and $\alpha = .75$ for the EL2 group.

Grade three word-level literacy skills.

Grade three word reading. The Sight Word Efficiency (SWE) subtest of the Test of Word Reading Efficiency (TOWRE; Torgesen, Wagner, & Rashotee, 1999) was used to measure word-level reading skills in the grade three sample. This task required students to read as many words from a list as they could in 45 seconds. It was selected for use in the grade three sample over the WRAT-3 because it captures both fluency and accuracy of word-reading in isolation, providing a more sensitive measure of word-level reading ability and thereby offering more insight into grade three word reading skills. Standard administration and scoring procedures from the test manual were followed. Raw scores reflected the number of words read correctly in 45 seconds.

Standard scores were not used because the normative population did not include L2 students (Torgesen et al., 1999). The timed nature of this test precludes estimation of internal consistency, however, the test manual reports high inter-rater and test-retest reliability values of $\alpha = .99$ and $\alpha = .97$ respectively and offers adequate evidence of test validity (Torgesen et al., 1999).

Grade three spelling. The Spelling subtest of the WRAT-3 (Wilkinson, 1993) was administered to assess word-level spelling skills in isolation in grade three. The same administration and scoring procedures were used as in the kindergarten sample. Internal consistency for the grade three sample was estimated at $\alpha = .86$ for the EL1 group and $\alpha = .77$ for the EL2 group. These are consistent with the values reported in the test manual for eight to nine-year-old students ($\alpha = .83$ to .88; Wilkinson, 1993).

Grade three writing proficiency. Writing ability in the grade three sample was assessed using a paragraph writing task, administered and scored according to the instructions of the Paragraph Writing subtest of the Wechsler Individual Achievement Test–Second Edition (WIAT-II; The Psychological Corporation, 2002). Participants were asked to write a paragraph about their favorite vacation and instructed that correct spelling and punctuation were important. They were given ten minutes to complete the paragraph. Students' responses were scored on the criteria for mechanics, organization, and vocabulary listed in the test manual. Criteria for mechanics included spelling errors, punctuation errors, and presence of multiple spellings for a maximum of nine points. Criteria for paragraph organization included sentence structure, number of sentences produced, use of linking expressions and examples, topic coherence, and logical order, for a maximum of ten points. Criteria for vocabulary reflected the variety of vocabulary and expressions used in children's paragraphs, for a maximum of five points. Raw scores represented the total number of points children received across all three categories based on these

criteria; standard scores were not used because of the lack of L2 students in the normative sample (The Psychological Corporation, 2002).

All participants' paragraphs were scored by two trained graduate students, and an inter-rater agreement of $\alpha = .88$ was obtained. This is consistent with the average inter-rater reliability estimate of $\alpha = .85$ reported in the test manual (The Psychological Corporation, 2002). Split half internal consistency could not be estimated for this task because the single item response format precludes division into equivalent halves. However, the written expression subtest of the WIAT-II from which this task was derived reports a test-retest reliability coefficient of $\alpha = .87$ for students ages eight to nine, and $\alpha = .78$ for students in grade three (The Psychological Corporation, 2002). This paragraph writing task was selected as an appropriate measure of text-level writing skills for grade three students because it observes age-appropriate writing behavior and writing product directly.

Statistical Analysis

Consistent with previous research on second language populations (Geva & Yaghoub-Zadeh, 2006; Harrison et al., 2016, 2013; Jean & Geva, 2009), all statistical analyses were conducted using raw scores rather than assessment-derived standard (norm-referenced) scores, as none of the measures used included EL2 students in their normative sample. To facilitate the comparison of measures and combination of scores into composite variables for the main analysis, *z*-scores were created for all variables instead. Participants' raw scores were converted to *z*-scores separately for EL1 and EL2 samples in each grade, standardizing the mean and standard deviation of each measure in each group to one and zero respectively. Language groups were standardized separately in order to retain the unique variance of the separate populations.

As the primary focus of this study was to investigate the relative roles of oral language and word-level literacy skills in writing, rather than the contribution of individual tasks, composite variables were created to represent the oral language and word-level skills constructs in analysis. Composite variables were chosen over latent variables on the basis of ecological validity and limited sample size. Composite variables were created by summing each participants' *z*-scores on the two measures of interest, yielding distributions with means of approximately zero and standard deviations between one and two. The oral language composite variable comprised of a summation of participant's *z*-scores on oral vocabulary and syntactic awareness measures. The word-level literacy skills composite variable comprised of a summation of participants' *z*-scores on word reading and spelling measures. No writing composite variable was created as only one writing task was administered in each grade; *z*-scores of writing task performance were used as a standalone outcome variable.

Prior to analysis, the composite and outcome variables of each sample were screened for missing data, outliers, issues of normality, and linearity of relations among variables, to ensure suitability for a regression-based analysis. Graphical analysis was used as the primary method for screening data, as suggested by the American Psychological Association (APA) Task Force on Statistical Inference (Wilkinson, 1999). Supplemental descriptive statistics for composite and outcome variables can be found in Appendix A. Results of these initial screens are presented at the beginning of each samples' results section, along with preliminary between group comparisons and correlational analyses addressing assumptions of multicollinearity and singularity. Residuals were examined post-analysis to address assumptions regarding normality, linearity, and homoscedasticity. The main analysis was conducted separately for each language

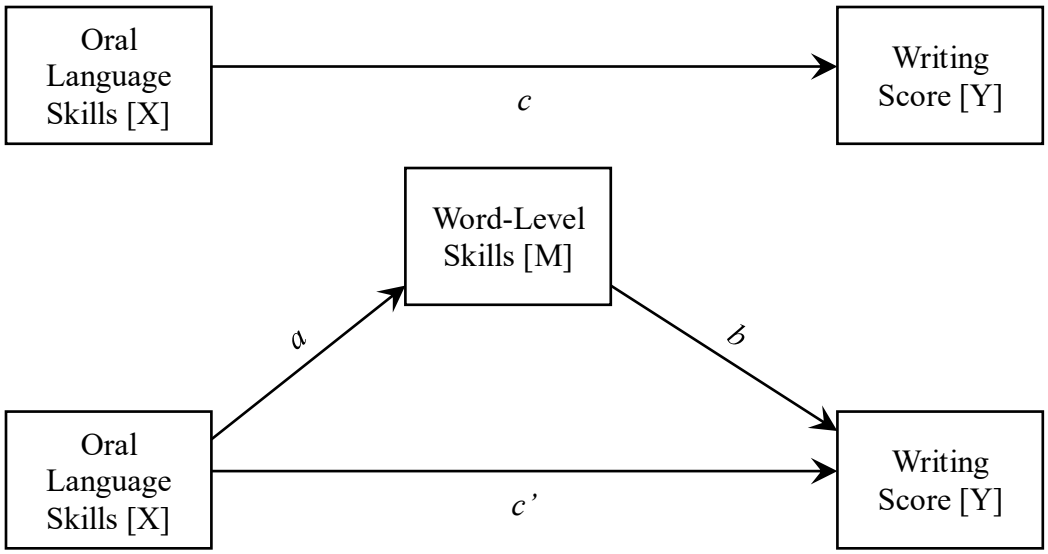

Figure 2. Conceptual model of the simple mediation analysis conducted for each group, after Hayes and Rockwood (2017). Oral language skills are a composite variable of participants' scores on oral vocabulary and syntactic awareness tasks. Word-level skills are a composite variable of participants' scores on word reading and spelling tasks. Writing score is a standalone outcome variable of participants' performance on a standardized writing task.
a = effect of X on M; *b* = effect of M on Y; *c'* = direct effect of X on Y controlling for M; *ab* = indirect effect of X on Y through M (product of paths *a*b*); *c* = total effect of X on Y (sum of direct and indirect effects *c*'+ *ab*).

group in each grade, such that the kindergarten sample consisted of an EL1 and EL2 group analysis, and the grade three sample consisted of an EL1 and EL2 group analysis.

Main analysis. Associations among oral language skills, word-level literacy skills, and writing skills in each group were tested with a simple mediation analysis conducted using ordinary least squares (OLS) regression-based path analysis, after Hayes (2013). A conceptual path diagram of the model tested is shown in Figure 2. The paths to be estimated in analysis included the effect of oral language skills on word-level skills (path *a*), the effect of word-level skills on writing (path *b*), the direct effect of oral language skills on writing (path *c'*), and the indirect effect of oral language on writing through word-level skills (path *ab*). The total effect of oral language skills on writing (path *c*, assessed in isolation of word-level skills) was also estimated to determine whether the effect of oral language skills on writing was impacted by inclusion of word-level skills in the model.

Model specification. The first step in creating a model which answered research questions about how oral language and word-level skills contribute to writing was to identify paths between them such that both oral language skills and word-level skills served as predictors of writing outcome (paths *b* and *c'* in Figure 2). Specification of these two paths arose directly from the key role of oral language and word-level literacy skills in theories of L1 and L2 learners' writing described above (Abbott & Berninger, 1993; Berninger & Amtmann, 2003; Schoonen et al., 2002). The association between oral language and word-level skills was of secondary interest. To analyze this association, it was necessary to determine the direction of influence between oral language and word-level skills (path *a* in Figure 2).

Specification of oral language skills as the independent variable and word-level skills as the mediator, rather than vice versa, arose from several lines of evidence. Oral language skills are the primary difference between EL1 and EL2 students, based both on their differing history of exposure to oral English as well as the significant differences in their scores on standardized assessments of oral vocabulary and syntax. This makes oral language a logical independent variable. Children's knowledge of the language of instruction logically impacts how well they will learn word-level skills instructed in school; this is a far more straightforward and parsimonious chain of events than the possible mechanisms by which acquired word-level literacy skills may impact oral language skills. Oral language skills also take time precedence over word-level literacy skills in development (Berninger, 2000), and variables which precede other variables in time ought to causally precede these variables in path models as well (Keith, 2015). In this case, oral language skills take time precedence over word-level skills because development of oral language systems precedes that of the written language systems upon which word-level skills rely (Berninger, 2000).

The advantage of a mediation analysis is that it goes beyond asking whether there is an association among variables, and addresses questions of *how* a causal antecedent variable, X, influences a consequent variable, Y (Hayes, 2013). Oral language skills are known to be involved in L1 writing, and known to be significantly lower in L2 learners, yet, as discussed earlier, the association between these two constructs in L2 students remains unclear. Assigning oral language skills as the independent variable in a mediation model allowed for assessment of *how* oral language impacts writing—it assessed the impact of oral language on writing indirectly as well as directly, thereby offering more information than a simple regression model alone and addressing a known gap in the literature.

In this way, specifying the direction of effect between oral language and word-level skills drew support from all four lines of evidence suggested for path analysis—theory, review of current literature, time precedence, and common sense (Keith, 2015). Specification of the model as seen in Figure 2 also met the conditions for valid inferences of causality in mediation analyses (Hayes, 2013). There is evidence of a relation between the variables being considered (see Table 3 and Table 7), the presumed cause takes time precedence over the presumed effect, and the relation between variables appears true and not spurious. Competing explanations that oral language mediates word-level skills' effect on writing can be ruled out on a theoretical and developmental basis.

Testing mediation. The simple mediation model used was based primarily on Hayes' (2013) methodological approach to mediation analysis using OLS path analysis. Mediation was established by testing the significance of the indirect effect of the independent on the dependent variable through the mediator (path *ab* in Figure 2), rather than following the traditional four-step causal approach (see Hayes & Rockwood, 2017, for a discussion). Statistical significance of

the indirect effect was established using both the Sobel test statistic and the bootstrap 95% confidence intervals (CIs) produced for the indirect effect. The Sobel test, or normal theory approach, yields a *p*-value for the indirect effect which can be used to reject the null hypothesis that the indirect effect is zero. A bootstrapped CI which does not contain zero also provides definitive evidence that the effect of X on Y operates to at least some degree through M (Hayes & Rockwood, 2017). Rejection of the null hypothesis that the indirect effect is zero, or a CI estimate that did not include zero, was considered sufficient evidence to support a claim of mediation of the effect of oral language on writing skills through word-level skills (Hayes & Rockwood, 2017).

Analyses were conducted separately for each sample group (e.g. Kindergarten EL1, Kindergarten EL2, Grade Three EL1, and Grade Three EL2) using the PROCESS v3 macro (Hayes, 2018) in IBM SPSS Version 25.0. Bootstrapping was used within the analysis to mitigate the effects of any non-normal sampling distributions (particularly that of the word-level composite variable), as failure to meet assumptions of normality can lead to underestimation of standard error and, correspondingly, increase the possibility of Type I error (Byrne, 2010). Unless otherwise mentioned, 5000 bootstrap samples were used for all analyses.

A note on bootstrapping. Bootstrapping is a resampling with replacement procedure which allows for calculation of the precision of statistical estimates (e.g. standard error or CI width) without making as many assumptions as traditional inferential methods (Wright, London, & Field, 2011). It creates a concrete sampling distribution of parameter estimates across the thousands of resamples performed, against which the point estimate of the statistic of interest in the original data sample can then be compared (Byrne, 2010; Wright et al., 2011). By relying on this bootstrap sampling distribution rather than the hypothetical normal distribution assumed in

inferential analytical formulas, this estimation method is freed from the restrictions and assumptions of traditional approaches, allowing for more precise estimation of standard errors and CIs and, subsequently, increasing the power of statistical analyses (Byrne, 2010; Wright et al., 2011). It is known to serve equally as well as traditional methods when data meets assumptions, but outperforms traditional methods in scenarios where assumption are not met (Wright et al., 2011). Bootstrapping thereby provides better estimates of standard error and CIs for continuous but non-normally distributed data (Beaujean, 2013). Furthermore, bootstrapping makes less assumptions about the distribution of residuals when estimating CIs for regression coefficients (Wright et al., 2011). Accordingly, inclusion of bootstrapping in the central analyses of the present study was intended to accommodate any non-normal data and increase estimates of precision without otherwise impacting results. Standard errors and percentile CIs reported for path coefficients are derived from the bootstrap sample distribution unless otherwise specified.

Between group comparisons. Coefficients for each path estimated were compared between language groups in each grade, and across grades for each language group, to determine whether the contributions of oral language and word-level literacy skills to writing differed between groups. Significant differences in path weights between language groups were taken to indicate differences in the associations between oral language, word-level literacy, and writing constructs between EL1 and EL2 students. Statistical significance of the difference in path weights between language groups was established two ways: using proportion overlap of 95% CIs, after Cumming (2009), and using Welch's two-sample *t*-test for unequal variances, as suggested by Keith (2015).

The former method involved comparison of each sample's 95% CI for the path of interest. According to Cumming (2009), $p \leq .05$ for a comparison of two independent means

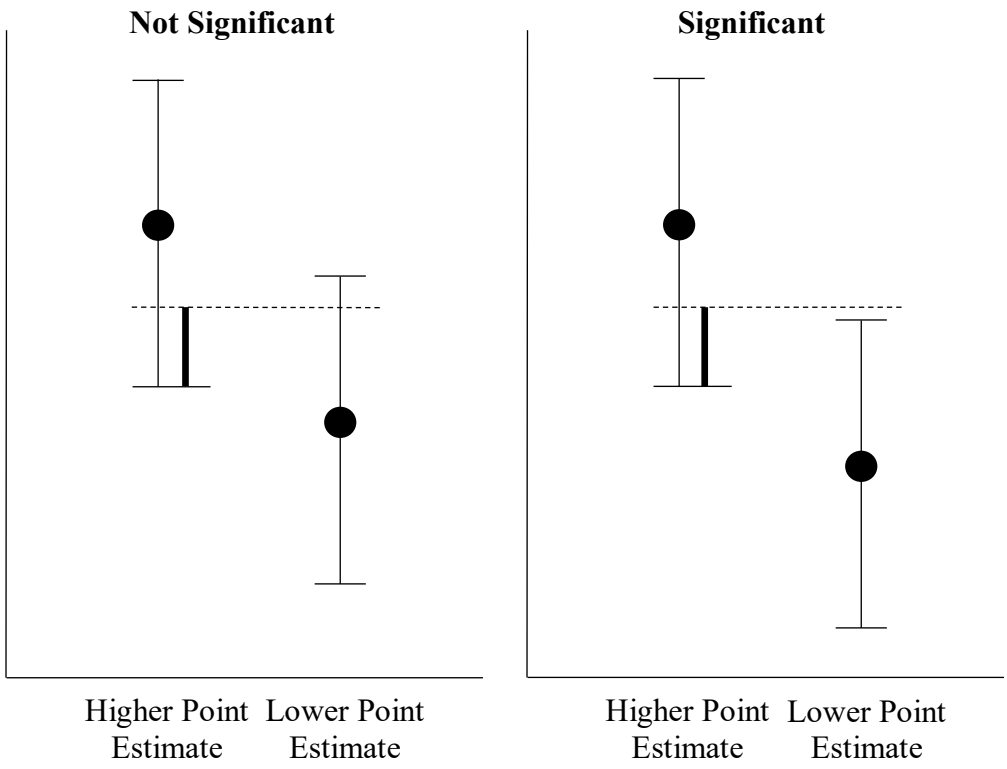

Figure 3. Comparison of confidence intervals (CIs) which overlap incompletely (one or both point estimates are outside the other sample's CI). The half-width distance (half the average CI arm width) is shown in bold. The half-width distance is added to the lower value of the higher point estimate's CI to determine a cutoff value for significance (indicated by the dashed line). A non-significant difference is shown on the left, where the upper value of the lower point estimate's CI exceeds the cutoff value. A significant difference is shown on the right, where the upper value of the lower point estimate's CI does not exceed the cutoff value.

when the overlap of the 95% CIs "is no more than about half the average margin of error, that is when POL [proportion overlap, expressed as a proportion of the length of a single arm of a CI] is about 0.5 or less" (p. 207). In other words, when one arm of a sample's CI overlaps the arm of the other sample's CI by half of its width or less, *p* can be assumed to be less than .05 and, therefore, the difference between samples significant. Following this method, complete non-overlap of CIs was taken to suggest a significant difference between groups, as CIs clearly overlapped by less than half an arm's width. Complete overlap of CIs (e.g. the *b* value of EL1 was contained within the CI of EL2 and vice versa) was taken to indicate no significant

difference in the path coefficient between groups, as this requires at least one full arm of one sample's CI to overlap the other sample's CI and, therefore, exceeds the half-width rule.

In cases where CIs overlapped incompletely (e.g. the arms of the two CIs overlapped but one or both groups' *b* values was outside the CI of the other group), calculations based on Cumming's (2009) half-width rule were used to determine whether the overlap met criteria for significance. The width of the arms of the two CIs were averaged and halved (to determine the half-width distance) and added to the lower value of the higher point estimate's CI to determine a cutoff value for significance (see Figure 3). If the upper value of the lower point estimate's CI exceeded this cutoff value, it indicated that the two CIs overlapped by more than half an arm's width and, therefore, the two path coefficients were not statistically significantly different from each other ($p > .05$; Cumming, 2009). If the upper value of the lower point estimate's CI did not exceed the cutoff value, it indicated that the two CIs overlapped by less than half an arm's width and, therefore, that the two path coefficients were statistically significantly different from each other ($p < .05$; Cumming, 2009).

Use of Welch's two sample *t*-test for was somewhat more straightforward. The regression coefficients for the path of interest in each sample were inputted as the means to be compared, and the standard error of each coefficient was used for the pooled variance calculation in the denominator (as shown in Equation 1).

$$z = \frac{b_1 - b_2}{\sqrt{SE_{b1}^2 + SE_{b2}^2}} \quad (1)$$

Calculation yielded a *z*-value which was compared to the standard normal distribution to determine probability of a *z*-value as or more extreme. Calculations were done in Microsoft Excel, using the NORMSDIST function to return the probability of achieving a *z*-score whose absolute value was as high or higher than the calculated value—this served as the *p*-value for

comparison tests (Keith, 2015). A *p*-value of less than .05 was considered statistically significant. Equal variances and equal sample sizes were not assumed, as Welch's two sample *t*-test does not require them.

Pertinence to research questions. The simple path mediation model analyzed was designed to address the primary research questions of the present study in several ways. Estimation of path coefficients in the mediation model indicated the variance each composite contributed to writing, and the means by which this variance was contributed (e.g. direct or indirect), addressing research question one and three (*How do oral language skills [oral vocabulary, syntactic knowledge] and word-level literacy skills [word reading, spelling] contribute to writing in EL1 and EL2 students in kindergarten/grade three?).* Research questions two and four (*Do the contributions of oral language and word-level literacy skills to writing differ between language groups in kindergarten/grade three?*) were addressed by a comparison of path coefficients between language groups in each sample. Finally question five (*Are there differences in the contributions of oral language and word-level literacy skills to writing between kindergarten and grade three?*) was addressed by a comparison of path coefficients between grades for each language group.

Section Summary

EL1 and EL2 students in kindergarten and grade three were administered a battery of standardized measures assessing oral language, word-level literacy, and writing skills. As these measures were not normed on L2 populations, raw scores were used as the basis of analysis instead of assessment-derived standard scores. Raw scores were converted to *z*-scores for creation of composite oral language and word-level literacy variables. An OLS regression-based mediation path analysis was used to test associations among oral language skills, word-level

literacy skills, and writing skills in each group. Mediation was established using both the Sobel test statistic and the significance of 95% bootstrap CIs, which offer more accurate estimates of statistical precision in non-normal data. Between group comparison of the 95% bootstrap CIs for each path tested was used to establish any significant differences between groups, alongside a modified Welch's *t*-test. Complete overlap of CIs was taken to indicate lack of significant difference between groups, complete non-overlap of CIs was taken to indicate a statistically significant difference between groups, and follow-up calculations were performed to determine significance for CIs which overlapped incompletely.

Results

Results are presented for the kindergarten sample first, followed by results for the grade three sample. For each sample, data screens and preliminary correlational analyses precede presentation of the main path analysis, which is presented for the EL1 and EL2 groups separately before between group comparisons are made. Results of cross-sectional comparisons and post-analysis consideration of residual assumptions are presented last. Information regarding the effect sizes used in explanation of results is available in Appendix B. Unless otherwise specified, all tests of statistical significance are based on a significance level of $p < .05$.

Kindergarten

Complete data were available for all participants in the EL1 and EL2 groups of the kindergarten sample. Given that the composite variables were used in the main analysis, their distributions were screened for normality rather than the individual variable distributions, with the exception of the writing outcome variable. Descriptive statistics used to supplement graphical analysis of these composite and outcome variables in the kindergarten sample are available in Table A1 (See Appendix A)**.** Visual screens of histograms and Q-Q plots of the composite and outcome variable distributions revealed several possible outliers. There was one particularly low EL2 score for the oral language composite, and two noticeably low scores on the EL2 word-level composite. Previous research on these data has investigated possible outliers and concluded no error of entry, however, so all participants were included in analysis (Harrison et al., 2013). It is likely that such scores are the result of the variability of skills in such a young age group.

Distributions of the oral language composite variable appeared approximately normal in both kindergarten groups. Distributions of the word-level composite variable were noticeably leptokurtic in both kindergarten groups, with a negative skew in EL2. Significant Shapiro-Wilk

statistics in both language groups confirmed that the word-level composite was not normally distributed, as did the high kurtosis statistic in EL2 (4.023). Rather than transforming this variable, however, it was anticipated that the looser assumptions of bootstrapping within the main analysis would accommodate the non-normal distribution. Distributions of the writing outcome variable appeared approximately normal in both kindergarten groups, though with a marginal positive skew in EL1. Visual examination of scatter plots indicated approximately linear relations among all composite and outcome variables in both EL1 and EL2 groups.

Table 1

Between Group Comparison of Mean Raw Scores in Kindergarten

	EL1 (56)		EL2 (68)			
Measure	*M*	*SD*	*M*	*SD*	*t*	*p*
PPVT-4	105.18	14.65	75.10	17.56	10.22	<.001
CASL Syntax	17.71	4.55	10.25	4.58	9.07	<.001
WRAT-3 Reading	16.98	5.70	15.49	2.76	1.80[a]	.08
WRAT-3 Spelling	14.70	3.31	14.50	2.77	0.36	.72
OWLS Writing	12.43	4.23	12.29	3.56	0.19	.85

Note. PPVT-4 = Peabody Picture Vocabulary Test-4th Edition; CASL Syntax = Comprehensive Assessment of Spoken Language, Syntax Construction Subtest; WRAT-3 Reading = Wide Range Achievement Test-3rd Edition, Reading Subtest; WRAT-3 Spelling = Wide Range Achievement Test-3rd Edition, Spelling Subtest; OWLS Writing = Oral and Written Language Scales, Writing Tasks.

[a] Equal variances not assumed (Levene's test for equality of variances yielded $p < .05$).

Kindergarten preliminary analyses. Table 1 summarizes the raw score descriptive statistics across language groups for all oral language, word-level literacy, and writing measures administered in kindergarten. Independent sample *t*-tests were conducted for each measure to identify any between group differences in performance. Kindergarten EL2 students performed significantly lower than their EL1 peers on the vocabulary ($t = 10.22$, $p < .001$) and syntactic awareness ($t = 9.07$, $p < .001$) measures, but no significant between group differences were found on the word reading, spelling, or writing tasks in kindergarten.

Correlations among individual variables. Correlational analyses examining the associations among individual standardized variables in the kindergarten EL1 and EL2 groups are shown in Table 2. For the EL1 group (shown above the diagonal), all correlations were significant with the exception that syntactic awareness was not significantly correlated with spelling (r = .22, p = .10) or writing (r = .18, p = .19). For the EL2 group (shown below the diagonal), all correlations were significant among all variables. The only difference in correlational associations between language groups, then, was that syntactic awareness was significantly correlated with spelling and writing in EL2 but not EL1 students.

Table 2

Correlations Among Standardized Measures in Kindergarten

Measure	1	2	3	4	5
1. PPVT-4	——	.52**	.35**	.37**	.39**
2. CASL Syntax	.53**	——	.30*	.22	.18
3. WRAT-3 Reading	.39**	.38**	——	.74**	.76**
4. WRAT-3 Spelling	.39**	.28*	.84**	——	.84**
5. OWLS Writing	.34**	.25*	.72**	.81**	——

Note. Pearson correlation coefficients for EL1 students (n = 56) are presented above the diagonal and Pearson correlation coefficients for EL2 students (n = 68) are presented below the diagonal.
PPVT-4 = Peabody Picture Vocabulary Test-4th Edition; CASL Syntax = Comprehensive Assessment of Spoken Language, Syntax Construction Subtest; WRAT-3 Reading = Wide Range Achievement Test-3rd Edition, Reading Subtest; WRAT-3 Spelling = Wide Range Achievement Test-3rd Edition, Spelling Subtest; OWLS Writing = Oral and Written Language Scales, Writing Tasks.
* p < .05, two-tailed. ** p < .01, two-tailed.

The significant correlation between vocabulary and syntactic awareness in both language groups (r = .52, p < .001 in EL1; r = .53, p < .001 in EL2) was of large effect size (Cohen, 1992), supporting combination of the two measures into a composite oral language variable for the main analysis. The correlations between word reading and spelling in both language groups were also significant and of large effect size in both language groups (r = .74, p < .001 in EL1; r = .84, p < .001 in EL2), supporting their combination into a composite word-level literacy skills variable

for the main analysis. While several bivariate correlation coefficients for the kindergarten data were quite large, none exceeded .90, indicating that multicollinearity as not an issue and the various language and literacy measures were not redundant (Tabachnick & Fidell, 2013).

Table 3

Correlations Among Composite Variables in Kindergarten

Measure	1	2	3
1. Oral Language Composite[a]	—	.38**	.33*
2. Word-Level Composite[b]	.43**	—	.85**
3. Writing Outcome	.34**	.79**	—

Note. Pearson correlation coefficients for EL1 students (n = 56) are presented above the diagonal and Pearson correlation coefficients for EL2 students (n = 68) are presented below the diagonal.
[a] Composite includes standardized vocabulary and syntax scores. [b] Composite includes standardized word reading and spelling scores.
* $p < .05$, two-tailed. ** $p < .01$, two-tailed.

Correlations among composite variables. Correlational analyses were also conducted to examine the associations among the composite variables and the writing outcome variable in kindergarten and are shown in Table 3. The primary goal of these analyses was to ensure that no singularity or multicollinearity existed among the composite variables and the outcome variables to be used in the main analyses. While the correlation between the word-level composite variable and writing outcome variable was quite large and significant in both EL1 ($r = .85$, $p < .001$) and EL2 ($r = .79$, $p < .001$) in kindergarten, neither exceeded .90, indicating no issues of multicollinearity or singularity which would impact analysis (Tabachnick & Fidell, 2013). This was confirmed by examination of tolerance indices in later analyses; none of the variables entered demonstrated tolerance indices less than .20. Patterns of correlations were comparable between EL1 and EL2 groups in kindergarten, with significant associations found among all variables.

Kindergarten main analyses. Analyses addressing the research questions for the kindergarten sample are presented below. Research question one was addressed by mediation

analyses conducted separately in the kindergarten EL1 and EL2 groups. Research question two was addressed by a comparison of the results of these mediation analyses.

Kindergarten mediation analyses. Results of the OLS regression-based mediation path analyses conducted on the kindergarten EL1 and EL2 groups are shown in Figures 4 and 5 respectively. Statistical information regarding individual paths in the model, and the direct, indirect, and total effect of oral language on writing are shown in Table 4. Unless otherwise specified, the 95% bootstrap CI for each path indicated the same significant or not significant difference from zero as the inferential hypothesis test.

Kindergarten EL1. The specified model for kindergarten EL1 students was a significant predictor of writing, with oral language and word-level literacy skills together predicting approximately 73.0% of variance in the outcome variable (F [2, 53] = 71.56, $p < .001$). Oral language skills were a significant predictor of word-level skills ($b = .408$, $t = 3.03$, $p = .004$), explaining approximately 14.5% of variance in the mediator (F [1,54] = 9.17, $p = .004$). Word-level skills were a significant predictor of writing skills ($b = .457$, $t = 11.06$, $p < .001$). Oral language skills, however, did not have a significant direct effect on writing skills in the kindergarten EL1 group. This is in contrast to the significant total effect of oral language on writing skills in isolation ($b = .187$, $t = 2.53$, $p = .01$), which accounted for approximately 10.6% of variance in writing alone (F [1,54] = 6.41, $p = .01$). Both the Sobel test of the mediation hypothesis ($b = .187$, $z = .290$, $p = .004$) and the exclusion of zero from the 95% bootstrap CI for the indirect effect (.093 - .270) indicated that the impact of oral language on writing was significantly mediated by word-level skills. Taken together, these results indicated that the bulk of the effect of oral language skills on writing occurred indirectly through word-level skills rather than through direct effect; the proximity of the direct effect to zero suggested complete

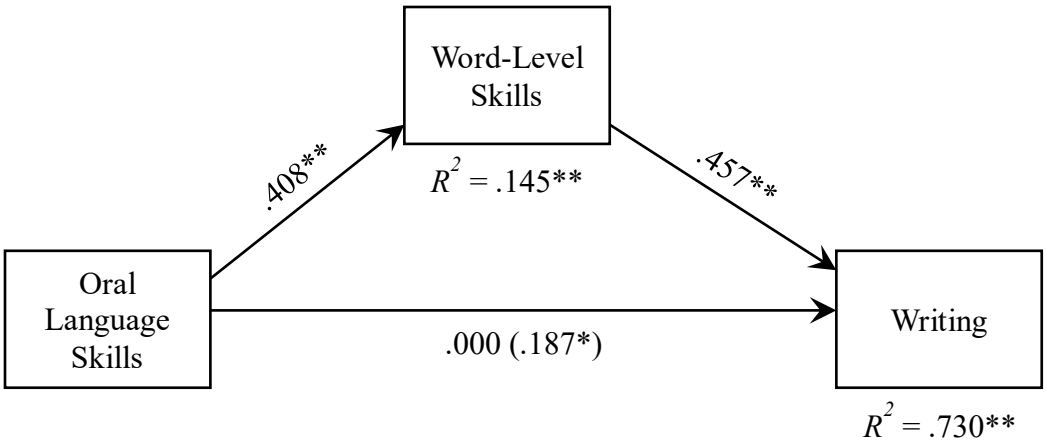

Figure 4. Regression coefficients for the association between oral language and writing skills as mediated by word-level literacy skills in the Kindergarten EL1 group. The regression coefficient for the total effect of oral language on writing skills in isolation (path *c*) is shown in parentheses. Total predicted variances for word-level and writing skills are also shown.
* $p < .05$. ** $p < .01$.

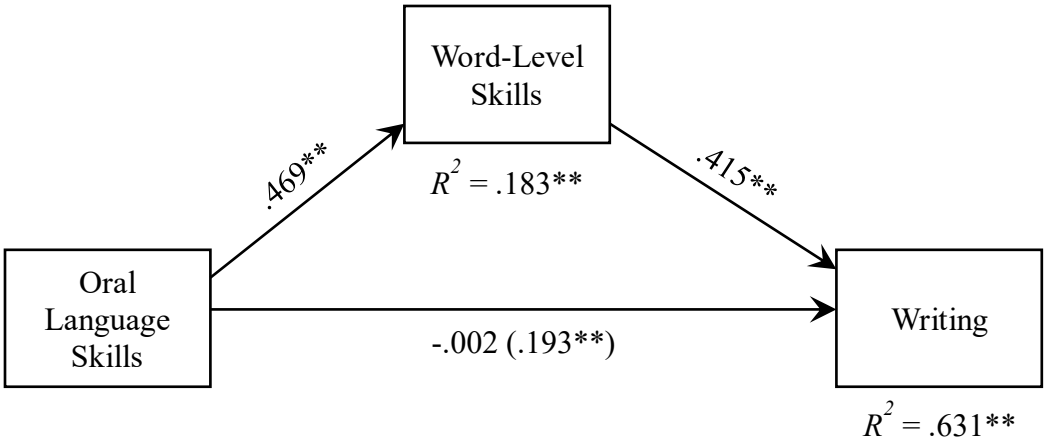

Figure 5. Regression coefficients for the association between oral language and writing skills as mediated by word-level literacy skills in the Kindergarten EL2 group. The regression coefficient for the total effect of oral language on writing skills in isolation (path *c*) is shown in parentheses. Total predicted variances for word-level and writing skills are also shown.
* $p < .05$. ** $p < .01$.

mediation of the effect of oral language on writing skills through word-level literacy skills in the kindergarten EL1 group.

Kindergarten EL2. The specified model for kindergarten EL2 students was a significant predictor of writing, with oral language and word-level literacy skills together predicting approximately 63.1% of variance in the outcome variable (F [2,65] = 55.50, $p < .001$). Oral

language skills were a significant predictor of word-level skills (b = .469, t = 3.85, p < .001), explaining approximately 18.3% of variance in the mediator (F [1,66] = 14.81, p < .001). Word-level skills were a significant predictor of writing skills (b = .415, t = 9.54, p < .001). Oral language skills, however, did not have a significant direct effect on writing skills in the kindergarten EL2 group. This is in contrast to the significant total effect of oral language on writing skills in isolation (b = .193, t = 2.92, p = .005), which accounted for approximately 11.4% of variance in writing alone (F [1,66] = 8.50, p = .005). Both the Sobel test of the mediation hypothesis (b = .195, z = 3.55, p < .001) and the exclusion of zero from the 95% bootstrap CI for the indirect effect (.099 - .315) indicated that the effect of oral language on writing was significantly mediated by word-level skills. Taken together, these results indicated that the bulk of the effect of oral language skills on writing occurred indirectly through word-level skills rather than through direct effect; the proximity of the direct effect to zero suggested complete mediation of the effect of oral language on writing skills through word-level literacy skills in the kindergarten EL2 group.

Kindergarten effect size. Effect size calculations indicated that oral language skills explained a medium proportion of variance in word-level skills in both the EL1 (f^2 = 0.17) and EL2 (f^2 = 0.22) groups in kindergarten. Oral language skills alone predicted a small proportion of variance in kindergarten writing in both the EL1 (f^2 = 0.12) and EL2 (f^2 = 0.13) groups, whereas oral language skills and word-level skills together predicted a large proportion of variance in writing in both the EL1 (f^2 = 2.70) and EL2 (f^2 = 1.71) groups. Additional information concerning effect sizes can be found in Appendix B.

Kindergarten between group comparison. Results of the between group path comparisons in kindergarten are shown in Table 4. In the kindergarten sample, the CIs for all

paths overlapped completely across EL1 and EL2 groups. Accordingly, no follow up tests of overlap significance were needed. Welch's two-sample *t*-test also indicated that no paths differed significantly between the two groups. Taken together, these results indicate that the relations between oral language, word-level, and writing skills are not significantly different between EL1 and EL2 students in kindergarten. In both groups, the indirect effect of oral language skills on writing through word-level skills was significant, while the direct effect of oral language skills on writing was not. Oral language skills did, however, significantly predict word-level skills, which in turn significantly predicted writing in both kindergarten groups.

Table 4

Between Group Comparison of Path Coefficients in Kindergarten

	Kindergarten EL1			Kindergarten EL2			Welch's t-test	
Path	*b*	*SE*	95% CI	*b*	*SE*	95% CI	*z*	*p*
Path *a*	.408**	.100	[.199, .596]	.469**	.143	[.221, .776]	-0.35	0.36
Path *b*	.457**	.034	[.393, .529]	.415**	.061	[.330, .569]	0.61	0.27
Direct effect *c'*	.000	.037	[-.069, .081]	-.002	.047	[-.105, .083]	0.03	0.49
Total effect *c*	.187*	.074[a]	[.039, .334][a]	.193**	.066[a]	[.061, .326][a]	-0.07	0.47
Indirect effect *ab*	.186++	.045	[.093, .270]	.195++	.055	[.099, .315]	-0.12	0.45

Note. Standard error and 95% confidence interval (CI) for path coefficients are bootstrapped unless otherwise specified (5000 bootstrap samples). Path *a* = effect of oral language on word-level skills; path *b* = effect of word-level on writing skills; direct effect *c'* = direct effect of oral language on writing skills controlling for word-level skills; total effect *c* = total effect of oral language on writing skills (via both direct and indirect paths); indirect effect *ab* = effect of oral language on writing skills through word-level skills.

[a] value not derived from bootstrapping.

* $p < .05$. ** $p < .01$.

+ $p < .05$ for Sobel test of indirect effect. ++ $p < .01$ for Sobel test of indirect effect.

Grade Three

Complete data were available for all participants in the EL1 and EL2 groups of the grade three sample. Given that the composite variables were used in the main analysis, their distributions were screened for normality rather than the individual variable distributions, with

the exception of the writing outcome variable. Descriptive statistics used to supplement graphical analysis of these composite and outcome variables in the grade three sample are available in Table A2 (See Appendix A). Visual screens of histograms and Q-Q plots of the composite and outcome variable data revealed only one possible EL1 outlier on the word-level composite. Apart from this one unusually low score, however, visual screens showed no other apparent outliers. As previous research on these data has screened all samples for outliers and concluded no error of entry, all participants were included in analysis (Harrison et al., 2016).

The oral language and word-level composite variables appeared approximately normally distributed in both groups in grade three, fitting a normal curve far more closely than the kindergarten data. The writing outcome variable appeared negatively skewed in the EL1 group, but only marginally negatively skewed in the EL2 group. This was confirmed by a significant Shapiro-Wilk statistic in the EL1 group but not the EL2 group. It was anticipated that bootstrapping would accommodate the non-normal writing distribution in EL1, so no variable transformations were made. Visual examination of scatter plots indicated approximately linear relations among all composite and outcome variables in both EL1 and EL2 groups.

Table 5

Between Group Comparison of Mean Raw Scores in Grade Three

	EL1 (51)		EL2 (61)			
Measure	*M*	*SD*	*M*	*SD*	*t*	*p*
PPVT-4	148.71	16.31	124.89	18.92	7.06	<.001
CASL Syntax	32.84	5.29	29.31	4.61	3.78	<.001
TOWRE Reading	65.33	10.26	63.57	8.88	0.97	.34
WRAT-3 Spelling	28.92	4.31	27.92	3.01	1.40[a]	.17
Paragraph Writing	11.41	3.68	11.46	3.03	-0.08	.94

Note. PPVT-4 = Peabody Picture Vocabulary Test-4th Edition; CASL Syntax = Comprehensive Assessment of Spoken Language, Syntax Construction Subtest; TOWRE Reading = Test of Word Reading Efficiency, Sight Word Efficiency Subtest; WRAT-3 Spelling = Wide Range Achievement Test-3rd Edition, Spelling Subtest.

[a] Equal variances not assumed (Levene's test for equality of variances yielded $p < .05$).

Grade three preliminary analyses. Table 5 summarizes the raw score descriptive statistics across language groups for all oral language, word-level literacy, and writing measures administered in grade three. Independent sample *t*-tests were conducted for each measure to identify any between group differences in performance. Grade three EL2 students performed significantly lower than their EL1 peers on the vocabulary ($t = 7.06$, $p < .001$) and syntactic awareness ($t = 3.78$, $p < .001$) measures, but no significant between group differences were found on the word reading, spelling, or writing tasks in grade three.

Table 6

Correlations Among Standardized Measures in Grade Three

Measure	1	2	3	4	5
1. PPVT-4	––	.50**	.37**	.54**	.39**
2. CASL Syntax	.34**	––	.37**	.42**	.42**
3. TOWRE Reading	.21	.18	––	.58**	.44**
4. WRAT-3 Spelling	.16	.25	.71**	––	.60**
5. Paragraph Writing	.26*	.23	.61**	.61**	––

Note. Pearson correlation coefficients for EL1 students (n = 51) are presented above the diagonal and Pearson correlation coefficients for EL2 students (n = 61) are presented below the diagonal.
PPVT-4 = Peabody Picture Vocabulary Test-4th Edition; CASL Syntax = Comprehensive Assessment of Spoken Language, Syntax Construction Subtest; TOWRE Reading = Test of Word Reading Efficiency, Sight Word Efficiency Subtest; WRAT-3 Spelling = Wide Range Achievement Test-3rd Edition, Spelling Subtest.
* $p < .05$, two-tailed. ** $p < .01$, two-tailed.

Correlations among individual variables. Correlational analyses examining the associations among standardized variables in the grade three EL1 and EL2 groups are shown in Table 6. For the EL1 group (shown above the diagonal), all correlations were significant among all variables. For the EL2 group (shown below the diagonal), only half of the correlations among variables were significant. The difference in correlational associations between language groups, then, was that oral vocabulary was correlated with word reading and spelling in EL1 but not EL2 students, and syntactic awareness was correlated with word reading, spelling, and paragraph writing in EL1 but not EL2 students. The remaining correlations were significant in both groups,

such that oral vocabulary was significantly correlated with syntactic awareness, and word reading was significantly correlated with spelling in both EL1 and EL2 students. Paragraph writing was significantly correlated with oral vocabulary, reading, and spelling in both groups but only significantly correlated with syntactic awareness in EL1 students.

Table 7

Correlations Among Composite Variables in Grade Three

Measure	1	2	3
1. Oral Language Composite[a]	––	.55**	.46**
2. Word-Level Composite[b]	.26*	––	.59**
3. Writing Outcome	.30*	.66**	––

Note. Pearson correlation coefficients for EL1 students (n = 51) are presented above the diagonal and Pearson correlation coefficients for EL2 students (n = 61) are presented below the diagonal.
[a] Composite includes standardized vocabulary and syntax scores. [b] Composite includes standardized word reading and spelling scores.
* $p < .05$, two-tailed. ** $p < .01$, two-tailed.

Correlations between vocabulary and syntactic awareness were significant in both language groups in grade three ($r = .50$, $p < .001$ in EL1; $r = .34$, $p = .007$ in EL2), supporting their combination into the oral language composite variable for the main analysis. This correlation was only of medium effect size in the EL2 group, however, while it was of large effect size in the EL1 group (Cohen, 1992). The correlations between word reading and spelling were significant and of large effect size in both groups in grade three ($r = .58$, $p < .001$ in EL1; $r = .71$, $p < .001$ in EL2). This pattern of shared variance in both language groups supported their combination into a composite word-level skills variable for the main analysis. It is of note that the shared variance between oral language skills was noticeably lower in the EL2 group, and the shared variance between word-level skills was noticeably higher in the EL2 group compared to the EL1 group in grade three. As in the kindergarten sample, however, no bivariate correlation coefficients for the grade three data exceeded .90, indicating that multicollinearity was not an issue and the various literacy measures were not redundant (Tabachnick & Fidell, 2013).

Correlations among composite variables. Correlational analyses were also conducted to examine the associations among the composite variables and the writing outcome variable in grade three and are shown in Table 7. The primary goal of these analyses was to ensure that no singularity or multicollinearity existed among the composite variables and the outcome variable to be used in the main analyses. Patterns of correlation were comparable between EL1 and EL2 groups in grade three, with significant associations found among all variables. The size of correlations among variables indicated that multicollinearity and singularity was not an issue, as no coefficients exceeded .90 (Tabachnick & Fidell, 2013). This was confirmed by examination of tolerance indices in later analyses; none of the variables entered demonstrated tolerance indices less than .20.

Grade three main analyses. Analyses addressing the research questions for the grade three sample are presented below. Research question three was addressed by mediation analyses conducted separately in the grade three EL1 and EL2 groups. Research question four was addressed by a comparison of the results of these mediation analyses.

Grade three mediation analyses. Results of the OLS regression-based mediation path analyses conducted on the grade three EL1 and EL2 samples are shown in Figures 6 and 7 respectively. Statistical information regarding individual paths in the model, and the direct, indirect, and total effect of oral language on writing are shown in Table 8. Unless otherwise specified, the 95% bootstrap CI for each path indicated the same significant or not significant difference from zero as the inferential hypothesis test.

Grade three EL1. The specified model for grade three EL1 students was a significant predictor of writing, with oral language and word-level literacy skills together predicting approximately 37.5% of variance in the outcome variable (F [2,48] = 14.38, $p < .001$). Oral

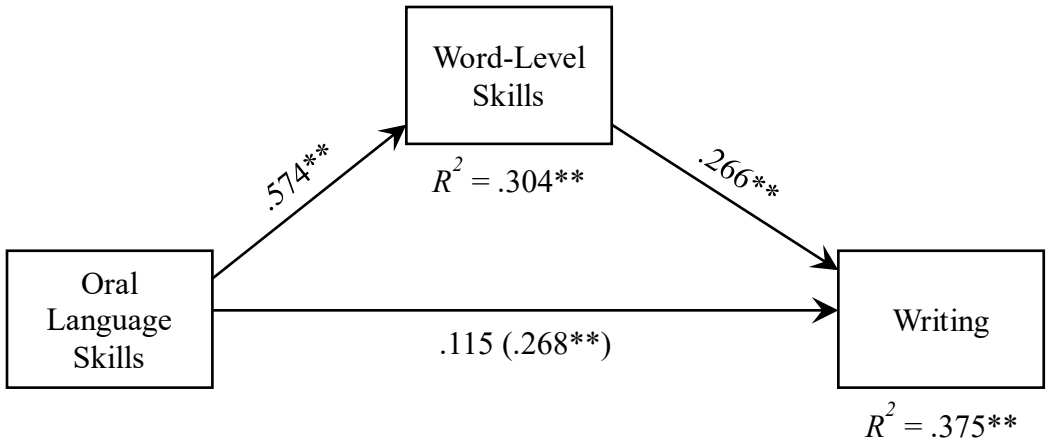

Figure 6. Regression coefficients for the association between oral language and writing skills as mediated by word-level literacy skills in the grade three EL1 group. The regression coefficient for the total effect of oral language on writing skills in isolation (path *c*) is shown in parentheses. Total predicted variances for word-level and writing skills are also shown.
* $p < .05$. ** $p < .01$.

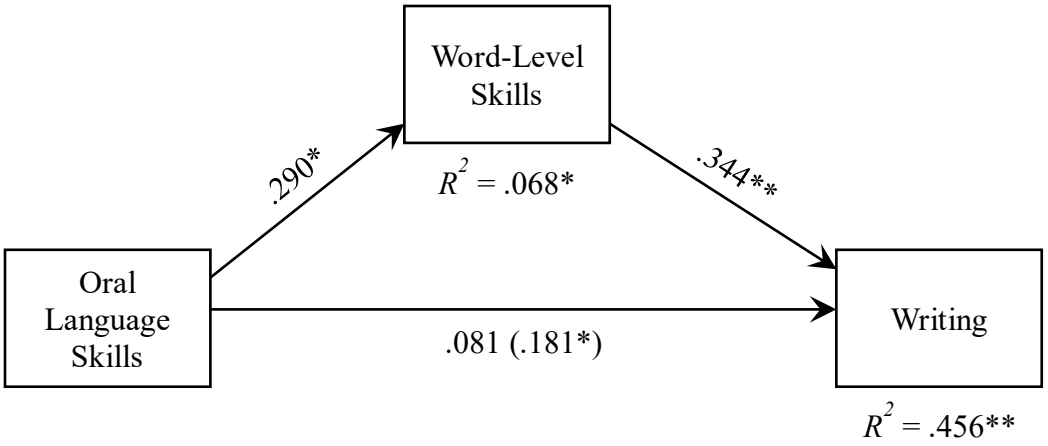

Figure 7. Regression coefficients for the association between oral language and writing skills as mediated by word-level literacy skills in the grade three EL2 group. The regression coefficient for the total effect of oral language on writing skills in isolation (path *c*) is shown in parentheses. Total predicted variances for word-level and writing skills are also shown.
* $p < .05$. ** $p < .01$.

language skills were a significant predictor of word-level skills ($b = .574$, $t = 4.63$, $p < .001$), explaining approximately 30.4% of variance in the mediator (F [1,49] = 21.42, $p < .001$). Word-level skills were a significant predictor of writing skills ($b = .266$, $t = 3.50$, $p = .001$). Oral language skills, however, did not have a significant direct effect on writing skills in the grade three EL1 group. This is in contrast to the significant total effect of oral language on writing

skills in isolation (b = .268, t = 3.66, p < .001), which accounted for approximately 21.5% of variance in writing (F [1,49] = 13.41, p < .001) alone. Both the Sobel test of the mediation hypothesis (b = .153, z = 2.75, p = .006) and the exclusion of zero from the 95% bootstrap CI for the indirect effect (.017 - .266) indicated that the impact of oral language on writing was significantly mediated by word-level skills. Taken together, these results indicated that the bulk of the effect of oral language skills on writing occurred indirectly through word-level skills rather than through direct effect. The reduced impact of oral language skills on writing, both in significance and size, when word-level skills were included indicates partial mediation of the effect of oral language on writing skills through word-level literacy skills in the grade three EL1 group.

Grade three EL2. The specified model for grade three EL2 students was a significant predictor of writing, with oral language and word-level literacy skills together predicting approximately 45.6% of variance in the outcome variable (F [2,58] = 24.3, p < .001). Oral language skills explained approximately 6.8% of variance in the mediator (F [1,59] = 4.29, p = .043). While the hypothesis test indicated that oral language skills were a significant predictor of word-level skills in the grade three EL2 group (b = .290, t = 2.07, p = .043), the inclusion of zero in the 95% bootstrap CI suggested the effect was not significantly different from zero. Word-level skills were a significant predictor of writing skills (b = .344, t = 6.26, p < .001). Oral language skills, however, did not have a significant direct effect on writing skills in the grade three EL2 group. This is in contrast to the significant total effect of oral language on writing skills in isolation (b = .181, t = 2.38, p = .02), which accounted for approximately 8.8% of variance in writing alone (F [1,59] = 5.68, p = .02). Both the Sobel test of the mediation hypothesis (b = .100, z = 1.94, p = .052) and the 95% bootstrap CI for the indirect effect (-.006 -

.207) indicated that the impact of oral language on writing was not significantly mediated by word-level skills in the grade three EL2 sample, though only marginally so. This is the only sample in which no significant mediation was found—neither the direct nor indirect effect of oral language on writing skills were significant in the grade three EL2 group. It is possible that the significant total effect of oral language on writing skills observed in isolation arises from the combined effect of the two smaller, non-significant, direct and indirect effects (Field, 2018; Hayes, 2013). Within a model including both word-level and oral language skills, however, oral language had no significant impact on writing through either pathway in the grade three EL2 group.

Grade three effect size. Effect size calculations indicated that oral language skills explained a large proportion of variance in word-level skills in the EL1 ($f^2 = 0.44$) group but only a small proportion of variance in word-level skills in the EL2 ($f^2 = 0.07$) group in grade three. Oral language skills alone predicted a medium proportion of variance in grade three writing in the EL1 ($f^2 = 0.27$) group and a small proportion of grade three writing in the EL2 ($f^2 = 0.10$) group, whereas oral language skills and word-level skills together predicted a large proportion of variance in writing in both the EL1 ($f^2 = 0.60$) and EL2 ($f^2 = 0.84$) groups. Additional information concerning effect sizes can be found in Appendix B.

Grade three between group comparison. Results of the between group path comparisons in the grade three sample are shown in Table 8. In the grade three sample, the CIs of the EL1 and EL2 coefficients for the path from oral language to word-level skills (path *a*) overlapped incompletely; the point estimate of the EL2 coefficient for path *a* ($b = .290$, $p = .04$) was below the 95% CI of EL1 (.382 to .793). Accordingly, follow up calculations were performed to determine whether the overlap between CIs indicated a significant difference. To test the

hypothesis that the standardized beta weights of path *a* were statistically significantly different in the EL1 (*b* = .574) and EL2 (*b* = .290) groups, half of the average of the overlapping CI arms was calculated (.134) and added to the lower bound of the EL1 CI (.382) to yield a cut off value of .516. As the upper bound of the EL2 CI (.633) exceeded this cut off value, the differences between the two groups beta weights (Δ = .284) was not considered statistically significant ($p > .05$). This result was mirrored by Welch's *t*-test, which was also not significant ($p = .07$) for the path *a* comparison between grade three language groups.

Table 8

Between Group Comparison of Path Coefficients in Grade Three

	Grade 3 EL1			Grade 3 EL2			Welch's t-test	
Path	*b*	*SE*	[95% CI]	*b*	*SE*	95% CI	*z*	*p*
Path *a*	.574**	.102	[.382, .793]	.290*	.163	[-.015, .633]	1.48	0.07
Path *b*	.266**	.098	[.029, .418]	.344**	.050	[.255, .453]	-0.70	0.24
Direct effect *c'*	.115	.077	[-.014, .290]	.081	.071	[-.052, .231]	0.33	0.37
Total effect *c*	.268**	.073[a]	[.121, .415][a]	.181*	.076[a]	[.029, .332][a]	0.83	0.20
Indirect effect *ab*	.153++	.062	[.017, .266]	.100	.054	[-.006, .207]	0.65	0.26

Note. Standard error and 95% confidence interval (CI) for path coefficients are bootstrapped unless otherwise specified (5000 bootstrap samples). Path *a* = effect of oral language on word-level skills; path *b* = effect of word-level on writing skills; direct effect *c'* = direct effect of oral language on writing skills controlling for word-level skills; total effect *c* = total effect of oral language on writing skills (via both direct and indirect paths); indirect effect *ab* = effect of oral language on writing skills through word-level skills.

[a] value not derived from bootstrapping.

* $p < .05$. ** $p < .01$.

+ $p < .05$ for Sobel test of indirect effect. ++ $p < .01$ for Sobel test of indirect effect.

All other paths compared between groups in the grade three sample had completely overlapping CIs and were not significantly different according to Welch's *t*-test. Accordingly, no statistically significant differences were inferred. Taken together, these results indicate that the relations between oral language, word-level, and writing skills are not significantly different between EL1 and EL2 students in grade three, despite some apparent inconsistencies. Oral

language significantly predicted word-level skills in both groups according to the hypothesis test, though the weight of the EL2 path was noticeably lower than that of EL1 and the 95% bootstrap CI indicated the EL2 path was not significant. Word-level skills significantly predicted writing in both grade three groups, but the direct effect of oral language on writing was not significant in either group. It is of note that the between group difference in the indirect path weight (path *ab*) was not found to be significant, despite the indirect path being significant in EL1 but not significant in EL2 participants in grade three. It is possible this lack of difference arises from the noticeably small margin by which the indirect effect of oral language was deemed not significant in grade three EL2 – the Sobel test only barely exceeded .05 (unrounded, $p = .0519$) and zero was only barely included in the 95% bootstrap CI (-.006 - .207). This finding will be discussed in more detail later.

Cross-Grade Comparisons

Several issues arose in comparison of the kindergarten and grade three data that precluded formal statistical analysis. The first was that reading and writing measures differed from kindergarten to grade three and, therefore, any differences found between grades may have been due to choice of measure rather than genuine difference in performance. The second was that 50 participants were included in both kindergarten and grade three data collection (distributed across both the EL1 and EL2 groups) and, therefore, a subset of the data was longitudinal while the rest of the data was cross-sectional. This prevented use of an independent samples test, such as Welch's two sample *t*-test, to compare path weights between the kindergarten and grade three samples as intended. As these comparisons were already complicated by the differing measures between grades, an alternative statistical approach was not used. Instead, the overlap between CIs was examined to determine whether there were any

apparent differences between associations from kindergarten to grade three which merit further investigation in future research.

EL1 associations across grades. The kindergarten and grade three CIs for the path from oral language to word-level skills (path *a*) overlapped completely, suggesting no difference between grades in EL1 students. The CIs for the indirect effect of oral language on writing through word-level skills (path *ab*), and the total effect of oral language on writing in isolation of word-level skills (path *c*), also overlapped completely and suggested no difference between grades. Overlap of CIs was incomplete for the path from word-level skills to writing (path *b*), and the direct path from oral language to writing (path *c'*); as such, no conclusions can be drawn about the difference in these associations between kindergarten and grade three EL1 students.

EL2 associations across grades. The CIs for all paths overlapped completely between the EL2 groups in kindergarten and grade three. This would suggest no difference in associations between grades for EL2 students, however, further research is needed to confirm this.

Post-Analysis Evaluation of Assumptions

In order to draw valid conclusions about the above-discussed path analysis results, it was necessary to confirm that data met all the assumptions of an OLS regression-based path analysis (Keith, 2015). While the assumptions of multicollinearity and singularity were addressed in preliminary analyses, assumptions regarding the distribution of residuals required additional post-analysis evaluation to ensure that no major violations impacted the estimation of standard error and, subsequently, the validity of results (Byrne, 2010). The three assumptions of concern—normality, linearity, and homoscedasticity of residuals—were addressed by graphical analysis, as recommended by the APA Task Force on Statistical Inference (Wilkinson, 1999). To analyze residual values, the three regression equations composing the path model were

separated—equation one regressed writing onto oral language and word-level skills (paths *b* and *c'*). Equation two regressed word-level onto oral language skills (path *a*). Equation three regressed writing onto oral language skills in isolation (path *c*). Normality was addressed by visual screens of the histogram and Q-Q plots of standardized residuals from each regression equation. Linearity and homoscedasticity were addressed by plotting the unstandardized residuals against the independent variable(s) used in each regression equation. Earlier assumptions made about outliers were also confirmed by checking the minimum and maximum value of the standard residuals for all samples. All screens of residuals were interpreted under the looser assumptions of bootstrapping.

Kindergarten EL1 residuals. Histograms and Q-Q plots of the standardized residuals appeared approximately normally distributed for all equations in the kindergarten EL1 sample. Scatterplots of unstandardized residuals for equation one appeared to meet assumptions of homoscedasticity and linearity when plotted against the oral language independent variable. When unstandardized residuals from equation one were plotted against the word-level independent variable, the residuals appeared somewhat clumped around the mean of word-level skills, though not so distinctly as to raise any concerns under the looser assumptions of bootstrapping. This distribution of residuals is possibly attributed to the non-normal distribution of the word-level composite variable in the kindergarten data; results of path *b* in the kindergarten EL1 sample should accordingly be interpreted with some caution. The scatterplots of unstandardized residuals plotted against the oral language independent variable for each of equations two and three appeared to meet assumptions of homoscedasticity and linearity. Standard residuals did not exceed ±3.0 in equations one (std. residual min = -2.26, std. residual max = 2.95) or three (std. residual min = -1.92, std. residual max = 2.81), indicating no outliers

in the solution. Standard residuals for equation two indicated one possible outlier in solution (std. residual min = -2.91, std. residual max = 3.21; possible outlier value 3.21), which was retained given the looser assumptions of a bootstrapped analysis.

Kindergarten EL2 residuals. Histograms and Q-Q plots of the standardized residuals appeared approximately normally distributed for equations one and three, and approximately normal with a slight negative skew in equation two. This is possibly due to the non-normal distribution of the word-level composite in the kindergarten EL2 sample but is accounted for by the looser normality assumptions of bootstrapping. Scatterplots of unstandardized residuals for equation one appeared to meet assumptions of homoscedasticity and linearity when plotted against the oral language independent variable and the word-level independent variable. The latter scatterplot was clumped around the word-level variable mean with several apparent outliers, again possibly attributed to the non-normal distribution of word-level skills in the kindergarten data; results of path *b* in the kindergarten EL2 sample should accordingly be interpreted with some caution. The scatterplots of unstandardized residuals plotted against the oral language independent variable for each of equations two and three appeared to meet assumptions of homoscedasticity and linearity. Standard residuals did not exceed ±3.0 in equations one (std. residual min = -1.95, std. residual max = 2.11) or three (std. residual min = -2.24, std. residual max = 2.30), indicating no outliers in the solution. Standard residuals for equation two indicated two possible outliers in solution (std. residual min = -3.45, std. residual max = 1.54; possible outlier values -3.45, -3.33) but were retained given the looser assumptions of a bootstrapped analysis.

Grade three EL1 residuals. Histograms and Q-Q plots of the standardized residuals appeared approximately normally distributed with a slight negative skew for all equations in the

grade three EL1 sample, though not so skewed as to raise concern given the looser assumptions of a bootstrapped analysis. Scatterplots of unstandardized residuals for equation one appeared to meet assumptions of homoscedasticity and linearity when plotted against the oral language and word-level independent variables. Scatterplots of unstandardized residuals for equations two and three also appeared to meet the assumptions of homoscedasticity and linearity when plotted against the oral language independent variable. Standard residuals did not exceed ±3.0 in equations one (std. residual min = -2.76, std. residual max = 1.47) or three (std. residual min = -2.77, std. residual max = 1.75), indicating no outliers in the solution. Standard residuals for equation two indicated one possible outlier in the solution (std. residual min = -3.26, std. residual max = 1.63; possible outlier value -3.26) but were retained given the looser assumptions of a bootstrapped analysis

Grade three EL2 residuals. Histograms and Q-Q plots of the standardized residuals appeared approximately normally distributed for equations one and three, and approximately normal with a slight negative skew for equation two in the grade three EL2 sample. Scatterplots of unstandardized residuals for equation one appeared to meet assumptions of homoscedasticity and linearity when plotted against the oral language and word-level independent variables. Scatterplots of unstandardized residuals for equations two and three also appeared to meet the assumptions of homoscedasticity and linearity when plotted against the oral language independent variable. Standard residuals did not exceed ±3.0 in equations one (std. residual min = -2.32, std. residual max = 2.00), two (std. residual min = -2.90, std. residual max = 1.98) or three (std. residual min = -1.80, std. residual max = 2.36), indicating no outliers in the solution.

Section Summary

Results of the present study are summarized below in light of the research questions they were intended to answer:

1) *How do oral language (oral vocabulary, syntactic knowledge) and word-level literacy skills (early word reading, spelling) contribute to early writing in EL1 and EL2 students in kindergarten?*

When considered together, oral language skills indirectly contributed to writing through word-level skills but did not themselves make a significant direct contribution to kindergarten writing. By contrast, word-level skills significantly predicted writing outcomes in kindergarten. This indicates that word-level reading and spelling have more influence on kindergarten writing than oral vocabulary and syntactic awareness.

2) *Do the contributions of oral language and word-level literacy skills to early writing differ between language groups in kindergarten?*

No, no significant differences between EL1 and EL2 groups were found in any of the relations among oral language, word-level literacy, and writing skills in kindergarten. This suggests that word reading and spelling are relatively more important to kindergarten writing than oral language skills regardless of language background.

3) *How do oral language (oral vocabulary, syntactic knowledge) and word-level literacy skills (word reading, spelling) contribute to writing in EL1 and EL2 students in grade three?*

When considered together, oral language skills did not make a significant direct contribution to grade three writing, whereas word-level skills did. Oral language skills did, however, have a significant indirect effect on writing through word-level skills in grade three EL1 students. The

same was not true of the grade three EL2 students; word-level skills may mediate the effect of oral language skills on writing to some degree, but this indirect effect was not significant in the grade three EL2 group.

4) *Do the contributions of oral language and word-level literacy skills to early writing differ between language groups in grade three?*

No, no significant differences between EL1 and EL2 groups were found in any of the relations among oral language, word-level literacy, and writing skills in grade three, despite some apparent inconsistencies. This suggests that word reading and spelling are relatively more important to grade three writing than oral language skills regardless of language background.

5) *Are there differences in the contributions of oral language and word-level literacy skills to writing between students in kindergarten and students in grade three?*

Unfortunately, based on the present study alone, this remains unclear. Results hint that the contribution of oral language and word-level literacy skills to writing may change in EL1 students between kindergarten and grade three, but future research needs to investigate this question in a purely longitudinal or cross-sectional sample before any conclusions can be drawn regarding EL2 students.

Discussion

The primary goal of the present study was to investigate the relative contributions of oral language and word-level literacy skills to writing achievement across EL1 and EL2 students in kindergarten and grade three. While the analyses undertaken to answer these research questions were complex, the central findings of the present study were surprisingly simple: when word-level literacy skills and oral language skills were considered together in kindergarten and grade three students, word-level literacy skills consistently made a significant direct contribution to writing, whereas oral language skills consistently did not. This was true across EL1 and EL2 groups in both the kindergarten and grade three samples; no significant differences in the associations among oral language, word-level literacy, and writing skills were found between language groups at either grade. This invariance in associations between language groups was another central finding of the present study. It suggests that the contributions of oral language and word-level literacy skills to kindergarten and grade three writing do not differ based on students' language background.

An additional and somewhat unexpected finding of the present study was that the effect of oral language skills on writing was significantly mediated by word-level literacy skills in all but the grade three EL2 group. More specifically, oral language skills were found to have a significant indirect effect on writing through word-level skills in EL1 and EL2 kindergarten students, and EL1 grade three students. This indicates that, while oral language skills did not impact writing directly in these groups, they did impact word-level skills which, in turn, impacted writing outcomes. Interestingly, while this indirect effect of oral language skills on writing was not significant in grade three EL2 students, it was not statistically different from the significant indirect effect of oral language on writing in grade three EL1 students. This suggests

that word-level skills mediate the effect of oral language on writing similarly in EL1 and EL2 students in both grades, despite apparent differences in statistical significance; it is possible this discrepancy arises from the small margin by which the indirect effect in grade three EL2 students failed to achieve significance. Future research should replicate this study with a larger sample size to determine whether or not the indirect effect of oral language skills on writing through word-level skills is truly not significant in grade three EL2 learners, as such a finding would represent an important difference between EL1 and EL2 groups.

The effects of oral language skills on word-level skills were another unexpected and advantageous finding arising from use of a mediation model in the present study. The pattern of results regarding the effect of oral language skills on word-level skills mimicked that of the indirect effect of oral language on writing through word-level skills—oral language skills had a clear and direct impact on word-level skills in kindergarten EL1 and EL2 students, and grade three EL1 students. This suggests that these students' knowledge of oral vocabulary and syntax had a significant impact on their word reading and spelling skills. However, it was unclear whether this impact was significant in grade three EL2 students; traditional statistical tests indicated significance (though only barely), while a more precise method of estimation suggested the effect of oral language on word-level skills was not significant in grade three EL2 students. Despite this uncertainty, no significant differences in this association were found between EL1 and EL2 grade three students. This would suggest that oral language has a similar impact on word-level skills in grade three students regardless of language background, though the size of this effect is large in EL1 students and small in EL2 students. Future research should investigate this association with a larger sample size to clarify the between group differences in results.

It is interesting that both of these secondary associations—between oral language and word-level skills directly, and between oral language skills and writing through word-level skills—exhibited borderline significance in the grade three EL2 group. Their marginal significance and non-significance, respectively, suggest that the oral language skills of vocabulary and syntax may be less associated, or perhaps differently associated, with literacy skills in grade three EL2 students than in their EL1 peers. Possible explanations for this phenomenon will be discussed in more detail later. The following section turns, first, to a comparison of the key findings of the present study with the existing literature.

Convergence with the Literature

The finding that oral vocabulary and syntax skills were significantly lower in EL2 students than their EL1 peers, while word reading and spelling were not, is consistent with established trends in the existing literature (e.g. Lesaux et al., 2006), although it is not a novel result for this data set (Harrison et al., 2013, 2016). Limited research is available which compares the writing skills of L1 and L2 students in kindergarten as we did in this study, thus convergence of this result with the literature cannot be established. The comparable writing skills of EL1 and EL2 learners in the grade three sample, however, agree with the bulk of the existing literature which uses overall scores of writing content (e.g. Ball, 2003; Silverman et al., 2015) or measures of writing content and complexity (Woolpert, 2016) in grade one through five students. The only observed divergence of these results from the literature is with those reported by Babayiğit (2014), who found that grade four-aged L2 students in England underperformed their L1 peers on the same paragraph writing task used in the present study. This difference may arise from group administration of the writing task in Babayiğit's study, or perhaps from some other feature of the differing samples which merits further investigation.

Previous publications on the present data set have discussed the results of correlational analyses in some detail (Harrison et al., 2013, 2016). For the purposes of the present study, the main correlations of interest were those between oral language skills—oral vocabulary and syntax—and word-level skills—word reading and spelling. To our knowledge, there are no correlational analyses of kindergarten oral language and literacy skills with which to compare the present findings. The lack of correlation of oral vocabulary and syntax skills with word reading or spelling skills in the grade three EL2 students is consistent with Ball (2003), though disagrees with Arab-Moghaddam and Sénéchal (2001) who found vocabulary significantly correlated with word reading and spelling in grade two and three L2 students.

Contribution of word-level skills to writing. The significant direct effect of word-level literacy skills on writing in both the EL1 and EL2 groups in kindergarten and grade three is consistent with the limited literature which has investigated the association between word reading/word spelling and writing. Specifically, it is consistent with Babayiğit's (2014) finding that a latent word-level skills factor (comprised of word reading, word spelling, and in-text spelling accuracy) had a significant effect of moderate size on writing quality in both L1 and L2 students of approximately grade four age. Our findings are also consistent with hers in that there was no significant difference in this effect between L1 and L2 students. Our finding expands upon hers, however, by replicating this result without including in-text spelling accuracy, which might be considered a confounding variable as it is derived from the writing outcome itself. To our knowledge, the only other existing study of this particular effect in L2 students is correlational and therefore not comparable to the present study, though the significant correlation of word reading with writing fits a similar pattern of results (Davis et al., 1999).

Contribution of oral language skills to writing. The non-significant direct effect of oral language skills on writing in both EL1 and EL2 groups in kindergarten and grade three is somewhat of a departure from previous findings. Whereas our results suggested oral language had no direct effect on writing in either language group at grade three, Babayiğit (2014) found that a latent verbal skills factor (comprised of vocabulary, verbal working memory, and semantic fluency) had a significant direct effect of moderate size on writing in both L1 and L2 students in approximately grade four. There are several possible explanations for this divergence. The first is that the combination of oral language skills considered in our two studies differed. Whereas we only considered oral vocabulary and syntax, she included verbal working memory and semantic fluency—it is entirely possible that these two skills have a strong enough direct effect on writing to render the entire path significant even if vocabulary does not make a significant contribution. The second possible explanation is age—while no grade is listed, the participants in Babayiğit's study are approximately one year older than those in the present study. As the role of linguistic constraints on writing is known to arise in approximately grade four in L1 students (e.g. Abbott & Berninger, 1993), it is possible that the age difference between samples, while slight, may be enough to impact the role of oral language on writing at this stage of development.

It is also possible that the divergence in results is due to the differing nature of analyses. Our analyses indicated a significant total effect of oral language on writing in both groups; it was only due to the test of mediation that we were able to determine this effect was entirely indirect through word-level skills. As Babayiğit's (2014) structural model did not specify a direction of association between oral language and word-level skills, no indirect effects could be observed. It is entirely possible that the significant association between oral language and writing skills observed in her study is consistent with the significant total effect in ours, and that the direct

effect of oral language she found would be reduced to non-significance if mediation had been considered in the model.

Ball (2003) also investigated the effects of an oral language skills composite variable (including receptive and expressive vocabulary, grammatical judgement, listening comprehension, and sentence memory) on writing in grade three L1 and L2 students. She found that, when entered after cognitive ability in a sequential multiple regression analysis, oral language skills contributed significant variance to text-level writing skills in L1 but *not* L2 learners. It merits investigation that our findings both converge and diverge with this result. On the one hand, they converge in that neither of us found a direct effect of oral language on writing in grade three L2 students. On the other, they diverge in that she found a significant direct effect of oral language on writing in grade three L1 students where we did not. It is possible, as in Babayiğit's (2014) study, that this finding in L1 students reflects a total effect of oral language skills on writing which would dissipate if a mediator were added to the model. If this is the case, however, the difference between the effect in L1 and L2 students in Ball's study remains to be explained—could it be that, in Ball's study, oral language had neither a significant direct *nor* indirect effect on writing in L2 students and, therefore, that the total effect was not significant? This would bolster our own findings that oral language had neither a significant direct nor significant indirect effect in EL2 grade three students. Replication of the mediation analysis is needed to help clarify this explanation. It is, of course, also possible that the differences simply arise from the variety of oral language measures included.

These two comparisons illuminate an important implication for future research on L2 writing: when word-level literacy skills are not included as a mediator, oral language may appear to have a significant direct effect on writing when, in fact, the bulk of this effect is occurring

indirectly through other variables. Future research ought to ensure word-level literacy skills are always included alongside oral language skills in order to further clarify their interactions in the context of writing development. This stresses the importance of model specification, not only in designing studies, but in interpreting their results. Multiple regression and mediation analyses assume no errors of specification: correct causal ordering, correct specification of model, and no omitted variables (Fairchild & McQuillin, 2010; Hayes, 2013). Yet, when exploring new phenomena, our ability to detect such errors of specification is limited, and models may appear significant despite misspecification of associations among variables (Hayes, 2013). For this reason, accumulation of research will be important to the ongoing investigation of the role component skills play in writing; the results of each model tested can and should inform model specification in subsequent investigations.

Interactions between oral language and word-level skills. Going into this study, we suspected that oral language and word-level literacy skills might be associated in L2 learners, but the strong directional effect of oral language skills on word-level literacy skills found in most of our samples was rather a surprise. The strength of the finding was particularly notable in kindergarten, with a significant effect of medium size occurring in both language groups. The only study with which this can be compared is Bowyer-Crane et al. (2017), who found strong associations between combined language and literacy skills measures in L2 students at preschool entry. Beyond that, we believe this finding makes a novel contribution to the literature by addressing the association between oral language and word-level literacy skills in kindergarten.

It is interesting that, where the kindergarten findings converged between language groups for this effect, the grade three results diverged. In grade three, the effect of oral language skills on word-level skills was significant and of large effect size in EL1, but arguably non-significant

and of small effect size in EL2. While the unclear significance of the effect in grade three EL2 students merits further investigation, its contradictory nature does align with the conflicting results of the limited existing literature. On the one hand, Babayiğit (2014) found significant interactions between oral language and word-level latent variables in both L1 and L2 groups of approximately grade four age, and Arab-Moghaddam and Sénéchal (2001) found that vocabulary contributed additional variance to word reading and spelling in grades two and three L2 students. On the other hand, Ball (2003) found that none of her oral language measures were correlated with word reading or spelling in L2 grade three students, despite being correlated in L1 students. This pattern of correlations is consistent with our findings, which may explain the smaller effect of oral language on word-level skills we observed in the grade three EL2 group. Clearly, however, the association between oral language and word-level skills in grade three EL2 students deserves further investigation—in terms of directionality and significance, as well as difference from EL1 groups.

The indirect effect of oral language on writing through word-level literacy skills is, in some ways, an extension of the effect of oral language skills on word-level literacy skills alone; it indicates that oral language skills significantly impact word-level literacy skills which, in turn, impact writing. To our knowledge, this is the first study of L2 writing to date to find that word-level literacy skills played a significant mediating role in the effect of oral language skills on writing, though such a finding is consistent with developmental assertions of the simple view of writing (e.g. Abbott & Berninger, 1993, discussed below). This indirect effect was clear and consistent between language groups in kindergarten. Technically, there was no significant difference in the indirect effect between language groups in grade three either. However, the

indirect effect was only significant in the EL1 group in grade three; it failed to achieve statistical significance in the EL2 group in grade three, if only marginally.

Possible Explanations for the Grade Three Findings

We turn now to a consideration of the two statistical discrepancies in our grade three results mentioned above: the effect of oral language on word-level literacy skills, and the indirect effect of oral language on writing through word-level literacy skills, which were found not to differ between EL1 and EL2 groups despite some apparent inconsistencies in the EL2 group's tests of significance.

Statistical considerations. The effect of oral language on word-level literacy skills was found to be significant in the grade three EL2 group according to the traditional inferential test, but not significant according to the bootstrapped 95% CI. The first question this raises is whether the result is truly statistically significant. Technically, the bootstrapped 95% CI gives a more accurate estimate of statistical precision for the current data set. Coupled with the fact that the inferential test was only barely significant (p = .043), it's quite possible that the effect of oral language on word-level literacy skills is truly not significant in the grade three EL2 group, but some feature of our statistical analysis prevented us from capturing this accurately. By comparison, the same effect in the grade three EL1 group was irrefutably significant. In addition, correlations of oral vocabulary and syntax with word reading and spelling were significant in the grade three EL1 group but not the grade three EL2 group. Non-statistical comparison of the effect between the two groups certainly suggests a corresponding difference in the strength of the effect; the EL1 regression coefficient is nearly .30 higher than the EL2 coefficient. Why, then, was no difference found between groups? Perhaps a true difference exists and we simply lacked the power to detect it based on our sample size. Or perhaps the effect in EL2 is only marginally

significant because it truly does not differ from the effect in EL1. The former option would indicate that the association between oral vocabulary and syntactic skills, and word reading and spelling skills, differs based on students' language background. The latter would indicate no difference in associations between language groups and suggest that existing L1-based theories of writing may apply to L2 student populations. Given that either result has important implications for L2 literacy research, the association between oral language and word-level literacy skills in L2 students certainly merits clarification.

Unlike in the above scenario, the significance of the indirect effect of oral language on writing through word-level skills in the grade three EL2 group is not up for debate. Both the traditional inferential test and the bootstrapped 95% CI indicated it was not significant, albeit only barely (p = .052, 95% CI -.006 to .207). By comparison, the corresponding path in the grade three EL1 group was irrefutably significant (p < .01, 95% CI .017 to .266). Yet, again, no statistically significant difference was found between the two groups. The lack of difference is somewhat less surprising here, as the two coefficients are relatively close in size and the EL2 effect only barely achieved designation as not statistically significant. As above, it may be that that there is truly no difference between groups and, therefore, that the indirect effect of oral language on writing is comparable in EL1 and EL2 populations. If we consider a traditional definition of mediation—that any reduction of the total effect of the independent variable on the dependent variable due to inclusion of the mediator counts—perhaps the difference between the groups is not in whether word-level literacy skills mediate the effect of oral language on writing, but the degree to which this mediation occurs. Or, as above, it may be that a true difference exists and we lacked the power to detect it which, again has some interesting and important implications.

Possible interpretations. It is very possible that the unusual nature of these two findings arises from statistical issues in the present study, such as test sensitivity, inadequate sample size, and power. However, it is also possible that these results hint at a genuine anomaly in the data which merits further investigation. If we put statistics aside for a moment, and consider this possibility, we are faced with an interesting scenario: that the effect of oral language on word-level skills and, subsequently, through word-level skills to writing, is different in EL2 students than their EL1 peers. This would suggest that the way in which oral language skills—specifically oral vocabulary and syntax—impact word-level literacy skills and text-level writing skills is different in EL2 students in grade three. Specifically, it would indicate that, in grade three EL2 participants, oral vocabulary and syntax together influence neither word reading and spelling, nor text-level writing. This would represent a shift from kindergarten—a difference between language groups which appears later in development and reflects a more complicated interaction between the oral and print-based language systems which L2 learners are simultaneously acquiring.

Why might oral vocabulary and syntax have no impact on literacy skills at the word or text level in EL2 learners in grade three, when they are known to in EL1 learners? One possible explanation is that EL2 students in grade three are compensating for their lower oral language skills by relying on other skill sets to write effectively instead. Such compensatory skills are likely to be those implicated by theory but not included in the present analysis. The simple view of writing, for example, implicates verbal working memory and executive functions—such as conscious attention, self-regulatory strategies, planning, reviewing, and revising—in addition to transcription and text generation skills (Berninger & Amtmann, 2003). The componential model implicates metacognitive knowledge and processing efficiency—speed of word retrieval and

sentence building—in addition to vocabulary, grammar, and orthographic knowledge (Schoonen et al., 2002). Our two guiding theories, then, would suggest that executive functions spanning attention, verbal working memory, regulation of one's own thinking, and speed of processing could be impacting L2 learners' writing instead of oral language.

The neuropsychological model of writing developed by Hooper and colleagues (2011) offers another helpful framework in which to consider possible compensatory skills. In Hooper et al.'s model, written expression is predicted by three latent factors: a fine-motor factor (composed of fine-motor control tasks), a language-related factor (composed of rapid letter naming and word orthographic coding [spelling] tasks), and an attention/executive functions factor (which includes various dimensions of attention, inhibitory control, planning, verbal fluency, verbal and visual working memory, and long-term retrieval). We have already addressed the language-related factor by looking at spelling skills, and previous studies of the present data have confirmed no significant difference in rapid naming abilities between the EL1 and EL2 groups in grade three (though this does not preclude them having a differing impact on writing outcomes; Harrison et al., 2016). It seems unlikely that the fine motor factor would be a critical difference between EL1 and EL2 students, given that the two populations differ only in their learned language, not in their cognitive or motor abilities, and that handwriting fluency tends to be consistent between EL1 and EL2 groups in grade three (Harrison et al., 2016). This, as in the above theories, leaves the executive functions factor as the missing piece of the puzzle. Hooper and colleagues make the case that executive functions play a more important role in early writing than previously thought, which complements some of our existing understandings of L1 and L2 writing. Hooper et al.'s model has been shown to predict more than 50% of writing variance in first and second grade L1 students, vouching for an important role of attention, working memory,

and other executive functions in writing in a much younger population than Schoonen and colleagues' (2002) model. It may well be, then, that the missing compensation mechanism in the EL2 group lies somewhere in the area of attention, memory, and executive function; future research should evaluate Hooper et al.'s model in L2 students, as it subsumes the various possible compensatory skills quite neatly.

The other, and perhaps more interesting, possibility is that L2 students' oral and print-based language systems interact differently than L1 students' oral and print-based language systems. L2 students' first experiences with oral language occur in one language, while the bulk of their first experiences with print-based language occur in another. Considering Berninger's (2000) interpretation of language behavior, this means that L2 learners not only experience language as four different functional systems (language by ear, mouth, eye, and hand), they experience some of these systems in different languages than others. Furthermore, they acquire oral and print language systems in their second language simultaneously, after having acquired one oral language system already, rather than in the waves of overlapping development L1 learners experience. It would be unsurprising if this complicated the ways in which their oral and print-based language systems interact. Where L1 students can connect a print-based writing system to their existing knowledge of a corresponding oral language system, L2 learners may rely less on this association when learning print-based language skills. Accordingly, the nature of the associations among the four functional language systems in L2 learners merits investigation—do their interactions mirror those of L1 learners or, as we might suspect, are they more complex? Do they perhaps maintain more distinction between oral and print-based language systems than L1 learners? Careful, thorough research into this area, perhaps replicating some of Berninger's studies in L2 learners, could provide some very critical insight into L2

learners' language experiences and, subsequently, the ways in which their oral and print-based language systems interact.

Of course, one major drawback to this speculation about language system interactions is that we have only operationalized oral language skills in terms of vocabulary and syntax. Oral language as a construct is far more complex than this, and evaluation of the associations between oral and print-based language systems in L2 learners will require a far more comprehensive assessment of oral language skills. However, even if the only differences between L1 and L2 learners are in these two skills, this still represents a level of complexity in L2 learners' functional language systems which extends beyond that of their L1 peers, and that certainly merits further investigation.

Implications of the Present Study

The critical takeaways from the results of the present study are threefold. First, they emphasize the strong role of word-level literacy skills in EL1 and EL2 learners' writing in kindergarten and grade three. Second, they deemphasize the direct role of oral language skills in EL1 and EL2 learners' writing in kindergarten and grade three. And third, they suggest that the impact of oral vocabulary and syntactic knowledge on writing is mediated by word reading and spelling skills in kindergarten and grade three EL1 and EL2 learners. Taken together, these results have several implications for theory, research, and practice.

Implications for theory. Our results are consistent with the simple view of writing's assertion that transcription skills are the primary developmental constraint on children's writing ability in grades one through three (Abbott & Berninger, 1993). The strong influence of word-level skills on writing found across all of our paticipant groups suggests that the early impact of transcription skills on writing holds true in L2 populations as much as L1 populations in the

primary grades. The large effect size associated with the proportion of writing variance explained in both grades reiterates the predictive power of word-level skills across primary grades. It is also likely that the relatively lower proportion of writing variance explained in the grade three groups reflects the declining constraints of transcription skills between kindergarten and grade three as word-level skills are automatized, suggesting a similar developmental trajectory in both language groups. However, the mediation of oral language's effect on writing by word-level skills in the kindergarten EL2 group but not the grade three EL2 group is somewhat more difficult to interpret. If word-level transcription skills are the primary constraint on students' early writing, as the simple view suggests, it follows that the impact of oral language skills on writing would be filtered through—or mediated by—spelling ability. This supports the application of the simple view of writing to the kindergarten EL2 group. The lack of significant mediation in the grade three EL2 sample, however, breaks with this pattern of expectations, suggesting the theory may apply less effectively as EL2 students approach the intermediate grades.

It is unclear whether the next stage of developmental constraints suggested by the simple view of writing—that of oral language skills, via text generation—applies equally to both language groups. Typically, the significant and constraining role of oral language skills does not appear in L1 learners' writing until grades four through six (Abbott & Berninger, 1993). It is possible that the lack of significant mediation of oral language skills by word-level skills in the grade three EL2 group reflects an earlier automatization of transcription skills and declining reliance on spelling ability. If the simple view of writing applies, however, we would have expected to see a corresponding increase in the direct effect of oral language skills on writing. Replication of this analysis in a sample of older L2 students is needed to clarify whether the simple view of writing continues to apply in the intermediate grades. If, by grade five or six, we

see a significant direct effect of oral language on writing skills emerge, it would suggest that the simple view of writing continues to hold true for L2 students later in development. If not, our earlier speculation that some other phenomenon underlies the unusual EL2 results in grade three will be upheld.

It is also unclear how our results align with the componential model of writing (Schoonen et al., 2002). To our knowledge, no research to date has validated the model in a sample younger than grade eight. It is interesting that, despite the componential model's implication that vocabulary, grammar, and orthography play a substantial role in grade eight writing, this did not prove true in younger samples. While spelling skills made an obvious contribution to writing in all groups through the word-level composite, vocabulary and syntactic knowledge only contributed indirectly in kindergarten EL2 students, and hardly at all in grade three EL2 students. It is possible that the componential model, like the simple view of writing, has different implications for writing at different ages. Perhaps the lexical retrieval or metacognitive components play a stronger role in younger writers, whereas the importance of linguistic knowledge components (particularly vocabulary and grammar) contribute more in later grades. Future research can easily illuminate this by including lexical retrieval and metacognitive components alongside oral language and word-level literacy skills.

Implications for research. The key implication of the present study for research is the importance of considering word-level literacy and oral language skills together when investigating L2 writing. As mentioned above, failure to include word-level skills as a mediator may lead oral language skills to appear to have a significant direct effect on writing when, in fact, the bulk of this effect is occurring through other variables. Future research should be sure to include word-level literacy skills alongside oral language, as well as any other possible

mediators, moderators and confounding variables which arise with continuing study—for example, any executive functions which are determined to be important to elementary writing. Directionality of effect among these variables should be specified based on theory wherever possible, so as to continue to add to the collective understanding of associations among the component skills of writing in L2 learners.

Implications for practice. The central implication of these findings for practice is the importance of teaching word-level literacy skills to L2 learners. Given the known oral language gap in L2 students, it is tempting for educators to believe they can improve learning outcomes by addressing oral language skills. However, our results indicate that, at least in the early elementary grades, addressing word reading and spelling skills in L2 learners will have a far more substantial impact on writing outcomes. Where we lack understanding of the nuanced interactions between oral and print-based language systems in L2 learners, we do know that the interactions among literacy skills within the print-based language system are consistent between L1 and L2 learners, at least in the primary grades. It goes back to Abbott et al.'s (2010) determination that "it is easier for developing writers to forge connections across (a) levels of language within the same domain and (b) across domains within the same level of language" (p. 295). In essence, this means it is easier for L2 learners to create connections among print skills, such as word reading, spelling, and writing, than it is for them to create cross-domain connections with their lagging oral language skills. To be clear, these results by no means indicate that we should neglect L2 learners' oral language skills; they may well have a larger impact on L2 students' writing performance later in development. Neither should we ignore the impact a child's first spoken language has on their literacy learning experiences. The takeaway for elementary education is more that, in the early years, supporting L2 students' literacy

development occurs best by focusing on word-level literacy skills like word reading and spelling, so that they might be transmitted into more complex text-level skills such as writing composition.

Contribution to the Literature

To our knowledge, the present study is the first to employ a mediation model in considering the associations among oral language, word-level literacy, and writing skills in L2 students. Accordingly, the finding that word-level literacy skills mediate the effect of oral language skills on writing in kindergarten EL1 and EL2 students, in grade three EL1 students, and perhaps somewhat in grade three EL2 students, makes a novel contribution to the literature. The original intention of this study was to help clarify the role of oral language skills in L2 learners' writing; findings indicate that oral vocabulary and syntax contribute to writing through their impact on word reading and spelling, rather than directly. This study also adds to the literature by considering a directional association between oral language and word-level literacy skills in the context of writing. To date, Babayiğit (2014) is the only quantitative study which has considered the contribution of multivariate word-level and oral language skills to L2 writing simultaneously. The present investigation extends her work by considering a similar set of component skills of writing but including a directional association between them. Finally, this study contributes to the literature by analyzing the components of writing in L2 students as early as kindergarten—few studies have considered text-level writing in L2 learners at such a young age.

Limitations of the Present Study

While many precautions were taken to ensure the quality and validity of statistical analyses, several limitations merit discussion. The first is an issue of normality—despite

standardization and combination of raw scores, the word-level composite variable retained some non-normal distributional features in the kindergarten data (see Appendix A). Use of bootstrapping procedures within the main analysis was intended to combat these distributional issues by loosening normality assumptions. Bootstrapping, however, assumes that the sample used is a reasonable representation of the population on the measured variables; any oddities or extreme values in the original data may be exacerbated in the resampling process. This makes it difficult to generalize results beyond the present sample, especially since effects estimated in OLS regression analyses are sample-specific instantiations to begin with, and tell us nothing about the true values of the population parameters (Hayes, 2013).

The second is an issue of correct model specification—multiple regression and mediation analyses assume correct causal ordering, correct specification of model, and no omitted variables (Fairchild & McQuillin, 2010; Hayes, 2013). Despite our best intentions in specifying the mediation model, the lack of comparable analyses in this area limited our ability to confirm that the direction of effect we specified between oral language and word-level skills is correct. We chose oral language skills as the independent variable based on their time precedence over word-level skills in language development (Berninger, 2000). When considered in the context of writing development, however, the influence of word-level skills precedes that of oral language (at least according to Abbott & Berninger, 1993). Accordingly, one might argue that we should have specified the path in the opposite direction, and the significance of our results may disguise an issue of reverse causation. If this were the case, however, it is unlikely we would have found significant mediation. Furthermore, exploratory post-test analyses suggested that when the direction of effect between oral language and word-level skills is reversed, mediation does not occur. Fortunately, this issue does not impact our central findings regarding the direct effects of

oral language and word-level skills on writing. We mention it here more to encourage future research to further explore the true nature of this association in L2 learners. In a similar vein, it is also worth briefly mentioning that the mediation of the effect of oral language on writing by word-level skills does not preclude the existence of other mediators of the effect of oral language on writing (Hayes, 2013). In fact, the relatively lower proportion of writing variance predicted in the grade three sample suggests that there are other variables at play which explain, augment, or even confound the effects we observed. This goes back, again, to the importance of accumulating and replicating studies of these associations in L2 learners.

A final issue to consider is that of statistical power. The power of the present mediation analysis to detect medium sized effects (f^2 of .15) was calculated at 0.72 in the kindergarten EL1 group, 0.80 in the kindergarten EL2 group, 0.67 in the grade three EL1 group, and 0.75 in the grade three EL2 group using G*Power version 3 (Faul, 2014). A minimum of 68 participants per group would have been needed to achieve 80% power of detection for a medium-sized effect; this was attained only in the kindergarten EL2 sample. All other samples did, however, exceed the minimum of 31 participants needed to achieve 80% power to detect a large-sized effect (f^2 of .35). As such, the analyses conducted were sufficiently powerful to detect large effects in each of the four groups, but only the kindergarten EL2 analysis was sufficiently powerful to detect medium-sized effects. Achieving 80% power of detection for a small-sized effect (f^2 of .02) would have required 485 participants per sample. It follows that some of the issues of statistical significance in the present study may have arisen from inadequate power to detect anything less than a large effect. As always, replication with a larger sample in future research would be the ideal way to address this.

Suggestions for Future Research

The bulk of the implications of this study for future research have already been discussed. Most come down to the need to replicate the present results in a larger sample of L2 learners, as accumulation of information on L2 students' writing is the best way to support researchers in drawing generalizable conclusions. Analyses should be replicated in populations of varying ages, grades, language backgrounds, and locations, with as many participants and over as long a timespan as possible. Replication of the present analyses in older L2 learners is particularly important to piecing together a theoretical understanding of how L2 learners' writing develops. Such replication will also help clarify whether the effect of oral language skills on word-level literacy skills is legitimate in grade three L2 students, and if it is truly comparable to L1 learners. It will confirm or deny the validity of the mediation found in the present study as well as determine whether the indirect effect of oral language on writing through word-level skills truly drops off in grade three L2 learners but not their L1 peers. In short, replication of this component skills analysis across diverse L2 student populations will answer many of the questions raised here about whether, how, and why associations among oral language and word-level literacy skills differ between L1 and L2 students.

Future research might also attempt to further parse out the role of individual component skills in writing by splitting up oral vocabulary from syntactic knowledge, and word reading from spelling. Inclusion of, and comparison with, additional oral language measures may also be illuminating. If replication continues to show that there is no mediation in grade three L2 students, leaving neither a direct nor an indirect effect of oral language skills on writing, further research also needs to consider why this might be. Analyses should be recreated with measures of attention, executive function, verbal working memory, and linguistic retrieval implicated by

the various theories of L2 writing, to determine whether they serve as compensatory mechanisms in L2 students. Formal validation of writing models, such as those of Hooper et al. (2011) or Schoonen et al. (2002), across varying grades of L2 students may be particularly helpful in this regard. Finally, whether or not our speculations prove true, we believe that the connections between oral and print-based language systems in L2 learners should be further explored. Such interactions between language systems are fascinating and important, and may offer a wealth of insight into the nature of language behavior in individuals of diverse language backgrounds.

Conclusion

L2 learners are a growing population in Canada, and it is important that Canadian educators are prepared to support their literacy development alongside their L1 peers. The present study sought to investigate the relative contributions of oral language and word-level literacy skills to L2 learners' writing, based on their theorized roles in L1 learners' writing. While it is known that oral language skills are consistently lower in L2 than L1 students, and word-level literacy skills are consistently comparable between groups, minimal research to date has addressed the role these skills play in L2 learners' writing. The present study sought to address this gap through a mediation analysis of the effect of oral language skills on writing outcomes through word-level literacy skills in EL1 and EL2 students in kindergarten and grade three. Data were derived from a larger longitudinal study in which kindergarten and third grade EL1 and EL2 students completed a battery of oral language and literacy measures.

Results indicated that word-level literacy skills made a significant direct contribution to writing in kindergarten and grade three students regardless of language background, while oral language skills did not. Instead, the effect of oral language on writing was significantly mediated by word-level literacy skills in both the EL1 and EL2 groups in kindergarten, and the EL1 group in grade three, with possible non-significant mediation in grade three EL2 students. It was also determined that oral language skills had a significant effect on word-level literacy skills across groups though, again, with some ambiguity in the grade three EL2 group. No significant differences in the associations among oral language, word-level literacy, and writing skills were found between EL1 and EL2 students in kindergarten or grade three.

This study extends previous research by considering the contributions of oral language and word-level literacy skills to writing in L2 students simultaneously, rather than in isolation.

Furthermore, by investigating a directional association between oral language and word-level literacy skills in this context, we uncovered a mediational association among component writing skills not previously established in the L2 writing literature. The central implication of these results is the importance of word-level reading and spelling skills to L2 students' writing development. In kindergarten and grade three, word reading and spelling appear to make a far more substantial impact on students' writing than oral vocabulary and syntactic knowledge, regardless of their language background.

As multilingualism in Canadian student populations continues to grow, the field of L2 literacy research must grow with it. Researchers need to understand the theoretical basis of L2 students' literacy skills in order to determine how best to support their development. This, in turn, will support educators in developing successful evidence-based practices for ensuring L2 students develop the literacy skills they need to be successful in Canadian society. The central call this study makes for future research is simply that we need more of it—more researchers need to study L2 writing across more student populations. Future research should also address the complex nature of interactions between oral and print-based language systems in L2 learners, in order to create a full understanding of L2 literacy. A truly inclusive multilinguistic society is one which takes the full diversity of children's language experiences into account. Let us be sure our endeavors, in both research and practice, continue to reflect this.

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Appendix A: Composite and Outcome Variable Distributions

Table A1

Descriptive statistics for composite and outcome variables in kindergarten

							Shapiro-Wilk	
Variable	*M*	*SD*	Min.	Max.	Skew	Kurtosis	Statistic	Sig.
Kindergarten EL1 (n = 56)								
Oral Language Composite[a]	0.000	1.745	-5.652	3.881	-0.503	1.064	0.982	.556
Word-Level Composite[b]	0.000	1.867	-5.112	5.195	0.480	2.008	0.925	.002
Writing Outcome	0.000	1.000	-1.755	2.497	0.470	-0.165	0.967	.125
Kindergarten EL2 (n = 68)								
Oral Language Composite[a]	0.000	1.748	-4.476	3.671	-0.347	-0.306	0.984	.510
Word-Level Composite[b]	0.000	1.917	-7.592	3.260	-1.469	4.023	0.896	.000
Writing Outcome	0.000	1.000	-2.32	2.16	0.072	-0.332	0.976	.212

Note. [a] Composite includes standardized vocabulary and syntax scores. [b] Composite includes standardized word reading and spelling scores.

Table A2

Descriptive statistics for composite and outcome variables in grade three

							Shapiro-Wilk	
Variable	*M*	*SD*	Min.	Max.	Skew	Kurtosis	Statistic	Sig.
Grade 3 EL1 (n = 51)								
Oral Language Composite[a]	0.030	1.729	-4.652	4.046	-0.096	0.216	0.992	.978
Word-Level Composite[b]	-0.060	1.799	-5.168	3.517	-0.353	0.267	0.983	.693
Writing Outcome	0.000	1.000	-2.555	1.517	-0.709	0.125	0.945	.020
Grade 3 EL2 (n = 61)								
Oral Language Composite[a]	-0.025	1.640	-4.284	4.585	-0.271	0.669	0.973	.191
Word-Level Composite[b]	0.050	1.826	-4.850	3.630	-0.364	0.162	0.981	.449
Writing Outcome	0.000	1.000	-2.135	1.832	-0.248	-0.708	0.969	.124

Note. [a] Composite includes standardized vocabulary and syntax scores. [b] Composite includes standardized word reading and spelling scores.

Appendix B: Effect Size

Effect size of the variance predicted (R^2) by the specified mediation path model was calculated using Cohen's $f^2 = R^2/(1 - R^2)$, after Cohen (1992). Effect size values exceeding .02 are considered small, values exceeding .15 are considered medium, and values exceeding .35 are considered large (Cohen, 1992). Effect sizes for the word-level literacy skills mediator variable and the writing outcome variable, which both served as dependent variables in the model tested, are presented in Table B1.

Table B1

Effect Size for Variance Predicted in Dependent Variables in Mediation Analysis

	DV: Word-Level Skills			DV: Writing		
Group	R^2	f^2	ES	R^2	f^2	ES
	Writing Regressed onto Oral Language in Isolation					
K EL1	--	--	--	0.11	0.12	Small
K EL2	--	--	--	0.11	0.13	Small
Gr. 3 EL1	--	--	--	0.21	0.27	Medium
Gr. 3 EL2	--	--	--	0.09	0.10	Small
	Writing Regressed onto Oral Language and Word-Level Skills					
K EL1	0.15	0.17	Medium	0.73	2.70	Large
K EL2	0.18	0.22	Medium	0.63	1.71	Large
Gr. 3 EL1	0.30	0.44	Large	0.37	0.60	Large
Gr. 3 EL2	0.07	0.07	Small	0.46	0.84	Large

Note. Effect size classifications after Cohen (1992). DV = Dependent Variable, ES = Effect size.

The value of the standardized regression coefficients for each path served as their own effect size estimates; the standardized coefficients indicate the amount of change in the dependent variable, in terms of standard deviation units, that results from an increase of one standard deviation unit in the independent variable. For example, a regression coefficient for the path from oral language to word-level skills with a value of .408 indicates that an increase of one standard deviation unit in the composite oral language variable corresponds with an increase of

approximately four-tenths of a standard deviation unit in the word-level literacy skills variable. As such a measure of effect size requires no calculation and has no rule of thumb regarding the value of small, medium, and large effect sizes, no additional information is reported for effect sizes of the regression coefficients.