Reading & Writing - Journal of the Literacy Association of South Africa
ISSN: (Online) 2308-1422, (Print) 2079-8245

Perspectives on oral reading fluency, vocabulary and reading comprehension in bilingual learners from Ghana, South Africa and Zimbabwe

Authors:
Lieke Stoffelsma[1]
Carien Wilsenach[1]
Fungai Mutema[2]

Affiliations:
[1]Department of Linguistics and Modern Languages, College of Human Sciences, University of South Africa, Pretoria, South Africa

[2]Centre for Communication Studies, Midlands State University, Gweru, Zimbabwe

Corresponding author:
Carien Wilsenach,
wilseac@unisa.ac.za

Dates:
Received: 16 Mar. 2025
Accepted: 08 Sept. 2025
Published: 23 Jan. 2026

How to cite this article:
Stoffelsma, L., Wilsenach, C. & Mutema, F., 2026, 'Perspectives on oral reading fluency, vocabulary and reading comprehension in bilingual learners from Ghana, South Africa and Zimbabwe', *Reading & Writing* 17(1), a583. https://doi.org/10.4102/rw.v17i1.583

Background: While oral reading fluency (ORF) is linked to reading comprehension (RC) in African languages, the role of vocabulary remains underexplored.

Objectives: This study investigated the relative contributions of ORF and vocabulary to RC in the first and second languages of three bilingual groups: Akan-English in Ghana, isiZulu-English in South Africa, and Shona-English in Zimbabwe and examined the ORF rate needed for 80% comprehension in each language.

Method: A quantitative correlational design was used. Learners in Ghana (n = 158), South Africa (n =104), and Zimbabwe (n = 122) were assessed through convenience sampling. Constructs measured included: ORF, RC and receptive vocabulary tests.

Results: Oral reading fluency was a strong predictor of RC in first and second languages. Learners needed to read between 89 and 109 words correct per minute (WCPM) in English to achieve 80% comprehension. For African languages ORF thresholds ranged from 47 WCPM (isiZulu) to 55 WCPM (Akan).

Conclusion: Oral reading fluency emerged as a critical prerequisite for RC across bilingual populations. Without adequate ORF skills, vocabulary knowledge cannot support comprehension.

Contribution: This study provides novel data on reading fluency and comprehension in under-researched African languages, particularly Akan and Shona. It proposes preliminary ORF benchmarks for Ghana and Zimbabwe and validates existing benchmarks for South Africa.

Keywords: oral reading fluency; vocabulary; RC; ORF benchmarks; bilingualism; Akan; isiZulu; Shona.

Introduction

Worldwide, the most used parameters to measure basic education outcomes are literacy and numeracy. The importance of these fundamental skills is globally acknowledged, as illustrated by their inclusion in the United Nations Sustainable Development Goals, target 4.6: 'By 2030, ensure that all youth and a substantial proportion of adults, both men and women, achieve literacy and numeracy' (UN 2015). Initiatives to improve literacy outcomes, particularly in primary education, have increased rapidly across the African continent since global programmes, such as Education for All (UNESCO 2005, 2014), the Sustainable Development Goals (UN 2018) and the Education 2030 agenda (UNESCO 2015) materialised. A popular measure in these programmes is Oral Reading Fluency (ORF), typically measured by having learners read grade-level text aloud, with the number of words read correctly per minute used as the fluency score. The words correct per minute (WCPM) that an individual reads is calculated and represents the ORF score. Text reading fluency, which can be defined as 'the ability to read a text quickly, accurately and with proper expression' (National Institute of Child Health and Human Development 2000:3–5), has been established as a strong predictor of RC in Indo-European languages (Bigozzi et al. 2017; Fuchs et al. 2001; Hudson, Lane & Pullen 2005; Lervåg & Melby-Lervåg 2022).

Low RC levels continue to be a problem in many sub-Saharan African countries (Piper & Dubeck 2024). Given the established link between ORF and RC, researchers have explored this relationship to some extent in African languages. Existing studies (Ardington et al. 2020; Mutema & Pretorius 2024; Pretorius & Spaull 2016; Spaull, Pretorius & Mohohlwane 2020;

Wills et al. 2022) support the idea that fluency is important for RC in African languages, but research on ORF benchmarks (i.e. standardised WCPM scores that suggest the fluency rate at which a child should be reading in order to understand a text) for African languages remains scarce and inconclusive. Furthermore, while traditional English ORF benchmarks may assist teachers in identifying learners who struggle with English decoding and may help policymakers to determine when interventions are needed, their use in non-Western contexts poses some concerns. Although English is often used as a medium of instruction (MOI) in the intermediate and secondary education phases in African countries, it remains a second language (L2) for the majority of learners. Most English ORF benchmarks were established for first language (L1) readers in Western contexts. Since English L2 learners follow a different development pattern in language acquisition than L1 speakers (Cremer & Schoonen 2013; Goriot et al. 2021; Proctor et al. 2005), it is important to develop ORF benchmarks for African English L2 contexts, based on evidence from the same context in which they are used. This study contributes to the current debate by investigating to what extent L1 and L2 ORF and vocabulary knowledge predict L1 and L2 RC in three groups of bilingual children (Akan-English in Ghana, isiZulu-English in South Africa and Shona-English in Zimbabwe). Furthermore, the study estimates the fluency thresholds in L1 and L2 required to support comprehension in these children. The next sections outline relevant ORF benchmark research, the theoretical framework, and the linguistic contexts of the study.

Oral reading fluency benchmarks

In Indo-Euro languages, higher WCPM scores are generally associated with more fluent reading and better text comprehension (Daane et al. 2005; Jenkins et al. 2003; Klauda & Guthrie 2008). This correlation is not universal though, as higher ORF scores do not automatically ensure good comprehension among English learners in the United States (Schwanenflugel & Kuhn 2016), and lower ORF scores do not prohibit RC. Graham and Van Ginkel (2014), for instance, showed that readers could achieve 80% comprehension in the Kenyan languages Sabaot and Pokomo, when reading at 30 WCPM and at 24 WCPM. Dowd and Bartlett (2019) compared WCPM data from Grade 2 children in 11 developing countries and found that children reading 'slower' than 45–60 WCPM were able to achieve high comprehension levels. The mean WCMP in the 11 countries was 51 WCPM, but in terms of explaining comprehension across languages, this metric was not helpful: the fastest readers in Zimbabwe (who read with comprehension) read at this rate, but the average reader in Vietnam (who reads with comprehension) read at 95 WCPM. Dowd and Bartlett (2019) argued that WCPM:

> [C]annot be delimited with the precision required of a global metric; language-specific ranges are necessary, … and targets may need to be differentiated for pupils learning to read in a second or third language. (p. 203)

Reading rates will vary cross-linguistically because of differences in morphological and orthographical structures. In an eye tracking study, Land (2016) found that L1 isiZulu readers fixated significantly longer on characters in isiZulu (an agglutinative language) than in English (a non-agglutinative language) and that refixations increased when readers had to process long words in isiZulu. Land's data demonstrated that word recognition processes in isiZulu and English are different – less than 1% of isiZulu words were skipped, suggesting that fewer isiZulu words in the parafoveal view are predictable sight words.

Regarding fluency rates in English L2 in non-Western contexts, research shows that fast reading *does not* guarantee comprehension. Piper, Schroeder and Trudell (2016) found that Kenyan learners read significantly faster in English than in their L1, but often do not understand what they read. Comprehension may be hindered by poor vocabulary knowledge, poor linguistic knowledge, lack of background knowledge and poor inferencing skills. Factors such as text complexity and readability also need to be considered (Zainurrahman & Sukyadi 2024). Benchmarks focusing on speed rather than comprehension may thus disadvantage learners who read more slowly in order to construct meaning within the text (Goodman 2006).

In response to the need to establish ORF benchmarks for different African languages and for English L2 in African countries, the Department of Basic Education in South Africa led an extensive project between 2020 and 2023 to develop ORF benchmarks for the African languages used in education in South Africa. The project's main goal was to create contextually relevant standards that would help the education system to monitor and improve reading skills in the early grades. Based on this project, ORF benchmarks for Grade 3 learners in South Africa have been set at 35 WCPM for three Nguni languages (isiZulu, isiXhosa and siSwati) (Ardington et al. 2020) and at 60 WCPM for Sotho languages (Sesotho and Setswana) (Mohohlwane et al. 2022). For English L1 and English L2 in the South African context, Wills et al. (2022) suggest a threshold of 50 WCPM, stating that few learners will manage to read for meaning in English if they read below this rate. This threshold applies to L1 English learners in Grade 2 (who should reach a benchmark of 90 WCPM in Grade 3 to read at 85% comprehension levels) and to L2 English learners in Grade 3 (who should reach a benchmark of 90 WCPM in Grade 5 to read at 85% comprehension levels).

Despite recent progress in some countries, many indigenous African languages still do not have reliable benchmarks or use benchmarks that were set without systematic assessment or considering the morphological complexity and word length of the language. For example, the 2013 EGRA (Early Grade Reading Assessment) in Ghana suggested a single benchmark of 40–60 WCPM based on working memory capacity research for 11 different Ghanaian languages (Ministry of Education 2014). Based on this benchmark, the

study concluded that average fluency rates across all languages were insufficient for comprehension. No recent research on *L1 ORF* benchmarks in Akan or Shona, or on ORF benchmarks for L2 English in Ghana and Zimbabwe was identified by the authors, highlighting the need for the present study.

Theoretical framework

Although RC is a complex construct, remarkably strong evidence continues to support the notion that comprehension depends on decoding and linguistic comprehension, as described in the 'Simple View of Reading' (SVR) (Lervåg & Melby-Lervåg 2022). The SVR model (Hoover & Gough 1990) states that RC (RC) is the product of word-recognition abilities, also known as decoding (D) and linguistic comprehension (LC). Decoding is the process of translating written language into spoken language (Sadoski & Paivio 2007), while LC refers broadly to the ability to understand a language.

Critics of the SVR (e.g., Kirby & Savage 2008) pointed out that the model did not specify how decoding should be measured, even though it is generally interpreted as a measure of reading accuracy. Linguistic comprehension is a similarly broad concept, with Kirby and Savage (2008:76) arguing that it 'represents all of verbal ability, including vocabulary, syntax, inferencing and the construction of mental schemas'. They further argued that reading fluency (i.e. automatic decoding) is equally important for comprehension and called on researchers to consider the role of fluency within the SVR model. Theories of automaticity in reading presume that more cognitive space becomes available for comprehension when underlying processes such as decoding take place automatically. Automatic decoding and lexical access connect lower-level processes such as phonological and orthographical processing with higher-level processes such as inferencing and background knowledge integration – essentially, fluent readers recognise words automatically, which allows them to reserve cognitive resources for meaning construction (Lervåg & Melby-Lervåg 2022). Many studies in the early 2000s (Daane et al. 2005; Jenkins et al. 2003; Klauda & Guthrie 2008) demonstrated the importance of rapid and automatic processing of words in a text and associated this skill with comprehension. Consequently, automatic word recognition became associated with fluent reading, which became a prerequisite for RC (Daane et al. 2005; Jenkins et al. 2003; Klauda & Guthrie 2008). The importance of fluency for long-term reading success has also been demonstrated by Wang et al. (2019), who followed 30 000 learners from Grade 5 to Grade 10. The decoding-RC relationship was only maintained for learners who achieved decoding at a certain threshold level in Grade 5. For those reading below this threshold, RC remained stagnant. Scholars now agree that fluency is as important for comprehension as word recognition and linguistic comprehension, and stress the importance of developing fluency during the early stages of reading development.

As previously discussed, LC, or the ability to understand a language, is an important component of the SVR. Vocabulary knowledge (one aspect of LC) is necessary for RC, but not sufficient. When we read to learn, information that needs to be processed tends to be new. Given this, it is essential that readers can interact with texts in ways that allow them to adapt their existing knowledge, based on what they have read. Reading fluency, vocabulary knowledge and comprehension are thus interconnected and reciprocal skills: as learners become more fluent readers, they are exposed to more words, which helps expand their vocabulary, and which supports comprehension. Conversely, a strong vocabulary base supports better fluency, as learners can recognise and understand words more quickly. The implications of the SVR model are different for L1 and L2 readers (Grabe 2009). First language readers typically begin with strong LC and must develop D, while L2 readers may struggle with both, resulting in more complex relationships between decoding, comprehension, and fluency. Achieving automatic decoding depends on many variables, including L2 LC, quality of instruction and access to materials. In some cases, learners may reach high ORF rates, without achieving RC, because of a lack of L2 LC. In other cases, learners may reach acceptable L2 LC levels, but fail to read with comprehension because of a lack of automatic D. Even so, there is evidence that improvements in ORF lead to increased RC in bi-/multilingual children in the early grades (Baker et al. 2012; Kim, Wagner & Foster 2010; Wawire, Liang & Piper 2023). In their longitudinal study, Wawire et al. (2023) found that text reading fluency mediates the relationship between D and RC in both English and Kiswahili. Wawire et al. (2023) stressed the need for instructional practices that enhance text reading fluency in multilingual contexts, given its critical role in RC in multilingual learners.

Linguistic and literacy contexts in the current study

African countries are characterised by multilingualism (Eberhard et al. 2024). To manage linguistic diversity in public institutions, many African countries, including the ones in this study, have language education policies that limit the use of multiple languages in government, business and education. Many countries have adopted former colonial languages (English, French or Portuguese) as official languages (UNICEF 2016), even where indigenous languages enjoy official language status. All three countries in this study use an 'early exit model' in education, where mother-tongue education is supported from Grades 1–3,[1] followed by English instruction from Grade 4 onwards. This policy is implemented in South Africa, where 12 languages (Afrikaans, English, isiNdebele, isiXhosa, isiZulu, Sepedi, Sesotho, Setswana, siSwati, Tshivenda, Xitsonga, and South African Sign Language) are officially recognised and used as MOI in the Foundation Phase. In Zimbabwe and Ghana, this policy

1.The intention is that learners in the three countries receive formal instruction in the Foundation Phase in their L1. In reality, though, children in multilingual metropolitan areas might have an L1 at home that is different from the MOI that is used at the school that they attend. Also, the amount and quality of L1 instruction depends on the availability of teaching materials in the L1.

is not implemented consistently, and many children receive most of their literacy instruction in English, with the L1 being used as MOI to facilitate instruction (Chivhanga & Chimhenga 2013). Currently, the education systems of Ghana, South Africa and Zimbabwe continue to fail a large proportion of young bilingual learners. The 2013 EGRA study in Ghana reported that most learners in public schools could not read with comprehension by the end of Grade 2, with many children obtaining zero scores in oral passage reading (Ministry of Education 2014). In South Africa, the 2021 Progress in International Reading Literacy Study data show that 81% of Grade 4 learners cannot read for meaning (Van Staden, Roux & Tshele 2023). In Zimbabwe, the 2021 Southern and Eastern Africa Consortium for Monitoring Educational Quality report indicated that only 34% of Grade 6 learners achieved the minimum level of reading proficiency, and overall, 66% of learners did not reach the reading competency level expected for their grade (Awich 2021). Despite evidence that mother-tongue education benefits literacy development in both the L1 and the L2, and that it leads to better academic outcomes (Evans & Acosta 2020; Nag et al. 2019), early exit models persist in the current research settings and contribute to poor literacy outcomes.

The development of early reading skills is influenced by the linguistic and orthographic characteristics of a language (Seymour, Aro & Erskine 2003) and, although this is known, reading in African languages continues to be taught using methods developed for English. Akan, isiZulu and Shona all have transparent orthographies, which theoretically means they should be easy to decode (Pretorius & Mampuru 2007). However, all three languages add unique characteristics to letters of the Roman alphabet, including diacritics and tone markings (to preserve phonetic and tonal nuances needed for meaning), and special characters that compensate for sounds that are not in the standard Latin orthography (e.g. Ɛ, ɛ:, Ɔ and ɔ: in Akan). In addition, isiZulu and Shona are agglutinative languages: prefixes and suffixes are added to root words to indicate features such as noun class, tense, aspect, negation, mood and location. This means that isiZulu and Shona words are often long and complex and are visually similar, which makes decoding difficult (Ardington et al. 2020; Land 2016). The isiZulu example *Abafana abawufundi* ('The boys are not reading it') illustrates this complexity (researchers' own example). In *abawufundi* ('are not reading it'), *a-* is a negative prefix, marking the verb as negative present tense; *-ba-* is a subject concord prefix agreeing with the subject *abafana* 'boys' (noun class 2), *-wu-* acts as a concord prefix that substitutes the object (indicating 'it'), *-fund-* ('read') is the root verb and *-i* is a negative final vowel indicating negative present tense. African languages also differ in that they are written disjunctively (morphemes represent separate words, e.g., *ke a mo rata* [Northern Sotho 'I love him/her']) or conjunctively (multiple morphemes are combined into a single word, e.g., *ngiyamthanda* [isiZulu 'I love him/her']). Finally, isiZulu and Shona have complex consonant systems and a large code set, with isiZulu, for instance, using 60 phonemes compared to English's 44 (Land 2015a). Akan is not formally classified as an agglutinative language (Kambon 2012) but does exhibit some characteristics of agglutination. Akan has a consonant system that is not more complex than the English system, but that is distinct. For instance, the glottal stop in Akan is represented by an apostrophe ('). Combined, these linguistic characteristics can slow down decoding, especially if reading is taught using methods developed for English. Against this background, this study was guided by the following research questions.

Research questions

- To what extent do ORF and vocabulary predict RC in the Intermediate Phase among bilingual Akan-English, isiZulu-English and Shona-English learners in both their L1 and L2?
- What average ORF rate is needed to achieve 80% comprehension in the L1 and the L2 of Akan-English, isiZulu-English and Shona-English bilingual learners?

Research methods and design

Research setting and sample

Because of constraints on time and money, convenience sampling was used to test bilingual Akan-English learners (Ghana), isiZulu-English learners (South Africa), and Shona-English learners (Zimbabwe) in Grade 5 and Grade 6. The total sample included 158 Ghanaian learners, 104 South African learners, and 122 Zimbabwean learners (see mean ages in Table 2). Three public schools in a rural town in Ghana's Central Region participated in the study (…) in the study, where most inhabitants for in the fishing industry (…) most inhabitants work in the fishing industry, with 29.8% living below the national poverty line (Ghana Statistical Service 2015). In South Africa, two urban isiZulu schools in the City of Tshwane participated. The schools served mainly low-income communities. In Zimbabwe, two urban schools (also serving low-socio-economic communities) in the cities of Harare and Gweru participated. To be considered for inclusion, schools had to use Akan, isiZulu or Shona as the MOI, had to be no further than 20 km from the local research institutions, and had to serve low-income communities. Schools that met the MOI and low-income criteria, but that were further than 20 km from the researchers' institutions, were not considered for inclusion.

English is the L2 of all the children in the sample, but the Zimbabwean children used English as MOI from Grade 1, whereas the South African children used English as MOI from Grade 4. In Ghana, English is the MOI from Grade 4, but L1 instruction in Ghanaian languages in the first three years of education depends on variables such as the availability of materials and teacher training (Appiah 2024). All learners participated in a series of L1 and L2 language tests, which formed part of a larger literacy project. Learners were tested outside their classroom during school hours. All research assistants were native speakers of the L1 being tested, and fluent in English.

Instruments

To measure ORF, two traditional short stories were selected per grade level, one in English and one in the L1 (Akan, Shona or isiZulu). The selected English ORF tests were validated for English L2 research in the African context for similar grades in previous studies, such as the 2013 NEEDU study (Draper & Spaull 2015). Since no standardised ORF and comprehension tests for Akan, isiZulu and Shona were available, the researchers used L1 passages from the learners' mother-tongue course books, in line with similar studies (Graham & Van Ginkel 2014). The selection was done by local teachers and African language experts; consequently, all learners read passages that were thought suitable for their grade level. Learners were asked to read aloud the ORF story in their L1 for 1 min, during which errors were marked by the research assistant. Once the learner had finished, the WCPM score was calculated. Each passage was accompanied by five comprehension questions, making the minimum score 0 and the maximum score 5 per comprehension test. Learners who were unable to read the entire text in 1 minute were given an additional 2 minutes to finish reading the story (…) and then had to answer the five comprehension questions orally.

The English L2 ORF test was conducted in the same way. The Grade 5 English text had a Flesch Reading Ease (RE) score of 84.7 (easy), a Flesch-Kincaid Grade Level score of 3.47 (very easy), and an Automated Readability Index (ARI) score of 4.06 (easy), indicating that the text is suitable for learners aged 9–10 (Readability Formulas n.d.). The Grade 6 English text had a Flesch RE score of 83 (easy), a Flesch-Kincaid Grade Level score of 4.66 (fairly easy), and an ARI score of 4.88 (fairly easy), making this text suitable for learners aged 10–11 (Readability Formulas n.d.). An overview of the ORF texts is given in Table 1.

Comparability of language tests

When including several languages is the same study design, it is challenging to provide assessments of comparable levels of difficulty. Several steps were taken in the study to align the length and difficulty of the ORF tests as much as possible. Firstly, although the length of the ORF tests differed per language, the design was such that word count per test increased with grade level (see Table 1). Secondly, floor and ceiling effects were monitored for WCPM scores. None of the participants obtained the maximum WCPM score in their L1 or L2, showing that the texts had an appropriate length. Regarding the minimum WCPM scores, Table 1 shows that 24 of the 81 Grade 5 learners in Ghana (29.6%) obtained zero scores for Akan, which might be an indication that the text was somewhat difficult. Zero WCPM scores for Grade 6 Akan learners were also on the higher side (18.2%). In spite of these zero scores, the reliability of both tests was good. The high number of zero scores is in line with findings from other studies in Ghana (Ministry of Education 2014). Regarding the two other countries, Table 1 shows that zero scores were much lower in South Africa and non-existent in Zimbabwe. A third step taken to balance levels of difficulty was to include comparable RC questions. The majority of the questions for each test were easy questions for which learners had to retrieve straightforward information and key details. The other questions were either vocabulary questions, that is, working out the meaning of unknown words using contextual clues, or inferencing questions. As shown in Table 1, the Shona Grade 6 test for RC had the lowest number of retrieval questions.

TABLE 1: Description of oral reading fluency and comprehension texts per Grade, including Word count, minimum score, maximum score, reliability (Cronbach's alpha) and question type.

Grade	Language	Title	Word Count	Min WCPM Score	*n*	Max WCPM Score	*n*	Cronbach's alpha	Question type†		
									R	I	V
Ghana											
5	L1 Akan	Siantsir a egyninambowa na bɔdɔm nnyɛ anyenkofo bio *(Why the cat and the dog are no longer friends).*	158	0	24	96	1	0.84	5	0	0
6	L1 Akan	Siantsir a okura wia nam we *(Why the mouse steals meat).*	204	0	14	108	3	0.83	4	1	0
5	L2 English	How a Leopard got its spots.	197	0	12	126	1	0.79	4	1	0
6	L2 English	How Sanguru the Hare got his long ears.	246	0	5	236	1	0.67	4	0	1
South Africa											
5	L1 isiZulu	Kungani uMvubu engenaboya? *(How the hippo lost its fur).*	139	0	6	85	1	0.82	3	1	1
6	L1 isiZulu	Umfana owayememeza athi 'Nansi impisi!' *(The boy who shouted: "There comes the wolf!").*	192	0	5	81	1	0.86	3	2	0
5	L2 English	How a Leopard got its spots.	197	0	5	171	1	0.86	4	1	0
6	L2 English	How Sanguru the Hare got his long ears.	246	0	2	162	1	0.62	4	0	1
Zimbabwe											
5	L1 Shona	Mutambo webhora *(A football game).*	151	3	1	65	1	0.39	3	1	1
6	L1 Shona	Gava rakadambura musungo *(All hell broke loose).*	187	8	1	80	1	0.54	2	2	1
5	L2 English	How a Leopard got its spots.	197	12	1	148	1	0.48	4	1	0
6	L2 English	How Sanguru the Hare got his long ears.	246	13	1	214	1	0.61	4	0	1

†, *R*, retrieval; I, inferencing; V, vocabulary.

Test reliability

Cronbach's alpha reliability tests were performed to assess the reliability of the L1 and L2 RC tests. Results are presented in Table 1. The reliability of the tests ranged between 0.62 and 0.86 for the Ghanaian and South African samples. For the Grade 5 Zimbabwe sample, the tests were highly unreliable for both Shona (α = 0.388; n = 60) and L2 English (α = 0.479; n = 60). Further analysis of the Grade 5 items revealed that item-correlations ranged between –0.031 and 0.365, indicating a strong inconsistency within the scale. It was also investigated whether removing items with a negative inter-item correlation from the scale would improve the scale reliability, but this was not the case. Therefore, it was concluded that the Grade 5 Zimbabwe test data were not suitable for further use in the study. Rather than removing participant scores to manipulate results, all the Grade 5 data from the Zimbabwe were removed, leaving a sample of 62 Grade 6 learners in the Zimbabwe sample. The reliability of the Grade 6 Shona L1 RC test was also deemed low, hence items 1 and 2 were removed from the test, resulting in an alpha score of 0.612 (n = 62).

Receptive vocabulary in English was tested with the Peabody Picture Vocabulary Test (PPVT) Form B (Dunn & Dunn 2007). Receptive vocabulary in Akan, isiZulu and Shona was measured using a translation of the PPVT Form A. The isiZulu translation of Form A (Schaefer 2023) was used as basis for the translations into Akan and Shona, which were done by qualified language practitioners. Adaptations to the original English items (sets 1–11 of Form A), necessitated by linguistic or contextual limitations, are explained in Schaefer (2023). As the participants in the present samples were older than those in Schaefer's study, a certified translator translated three additional sets of Form A (sets 12–14). The additional translated items were piloted with 28 learners in Ghana, 15 in South Africa, and 20 in Zimbabwe. Following the reliability analysis of the pilot data, the researchers deemed the Akan and isiZulu tests suitable for further use. The Shona version was slightly adjusted after the pilot, because of ambiguous meanings of translated words. For example, the word 'dancing' (Form A, set 3, item 25) was translated as *kutamba*; however, this means both playing and dancing, making the selection of one picture complicated.

Directions in the PPVT manual were followed for both forms: each learner was shown a page with four pictures and was asked to point to the picture that represented the word spoken by the administrator of the test.

Data analysis

Scores were captured manually and data were entered into IBM SPSS Statistics (Version 30). Raw scores were calculated for ORF, RC and vocabulary. Descriptive statistics were conducted to explore the data. Reading comprehension scores were transformed to percentages to allow a comparison between the three groups. Pearson correlations were performed to assess the relationship between all the L1 and L2 variables.

Six hierarchical linear regression analyses were performed (three L1 models and three L2 models). Grade 5 and Grade 6 data were collapsed for Ghana and South Africa. For each language group we evaluated the roles of *gender*, *age*, *ORF* and *vocabulary* (predictor variables) on both L1 and L2 RC (outcome variables). *Gender* was entered first (model 1), followed by *age* (model 2), *ORF* (model 3), and *vocabulary* (model 4). Assumptions of normality (Shapiro-Wilk test for normality), multicollinearity (variance inflation factors [VIF]) and homoscedasticity (Breusch-Pagan test for heteroscedasticity) were checked throughout. The outcome of the assumption checking is provided for model 4 of each regression in the next section.

For L1 Akan RC, multicollinearity was low (VIF *Gender* = 1.09, VIF *Age* = 1.01, VIF *L1 ORF* = 1.14, VIF *L1 Vocabulary* = 1.13). The residuals were not normal (W = 0.97, p = 0.001), but homoscedasticity could be assumed (η = 3.52, p = 0.48). For L1 isiZulu RC, multicollinearity was also low (VIF *Gender* = 1.08, VIF *Age* = 1.05, VIF *L1 ORF* = 1.11, VIF *L1 Vocabulary* = 1.11). The residuals were not normal (W = 0.96, p = 0.008), but homoscedasticity could be assumed (η = 2.74, p = 0.602). For Shona L1 RC, multicollinearity (VIF *Gender* = 1.14, VIF *Age* = 1.03, VIF *L1 ORF* = 1.05, VIF *L1 Vocabulary* = 1.15) was low, and while the residuals were not normal (W = 0.92, p < 0.001), there was no statistical evidence of heteroscedasticity (η = 2.19, p = 0.7).

For L2 RC (Ghana), multicollinearity was low (VIF *Gender* = 1.19, VIF *Age* = 1.11, VIF *ORF* = 1.47, VIF *Vocabulary* = 1.48) and residuals were normal (W = 0.98, p = 0.208). The assumption of homoscedasticity was met (η = 1.47, p = 0.83). For L2 RC (South Africa), multicollinearity was low (VIF *Gender* = 1.13, VIF *Age* = 1.01, VIF *ORF* = 1.28, VIF *Vocabulary* = 1.19), and residuals also appeared normal (Shapiro-Wilk W = 0.99, p = 0.775). The assumption of homoscedasticity was met (η = 8.63, p = 0.07). For L2 RC (Zimbabwe), multicollinearity was acceptable (VIF *Gender* = 1.03, VIF *Age* = 1.11, VIF *ORF* = 1.73, VIF *Vocabulary* = 1.81), while the residuals deviated slightly from normality (W = 0.95, p = 0.03). Despite this deviation, the assumption of homoscedasticity was met (η = 7.34, p = 0.12).

Although the assumption of normality of residuals was not met for the L1 models, most other assumptions were met and the researchers thus proceeded with the regression analyses, understanding that the L1 results would have to interpreted cautiously.

Ethical considerations

Ethical clearance for this study was obtained from Radboud University (2021-9071 Ref. 21U.003003), from Ghana Education Service in Central Region, from the Department of Basic Education in South Africa (8/4/4/1/2) and from the Ministry of Primary and Secondary Education in Zimbabwe (C/426/3). Additional permission for school visits was obtained from the school principals. Caregivers received written information to

explain the study, including an informed consent form. Learners only participated if they had signed consent from their caregiver. Learners were asked for verbal assent to participate in the assessments. No learner was coerced to participate. To ensure anonymity and confidentiality, all participants were coded using a unique identifier in the data file.

Results

Descriptive statistics

The means, standard deviations, minimum and maximum scores for reading fluency, RC and vocabulary in both the L1 and L2 of the learners are presented in Table 2.

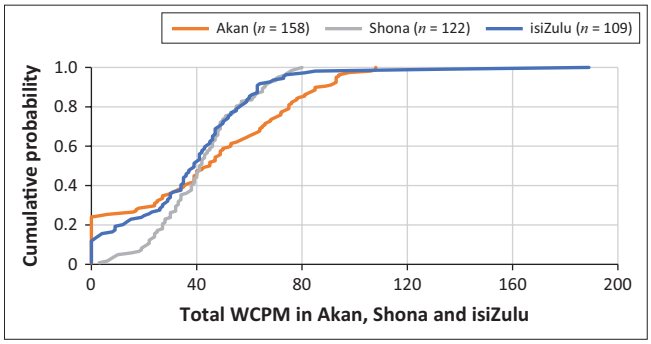
To allow comparisons with previous research, the researchers also present the cumulative distribution function (CDF) of ORF in both the L1 and L2 in the three groups (Figure 1 and Figure 2). The CDF represents the probability that a learner's ORF score is less than or equal to a particular value. Essentially, it shows the proportion of learners who read at or below a certain number of WCPM. Since the CDFs do not include the RC data, the original sample for Zimbabwe (n = 122) was included.

In Figure 1, the CDF indicates that the median WCPM is similar for the L1s (45 WCPM in Akan, 39 WCPM in Shona, and 49 WCPM in isiZulu). This means that 50% of the learners were reading at or below these ORF levels in their L1. At the 75th percentile, a different pattern was observed: 75% of Ghanaian learners read at or below 71 WCPM, while South African learners read at 52 WCPM and Zimbabwean learners read at 64 WCPM at this percentile. Figure 1 also shows zero scores for Akan and isiZulu learners, whereas in Zimbabwe no zero scores were recorded.

In Figure 2, the CDF indicates that the median WCPM for English L2 is similar for Ghana and South Africa (69 and 67 WCPM). Zimbabwean learners had a higher median (112 WCPM). This means that 50% of the learners were reading at or below these ORF levels in English. At the 75th percentile, 75% of Ghanaian learners read at or below 90 WCPM, while South African learners read at 95 WCPM and Zimbabwean learners read closer to 129 WCPM in English.

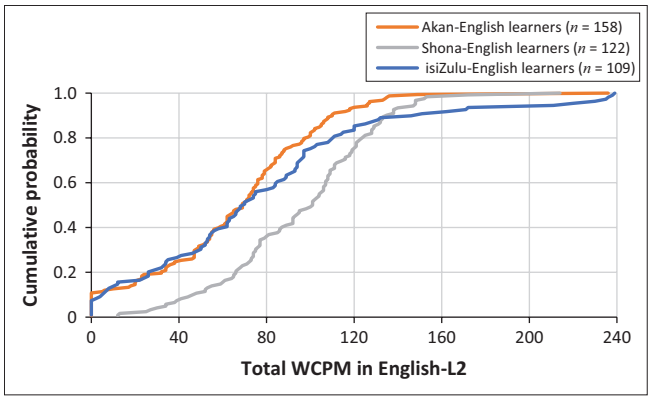
Words correct per minute and reading comprehension

In Akan and Shona, a higher WCPM was associated with higher RC, with readers achieving 100% comprehension at an average rate of 75 WCPM, and readers achieving 80% and 60% comprehension at WCPM rates of 55 and 45 (Figure 3). In Shona, children achieving 100% comprehension read at 56 WCPM, while children achieving 80% and 60% comprehension read at 48 WCPM on average. The pattern was less clear in isiZulu, where learners achieved 100% comprehension at an average of 44 WCPM, and 80% and 60% comprehension at an average of 46 WCPM.



WCPM, words correct per minute.

FIGURE 1: Cumulative distribution function of oral reading fluency in Akan, Shona and isiZulu.



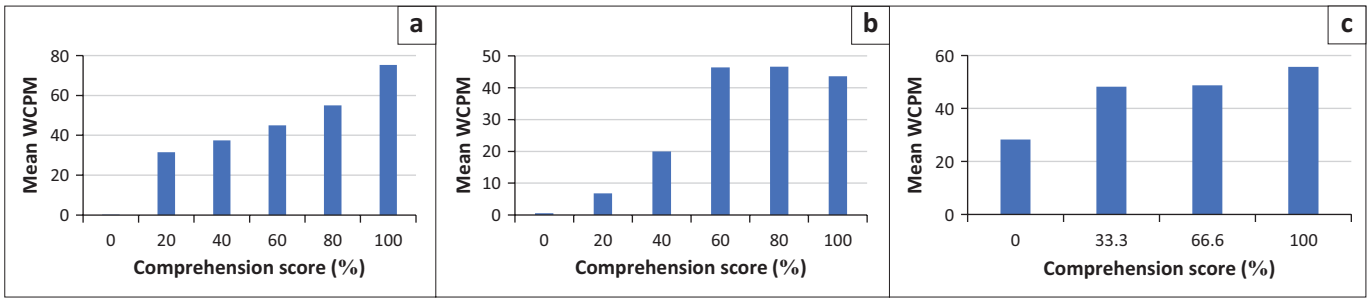
WCPM, words correct per minute.

FIGURE 2: Cumulative distribution function of English L2 oral reding fluency.

TABLE 2: Descriptive statistics for reading fluency, RC and vocabulary knowledge in L1 Akan (Ghana), L1 isiZulu (South Africa), and L1 Shona (Zimbabwe), and L2 English (all three countries).

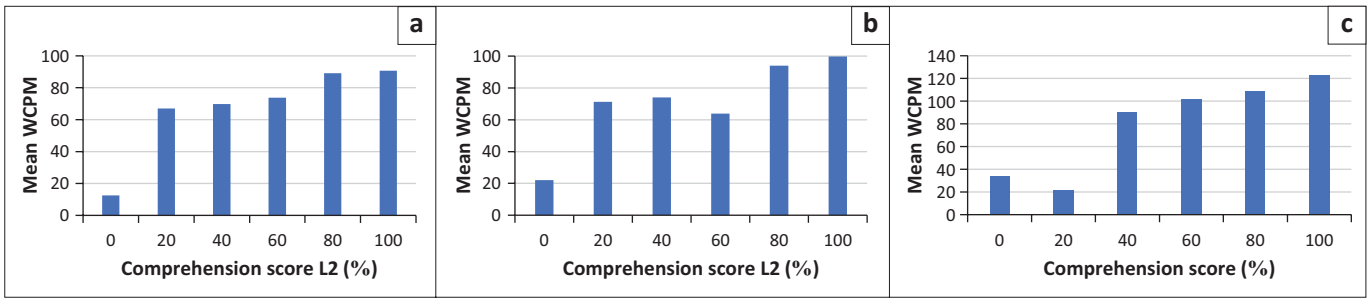
Measured constructs	Ghana (n = 158)			South Africa (n = 104)			Zimbabwe (n = 62)		
	Mean	SD	Min–Max	Mean	SD	Min–Max	Mean	SD	Min–Max
Age	12.7	1.3	9.7–15.9	11.1	0.9	9.8–15.5	11.6	0.6	9–13
L1 ORF	43.4	32.7	0–108	36.6	21.7	0–85	51.3	15.2	8–80
L1 CCPM	183.3	133.7	0–441	273.2	160.0	0–641	386.3	111.7	57–603
L2 ORF	65.7	39.1	0–236	66.5	41.3	0–171	108.1	33.8	12–214
L2 CCPM	286.3	169.6	0–1030	289.0	178.6	0–741	462.2	143.2	54–930
L1 RC †	2.9	1.9	0–5	3.5	1.7	0–5	2.3	0.9	0–3
L2 RC	2.3	1.7	0–5	2.2	1.7	0–5	4.0	1.2	0–5
L1 PPVT	131.3	21.6	39–157	138.0	15.7	77–165	128.4	15.5	67–148
L2 PPVT	82.7	22.2	31–167	96.5	21.5	51–160	137.0	25.2	87–181

CCPM, Characters correct per minute; ORF, Oral reading fluency; PPVT, Peabody picture vocabulary test; RC, Reading comprehension; SD, standard deviation.
†, based on a maximum of 3 items in Zimbabwe.



WCPM, words correct per minute.

FIGURE 3: Mean words correct per minute and comprehension scores in L1 for (a) Ghana (Akan); (b) South Africa (isiZulu); and (c) Zimbabwe (Shona).



WCPM, words correct per minute.

FIGURE 4: Mean words correct per minute and comprehension scores in L2 (English) for (a) Ghana; (b) South Africa; and (c) Zimbabwe.

For English L2, a higher WCPM was associated with higher RC in all three groups (Figure 4). Readers at the 100% comprehension level read at 90 WCPM (Ghana), 100 WCPM (South Africa), and 123 WCPM (Zimbabwe). Learners who achieved 80% comprehension read at 89 WCPM (Ghana), 94 WCPM (South Africa), and 108 WCPM (Zimbabwe). At lower comprehension levels, the pattern was less straightforward. In Ghana and South Africa, there was little variation between learners who understood between 20% and 40% of the texts (these children read between 67 WCPM and 74 WCPM). In Zimbabwe, children reading at 90 WCPM, on average, only scored 40% on comprehension, while those who read below 40 WCPM scored between 0 and 20% in comprehension.

Correlation and regression analyses

Correlational statistics[2] showed that *L1 ORF* and *L2 ORF* correlations ranged from moderate (Shona group, $r = 0.45$) to moderately strong (isiZulu group, $r = 0.66$) and strong (Akan, $r = 0.75$). *L1 ORF* strongly correlated with *L1 RC* in the Akan ($r = 0.84$) and isiZulu ($r = 0.70$) groups, and moderately in the Shona group ($r = 0.42$). In all three groups, *L2 ORF* and *L2 vocabulary* correlated moderately with *L2 RC*, with the exception of *L2 vocabulary* which correlated moderately strongly with *L2 RC* in the Shona group ($r = 0.65$).

Results of the hierarchical linear regression analyses are reported in Table 3. Given the number of regression models conducted, the researchers were mindful of potential Type I error inflation. The results were interpreted cautiously, emphasising consistent patterns across models and reporting effect sizes alongside *p*-values.

The first and second models (with *gender* and *age* as predictors) were significant for Akan (F [1, 156] = 5.60, $p = 0.019$, $R^2 = 0.04$ and F [2, 155] = 3.38, $p = 0.037$, $R^2 = 0.04$), but not for isiZulu or Shona. Adding *ORF* as predictor resulted in significant models for all three groups: Akan (F [3, 154] = 134.962, $p < 0.000$, $R^2 = 0.72$); isiZulu (F [3, 100] = 32.125, $p < 0.000$, $R^2 = 0.49$); and Shona (F [3, 58] = 4.479, $p < 0.000$, $R^2 = 0.19$). Finally, adding *L1 vocabulary* in model 4 as predictor variable resulted in significant models in all three groups: Akan $F[4, 153] = 100.807, p < 0.000, R^2 = 0.73$); isiZulu ($F$ [4, 99] = 24.389, $p < 0.000$, $R^2 = 0.50$); and Shona (F [4, 57] = 4.335, $p = 0.004$, $R^2 = 0.23$).

ΔR^2 from model 2 to model 3 was significant in all three L1 models (ΔR^2 Akan L1 RC = 0.68, $p < 0.000$; ΔR^2 isiZulu L1 RC = 0.47, $p < 0.000$; and ΔR^2 Shona L1 RC = 0.16, $p < 0.000$). Although model 4 was significant for all three groups, adding the last predictor (vocabulary) did not cause an increase in the predictive power of the model in any of the groups, highlighting the robustness of ORF as predictor. Following Cohen's (1988) standards,[3] the effect size of the predictors in model 4 may be described as large in all three groups. The strongest predictor of L1 RC was *L1 ORF* – adding this predictor explained 68% of additional variance for the Akan group 47% for the isiZulu group and 16% for the Shona group.

The *L1 ORF* coefficients were statistically significant in all three L1 RC models. Specifically, the standardised coefficients and

2.All Pearson correlations reported are significant ($p < 0.01$). Because of a lack of space, comprehensive correlation tables are not included.

3.Cohen (1988:413–414) proposed the following standards to interpret effect sizes of predictors and dependent variables using R-square: 0.02 (small effect); 0.13 (medium effect); 0.26 (large effect).

95% confidence intervals were as follows in model 4: Akan, β = 0.85, 95%CI (0.753, 0.934); isiZulu, β = 0.67, 95%CI (0.523, 0.822); and Shona, β = 0.36, 95%CI (0.124, 0.602). Because none of these intervals includes zero, one can conclude with 95% confidence that there is a positive linear relationship between *L1 ORF* and L1 RC and that the true population coefficient falls within the respective intervals. In contrast, the L1 vocabulary coefficients were not statistically significant in any of the models. The 95% confidence intervals for Akan (β = 0.03, 95%CI [–0.614, 0.119]), isiZulu (β = 0.08, 95%CI [–0.068, 0.230]), and Shona (β = 0.23, 95%CI [–0.021, 0.477]) all included zero. Thus, one cannot conclude with 95% confidence that L1 vocabulary has a significant linear association with L1 RC.

The hierarchical regression analyses with English L2 RC as outcome variable was performed in the same manner as described above. The regression statistics for the L2 comprehension models are given in Table 4.

The regression analyses show that the first L2 model (only *gender* added as predictor) was not significant in any of the groups groups (Ghana F [1,155] = 2.483, p = 0.177, R^2 = 0.02; South Africa F [1,94] = 1.416, p = 0.237, R^2 = 0.03; Zimbabwe F [1,60] = 1.32, p = 0.255, R^2 = 0.02). Adding the predictor *age* resulted in statistically significant models for the Ghanaian learners (F [2,154] = 12.457, p < 0.000, R^2 = 0.14), explaining 12% additional variance (R^2 = 0.12, p < 0.000). Adding *age* as predictor did not yield a significant model for the Zimbabwean or South African L2 data. Adding *L2 ORF* to the model in the third step resulted in significant models for all three groups (Ghana F [3,153] = 41.013, p < 0.000, R^2 = 0.45; South Africa F [3,92] = 13.328, p < 0.000, R^2 = 0.30; Zimbabwe F [3,58] = 9.779, p < 0.000, R^2 = 0.34). The models remained significant in all three groups when *L2 vocabulary* was added as predictor (Ghana F [4,152] = 39.013, p < 0.000, R^2 = 0.51; South Africa F [4,91] = 14.242, p < 0.000, R^2 = 0.39; Zimbabwe F [4,57] = 7.425, p < 0.000, R^2 = 0.34).

TABLE 3: Hierarchical regression *L1 reading comprehension.*

Analysis		Final βs (standardised)				Statistics L1 RC				
Number	Predictors	Gender	Age	L1-ORF	L1-Vocab	R	R^2	ΔR^2	ΔF	*Dfs*
Ghana: L1 Akan (n = 158)										
1	Gender	-0.19*	-	-	-	0.19	0.04	0.04	5.60*	1, 156
2	Gender/Age	-0.18*	-0.09	-	-	0.20	0.04	0.01	1.15	1, 155
3	Gender/Age/L1-ORF	0.03	-0.10*	0.85**	-	0.85	0.72	0.68	381.55**	1, 154
4	Gender/Age/L1-ORF/L1-V	0.03	-0.10*	0.85**	0.03	0.85	0.73	0.00	0.27	1, 153
South Africa: L1 isiZulu (n = 104)										
1	Gender	-0.15	-	-	-	0.15	0.02	0.02	2.19	1, 102
2	Gender/Age	-0.14	0.02	-	-	0.15	0.02	0.00	0.05	1, 101
3	Gender/Age/L1-ORF	-0.04	-0.07	0.69**	-	0.70	0.49	0.47	92.15**	1, 100
4	Gender/Age/L1-ORF/L1-V	-0.05	-0.07	0.67**	0.08	0.71	0.50	0.01	1.09	1, 99
Zimbabwe: L1 Shona (n = 62)										
1	Gender	-0.11	-	-	-	0.11	0.01	0.01	0.67	1, 60
2	Gender/Age	-0.09	-0.12	-	-	0.16	0.03	0.02	0.91	1, 59
3	Gender/Age/L1-ORF	-0.07	-0.08	0.41**	-	0.43	0.19	0.16	11.58**	1, 58
4	Gender/Age/L1-ORF/L1-V	-0.14	-0.08	0.36**	0.23	0.48	0.23	0.05	3.36	1, 57

Dfs, degrees of freedom.
*, p < 0.05; **, p < 0.001.

TABLE 4: Hierarchical regression *English L2 reading comprehension.*

Analysis		Final βs (standardised)				Statistics L2 RC				
Number	Predictors	Gender	Age	L2-ORF	L2-Vocab	R	R^2	ΔR^2	ΔF	*Dfs*
Ghana: L1 Akan (n = 158)										
1	Gender	-0.12	-	-	-	0.13	0.02	0.02	2.48	1,155
2	Gender/Age	-0.10	-0.33**	-	-	0.37	0.14	0.12	22.09**	1,150
3	Gender/Age/L1-ORF	0.07	-0.30**	0.59**	-	0.67	0.45	0.31	84.60**	1,150
4	Gender/Age/L1-ORF/L1-V	-0.01	-0.22**	0.44**	0.30**	0.71	0.51	0.06	18.75**	1,150
South Africa: L1 isiZulu (n = 104)										
1	Gender	-0.12	-	-	-	0.12	0.03	0.02	1.42	1,940
2	Gender/Age	-0.09	-0.16	-	-	0.20	0.04	0.03	2.44	1,930
3	Gender/Age/L2-ORF	0.05	-0.23*	0.53**	-	0.55	0.30	0.26	34.70**	1,920
4	Gender/Age/L2-ORF/L2-V	0.00	-0.25*	0.41**	0.31**	0.62	0.39	0.08	12.14**	1,910
Zimbabwe: Shona (n = 62)										
1	Gender	-0.15	-	-	-	0.15	0.02	0.02	1.32	1,600
2	Gender/Age	-0.13	-0.10	-	-	0.18	0.03	0.01	0.63	1,590
3	Gender/Age/L2-ORF	-0.07	-0.00	0.57**	-	0.58	0.34	0.30	26.56**	1,580
4	Gender/Age/L2-ORF/L2-V	-0.07	0.02	0.50**	0.11	0.59	0.34	0.01	0.58	1,570

Dfs, degrees of freedom.
*, p < 0.05; **, p < 0.001.

Adding vocabulary as predictor explained an additional 6% and 8% of the variance in the Ghanaian and South African models, but L2 vocabulary did not account for any additional variance in L2 RC in the Zimbabwean learners.

The L2 ORF coefficients were statistically significant in all three final models. In Ghana, the standardised coefficient was $\beta = 0.44$ (95%CI [0.305, 0.578]); in South Africa, $\beta = 0.41$ (95%CI [0.232, 0.603]); and in Zimbabwe, $\beta = 0.50$ (95%CI [0.215, 0.780]). None of these intervals includes zero, meaning that one can conclude with 95% confidence that there is a positive linear relationship between L2 ORF and English L2 RC, and that the true population coefficient falls within the respective intervals. For the L2 vocabulary coefficients, the results varied by country. The relationship was statistically significant for Ghana ($\beta = 0.30$, 95%CI [0.170, 0.444]) and South Africa ($\beta = 0.31$, 95%CI [0.126, 0.484]), as neither interval included zero. However, the coefficient for Zimbabwe was not statistically significant ($\beta = 0.11$, 95%CI [–0.179, 0.399]), as the confidence interval included zero.

ΔR^2 from model 2 to model 3 was again much more pronounced than ΔR^2 changes at any other stage. The effect size of model 4 was large for each group, with L2 ORF emerging as the strongest predictor of L2 English RC, explaining an additional 31% of variance in the Ghana model, an additional 26% of variance in the South Africa model, and an additional 30% of variance in the Zimbabwe model.

Discussion

The aim of this study was twofold. First, the researchers wanted to explore the contribution of reading fluency to RC in three different bilingual groups of African learners, using a conceptual model that also considered the contribution of vocabulary to RC. Second, the researchers wanted to contribute original ORF data from readers of African languages, and from English L2 readers in African contexts to further ORF benchmark research – specifically, we wanted to support the ORF benchmark estimates for Nguni languages as reported in Ardington et al. (2020), and estimate ORF benchmarks for Akan and Shona.

In all three L1 models, ORF was the strongest predictor of RC, accounting for 68% of the explained variance in Ghana, 47% in South Africa, and 17% in Zimbabwe. Gender and age were weak predictors of L1 RC; these variables explained 4% of variance in Ghana, 2% in South Africa, and 3% in Zimbabwe. Vocabulary contributed minimally once ORF was controlled, although in the L2 models for Ghana and South Africa, it explained an additional 6% – 8% of variance.

In the English Second language models, the analyses revealed again that *L2 ORF* was the best predictor of RC in all three countries. *Gender* was a poor predictor of L2 comprehension, but *age* had a significant negative impact in Ghana, indicating that older learners had lower RC scores. This may be attributed to older learners repeating grades or being absent from school. Most sub-Saharan African countries report high grade repetition rates (Taniguchi 2015). Driven by poverty, many Ghanaian children are absent from school because they have to help with farming, fishing, household chores, or other forms of labour (Ampiah & Adu-Yeboah 2009). This economic necessity often takes precedence over education, leading to irregular school attendance, poor academic performance, and high dropout. *Second language ORF* explained 31% of variance in reading L2 comprehension in Ghana, compared to 26% in South Africa and 30% in Zimbabwe. *Second language vocabulary* had a more pronounced effect on L2 comprehension in Ghana and South Africa, where *L2 vocabulary* uniquely contributed to L2 comprehension (with 6% and 8% additional variance explained). Even though Zimbabwean learners had significantly higher English vocabulary scores, adding *L2 vocabulary* did not significantly improve the model. Possibly, these learners found the English text comparatively easy (as English was their MOI from Grade 1), and a vocabulary-comprehension relationship might only appear when learners have to read a text that contains more challenging vocabulary.

The data presented support global results that have indicated the importance of developing fluency in both languages of a bilingual learner (Baker et al. 2012; Kim et al. 2010; Wawire et al. 2023), and confirm studies in African contexts that reported fluency as a stronger predictor of RC than vocabulary (Pretorius & Mampuru 2007). Furthermore, the findings support the work by scholars such as Leachman, Wolters and Kim (2025), who noted that the predictive power of models explaining comprehension varies as a function of developmental phases and orthographic depths, suggesting the need for tailored educational strategies in each language. Increased fluency also supports vocabulary expansion, which further supports other important literacy constructs such as RC, learner motivation and confidence, as readers experience more satisfaction from reading (Mason & Krashen 2017). Finally, fluency is linked to overall academic achievement because it enables learners to read to learn, accessing and understanding content across subjects (Paige & Smith 2018). Overall, the findings highlight the critical role of L1 and L2 reading fluency for L1 and L2 RC. English vocabulary contributed to English L2 comprehension, but its impact was secondary to that of fluency.

The second aim of the study was to contribute to the current debate on ORF benchmarks for African languages and L2 English readers in African contexts. Readers in European countries typically achieve both accuracy and fluency in L1 reading by the end of the first school year (Seymour et al. 2003). The developmental rate of English decoding and ORF skills in native English children is more than twice as slow as in children who are native speakers of other European languages with shallow orthographies; this difference has been attributed to differences in linguistic complexity and orthographic depth (Seymour et al. 2003). Southern African languages have transparent orthographies, which theoretically means that establishing phoneme–grapheme

correspondences (which supports decoding) should be simple. However, mounting evidence shows that South African learners read faster in English than in their L1, and many learners are not decoding text in their L1 at expected rates at the end of Grade 3. Decoding in African languages might be harder than anticipated, and fluency rates in African languages might be significantly lower than in English because of the agglutinative nature of (some) African languages, and orthographic demands. Van Rooy and Pretorius (2013), for example, show that eye-fixations of isiZulu speakers are much longer when reading isiZulu compared to English, suggesting that reading isiZulu requires more cognitive effort and processing time. Secondly, the lack of tone markers in written forms of the three languages may cause confusion. Finally, isiZulu words have a low number of permissible letter combinations, making many words look alike. This possibly requires long duration of fixations noted among proficient readers of isiZulu (Land 2015b, 2016).

The data in this study suggest that fluency rates in all three African languages were indeed lower than in English, and that children who could achieve 100% comprehension levels in Akan, isiZulu and Shona read at an average of 75 WCPM, 44 WCPM and 55 WCPM. Children reading at 46 WCPM (isiZulu) and 48 WCPM (Shona) could still achieve a comprehension level above 60%. Reading rates in Akan were slightly higher than in isiZulu, and Shona, and indicate that the single benchmark of 40–60 WCPM suggested for Ghanaian languages (Ministry of Education 2014) does not adequately capture variation. Large-scale data are needed to estimate ORF benchmarks for different Ghanaian languages, as existing data (even if limited) suggest that better defined ranges are essential. The present sample is too small to generalise data, but comparing these data to previous South African studies is useful to provide supportive evidence for existing South African benchmarks. The Grade 5 and Grade 6 learners who achieved 80% or higher comprehension in English L2 read at 94 WCPM in South Africa and at 89 WCPM in Ghana, which aligns well with the 90 WCPM benchmark set for the end of Grade 5 in Wills et al. (2022). Learners in Zimbabwe read faster (108 WCPM) at the 80% comprehension level, which falls in between the L1 English and L2 English benchmarks for South African readers. This probably reflects their amount of exposure to English. Researchers thus need to establish unique English L2 ORF benchmarks for Zimbabwe. Learners who read below 40 WCPM could not answer any questions in all three groups. Importantly, some learners in all three groups achieved less than 40% comprehension, even though they read well above the 50 WCPM threshold suggested for Grade 3 learners in South Africa. This confirms that reaching the 90 WCPM is important to facilitate English comprehension in the intermediate grades.

Regarding *L1 ORF* benchmarks, the data show that L1 isiZulu and Shona children can reach 80% comprehension levels at rates of 47 WCPM and 49 WCPM, which is slightly below the 50 WCPM suggested in Wills et al. (2022) for Grade 5 readers. Readers in Akan L1 read at 55 WCPM at the 80% comprehension level, which aligns fairly well with the benchmarks suggested for conjunctive languages in South Africa at Grade 5–6 level. In all three African languages, readers reading below 40 WCPM struggled with understanding, achieving less than 40% comprehension.

Theoretical and pedagogical implications

The original SVR proposed that RC is the product of D (word recognition) and LC (Hoover & Gough 1990), but most scholars now agree that reading fluency needs to be considered in RC models. The presented data support the idea that text reading fluency, in particular, bridges the gap between decoding individual words and RC. Some scholars have suggested that it is the ability to read with appropriate prosody (a particular feature of fluent text reading) that enhances comprehension and retention of information, rather than the ability to decode words accurately and rapidly (Tong et al. 2023; Wolters, Kim & Szura 2020).

Linguistic comprehension remains essential, as it directly impacts the ability to understand and process text. However, the models in this study show that LC (operationalised as vocabulary knowledge) do not always add significant explanatory power for RC once decoding is accounted for. The presented data neither fully support nor refute the SVR, but rather highlight the complexity of RC in the African context. The strong predictive power of L1 and L2 ORF supports the SVR's emphasis on decoding, but L1 vocabulary failed to explain any variance in L1 RC, and L2 vocabulary only marginally affected L2 RC. The SVR provides a useful framework, but does not capture the nuances of L1 RC in diverse multilingual African contexts, which also depends on knowledge of morphosyntactic structures, orthographic knowledge, quality of instruction, background knowledge and critical thinking skills.

The researchers recommend that interventions aimed at improving L1 and L2 comprehension should focus on enhancing reading fluency. Educational programmes should prioritise developing learners' fluency in reading aloud to boost their overall RC skills. To support L1 fluency in agglutinative African languages, we concur with Land (2016), who suggested that young readers should be introduced to a core list of short words that do not agglutinate (e.g., conjunctives), which are easier to decode automatically. Readers should also practise identifying common word stems and common combinations of morphemes in complex agglutinating words.

Extensive reading programmes have been flagged as interventions that are especially helpful for improving reading fluency and comprehension in learners of all ages (Kuhn, Schwanenflugel & Meisinger 2010; Mason & Krashen 2017; Reynolds & Goodwin 2016). Extensive reading has also been tested in the South African context, where its implementation

improved reading fluency and comprehension (Pretorius & Lephalala 2011; Pretorius & Mampuru 2007), and led to cognitive, affective, and social benefits as early as the Foundation Phase (Nkomo 2021). A key feature of extensive reading is that reading materials should be slightly above the learners' current proficiency level, ensuring that they are challenged without being frustrated. Comprehensible input also supports vocabulary acquisition (Mason & Krashen 2017). All extensive reading interventionists highlight the importance of reading for pleasure rather than for assessment. This reduces anxiety, promotes self-selection of reading materials and increases motivation, autonomy and engagement with texts. Implementing sustained silent reading (Kuhn et al. 2010) as part of extensive reading helps to set aside regular, uninterrupted time for reading, and when implemented correctly, improves reading stamina and fluency.

Educators need to incorporate a variety of reading materials beyond graded readers and textbooks in their daily classroom activities (Reynolds & Goodwin 2016). Learners' progress can be monitored and supported through reading logs and providing feedback and discussion about the books learners are reading, which will enhance comprehension and critical thinking (Reynolds & Goodwin 2016). Other practical classroom elements from extensive reading programmes are daily reading sessions, setting reading challenges, organising book clubs and group discussions, and encouraging the use of reading journals. Integrating extensive reading with other subjects by selecting books that complement the curriculum can also be beneficial.

Limitations

The present study has some limitations. First, the overall sample was small, and the removal of the Grade 5 Shona data meant that the researchers had limited Zimbabwean data. Although most of the assumptions of regression analyses were met, the residuals in the L1 models deviated from normality, which means that the reported confidence intervals may be too wide or too narrow. A larger sample would provide more robust results and support generalisations of the findings.

Second, gender and age were weak predictors of RC in this sample, indicating that other unmeasured variables were impacting RC. The predictive power of vocabulary was also smaller than anticipated – possibly because we measured only receptive vocabulary, because of limited time and resources. Expressive vocabulary showed stronger associations with RC than receptive vocabulary in languages such as English (Dixon et al. 2022) and Dutch (Van Viersen et al. 2022), suggesting that the relationship between different dimensions of vocabulary and RC in African languages needs to be studied more carefully. Given that the regression model (with *gender*, *age*, *L1* and *L2 ORF*, and *L1* and *L2 vocabulary* as predictors) is clearly not exhaustive, future models can include a broader range of cognitive and linguistic factors, as well as sociolinguistic and educational factors such as language exposure, learner motivation, the home literacy environment, teacher preparedness, and teaching materials. The focus here was only on within-language prediction, but an interactive framework that considers cross-linguistic prediction might prove more powerful overall.

Finally, in Ghana, L1 instruction in local indigenous languages in the first three years of education depends on variables such as the availability of materials and teacher training (Appiah 2024). The researchers were unable to control for these variables, which might have affected the amount of literacy instruction that children received in Akan.

Conclusion

This study highlights the important role of reading fluency in facilitating RC in both the L1 and L2 of bilingual learners in the intermediate education phase in Ghana, South Africa and Zimbabwe. First language reading fluency was the strongest predictor of L1 RC in Akan, isiZulu and Shona. First language vocabulary did not explain additional variance in this study, once reading fluency had been accounted for. Second language reading fluency also emerged as the strongest predictor of L2 English RC, but vocabulary did explain some of the variance in the Ghanaian and South African L2 models. Even so, the data show that reading fluency (in both the L1 and in English L2 reading) accounts for more variance in RC than vocabulary in these African learners, and support versions of the SVR that stress the importance of reading fluency for comprehension. It would seem that, at least up to the intermediate phase of education in African contexts, a strong focus on decoding, and specifically fluent decoding, is required. The role of vocabulary in comprehension can never be disregarded, but vocabulary knowledge cannot support RC without reading fluency.

This study also highlights the need for tailored educational strategies to support the development of reading fluency in the foundation and intermediate phases of formal education. The researchers argue that understanding the impact of ORF on RC will enable educators to better support learners' literacy development in African contexts, and recommend further studies on the developmental trajectory of reading fluency in multilingual African learners in low-resource contexts.

Acknowledgements

The authors would also like to acknowledge the diligence of the field workers in Ghana, South Africa and Zimbabwe, whose work enabled the authors to collect the data within a limited time frame.

Competing interests

The first author reported that she received funding from the Dutch Research Council Talent Programme (VENI). The author has disclosed those interests fully.

Authors' contributions

As project leader, Lieke Stoffelsma conceptualised the article and was responsible for instrumentation, data collection and supervision of field workers, data analysis, interpretation and visualisation, writing of the first draft, compiling references, data curation, reviewing and editing the final draft, project administration and funding acquisition. As South African collaborator, Carien Wilsenach was involved the development of isiZulu instruments, data collection and supervision of field workers, interpretation of data, writing of the first draft, compiling references, reviewing and editing the final draft, and project administration. As Zimbabwean collaborator, Fungai Mutema was involved in developing the Shona instruments, data collection, project administration, and producing contextual information and sources to be included in the draft version of the article.

Funding information

This work was supported by the Dutch Research Council Talent Programme (VENI) under Grant VI.Veni.201T.011.

Data availability

The data will be available at the Radboud University Repository: https://doi.org/10.34973/s0nb-em39.

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