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Examining the Independent Contribution of Prosodic Sensitivity to Word Reading and Spelling in Early Readers.

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Abstract

This study was designed to examine the independent contribution of prosodic sensitivity – the rhythmic patterning of speech – to word reading and spelling in a sample of early readers. Ninety-three English-speaking children aged five to six years old (*M* = 69.28 months, *SD* = 3.67) were assessed for their prosodic sensitivity, vocabulary knowledge, phonological, and morphological awareness (predictor variables) along with their word reading and spelling (criterion variables). Bivariate (zero-order) correlation analyses revealed that prosodic sensitivity was significantly associated with all other variables in this study. Hierarchical regression analyses revealed that after controlling for individual differences in vocabulary, phonological, and morphological awareness, prosodic sensitivity was still able to explain unique variance in word reading, but was unable to make an independent contribution to spelling. The findings suggest that prosodic sensitivity gives added value to our understanding of children's reading development.

Keywords: Prosody, Vocabulary, Phonology, Morphology, Reading, Spelling

Examining the independent contribution of prosodic sensitivity to word reading and spelling in early readers.

It is widely accepted that the success of children's reading development is largely determined by the completeness of underlying phonological representations of words. This is supported by four decades of research demonstrating that the ability to identify and manipulate sound units at the level of the syllable, rhyme, and phoneme (*segmental* phonological awareness) is strongly associated with reading development (e.g., Melby-Lervag, Lyster, & Hulme, 2012). More recently, a literature has begun to emerge which considers the importance of *suprasegmental* phonological awareness in children's reading development; that is, the ability to identify and manipulate sound patterns across syllables (speech segments) including prosodic features such as stress, intonation, timing – the rhythmic patterning of spoken language (Holliman, Williams et al., 2014). The aim of this study was to investigate whether prosodic sensitivity can explain unique variance in word reading and spelling in early readers after controlling for other more established predictors such as vocabulary knowledge, phonological, and morphological awareness to indicate whether prosodic sensitivity provides added value to our understanding of literacy development.

Over the last 16 years in particular a literature has been developing that implicates a role for prosody in reading acquisition (e.g., Goswami et al., 2002; Goswami, Gerson & Astruc, 2010; Holliman, Wood, & Sheehy, 2008, 2010a, 2010b, 2012; Leong, Hämäläinen, Soltész, & Goswami, 2011; Schwanenflugel, Hamilton, Kuhn, Wisenbaker, & Stahl, 2004; Whalley & Hansen, 2006). However, a key challenge remains in understanding the mechanisms by which prosody influences reading (and spelling) and whether it has a direct effect and/or an indirect effect via other mediating variables.

In terms of conceptualising the role of prosody in literacy development previous work has examined the importance of prosody in oral reading, i.e. the fluency of expression when reading ‘out loud’ and has evidenced a relationship with both the ability to decode (e.g., Schwanenflugel et al., 2004) and comprehend (e.g., Miller & Schwanenflugel, 2006; Ravid & Mashraki, 2007) a text. However, when considering the nature of the relationship in either pre-readers or early readers who are not yet able to read aloud texts, it is sensitivity to, or receptive understanding of, prosody that needs to be considered and the conceptualisation of this in relation to literacy development is under-represented in the literature.

One of the first conceptual models of literacy development to include prosodic sensitivity was posited by, Wood, Wade-Woolley, and Holliman (2009) who argued that prosodic sensitivity might influence word reading and spelling via three candidate mechanisms – vocabulary growth, phonological awareness (comprising both phoneme and rhyme), and morphological awareness. Regarding vocabulary, it was argued that sensitivity to syllabic stress (which is louder, articulated more forcefully, higher in pitch, and longer in duration) might facilitate spoken word segmentation and recognition given that 85% of lexical words in English begin with a strong syllable (Cutler & Carter, 1987). Growth in vocabulary supports the development of phonological awareness (Walley, 1993), a skill that has been extensively linked to early reading and spelling attainment (e.g., Bus & van Ijzendoorn, 1999; Cain, 2010; Snowling, 2000) and thus would ultimately support written word recognition.

Regarding a more direct link from prosodic sensitivity to phonological awareness, it was argued that sensitivity to stress might facilitate phoneme awareness given that phonemes and phoneme boundaries appear to be easier to perceive in stressed rather than unstressed syllables (e.g., Chiat, 1983; Kitzen, 2001) and rhyme awareness (awareness of onset-rime boundaries) given that the peak of loudness in a syllable corresponds to vowel location (e.g., Scott, 1998) and may support decoding skill via analogical reasoning (see Goswami et al., 2002). As mentioned previously segmental phonological awareness is widely implemented in successful reading and spelling development and both skills linked to prosody – phoneme and rhyme awareness, are highly correlated and implicated in the development of literacy (e.g., Anthony & Lonigan, 2004).

Lastly, regarding morphological awareness, it was argued that sensitivity to stress might be processed concurrently with knowledge of morphological rules when decoding multisyllabic words; for example, the location of stress in a multisyllabic word is somewhat dependent on the suffix of that word (see Carlisle, 2000) with some suffixes (e.g., “ity” and “tion”) resulting in a stress placement shift, so *eLECtric* becomes *elecTRICity*, while others (e.g., “ness”) do not. Prosodic sensitivity is therefore theorized to influence monosyllabic word reading (and spelling) via the mechanisms above, but can be considered particularly important for decoding multisyllabic words, which require the additional skill of stress assignment (one prosodic feature), and morphological awareness may support this process. In more recent models of literacy development (e.g., Nunes & Bryant, 2009) there has been an increased role for morphological awareness and studies have demonstrated an independent contribution beyond phonological awareness to both reading (e.g., Kirby, Desrochers, Roth, & Lai, 2008) and spelling (e.g., Deacon, Kirby, & Casselman-Bell, 2009).

In the only published examination of the Wood et al. (2009) model to date, Holliman, Critten et al. (2014) found in a sample of 75 five to seven-year-old children that morphological awareness and phonological awareness (rhyme) were strong mediators between prosodic sensitivity and word reading, and between prosodic sensitivity and spelling. This provided some support for the model, however as acknowledged by the authors, the findings were somewhat limited given the size and broad age range of the sample and the relatively low internal reliability for the prosodic sensitivity measure.

To summarise, the conceptual focus of the role of prosodic sensitivity in word reading and spelling has thus far suggested that its influence is exerted via other mediating variables. Indeed, in the aforementioned Holliman, Critten et al. (2014) study it is noteworthy that a direct pathway from prosodic sensitivity to word reading and spelling was not conceptualised and thus, was not examined. However it is plausible that, prosodic sensitivity might also have a direct role in word reading as stress assignment is necessary for reading aloud multisyllabic words. Certainly there is some empirical evidence for a direct role in word reading as while prosodic sensitivity is associated with vocabulary knowledge and phonological awareness, it can also predict word reading independently of this association (e.g., Holliman et al., 2008; Whalley & Hansen, 2006). Such findings have been replicated more recently (see Calet, Gutiérrez-Palma, Simpson, González-Trujillo, & Defior, 2015) where it was argued that prosodic sensitivity may have a direct effect on word reading. However, in both studies, and others in this area, morphological awareness was not assessed; therefore, it remains unknown whether prosodic sensitivity would have made an independent contribution to word reading had morphological awareness been controlled.

Whether prosodic sensitivity might also have some direct role in the learning of word spellings is less known given its under-exploration in the literature and the fact that there are no stress marks in the English orthography. However it is plausible that in orthographies such as Spanish or Greek, which include stress marks (e.g., ***cajón*** [drawer]) a direct influence may be more likely. Indeed stress awareness accounted for word spelling accuracy in 3rd grade Spanish children (Gutiérrez-Palma, Justicia-Galiano, Valencia-Naranjo, & Carpio-Fernández, 2016). In particular, the incorrect use of the stress mark was directly related to stress awareness, but not to phoneme awareness, while grapheme to phoneme errors were related to phoneme awareness but not to stress awareness. Stress awareness also accounted for word spelling accuracy in Spanish 5th graders (Defior, Gutiérrez-Palma, & Cano-Marín, 2012), but the above double dissociation was not found.

Therefore in order to further elucidate the role of prosodic sensitivity in early literacy development the present study is the first to examine whether prosodic sensitivity can explain unique variance in word reading and spelling in early readers after controlling for vocabulary knowledge, phonological, and morphological awareness. Furthermore as an improvement on Holliman, Critten et al. (2014) a larger sample of children (*N* = 93) drawn from a single cohort (Year 1) participated in this research and a more reliable measure of prosodic sensitivity was used.

Method

Participants

Ninety-three English-speaking children aged five to six years old (*M* = 69.28 months, *SD* = 3.67) in Year 1 participated in the study. Children were recruited from three primary schools in the West Midlands, UK, that were similar in terms of locality, proportion of males to females, and percentage of pupils with additional education requirements.

Measures

All measures in this study (except the new measure of prosodic sensitivity) were chosen because they are regularly used in the reading development field and have been standardized on UK and/or other English speaking populations.

Prosodic sensitivity; Prosodic sensitivity was assessed using the Brenda's Animal Park task (Holliman, 2016). This task was administered on a laptop using a Microsoft PowerPoint Presentation with audio files. During the task, children had to help the main character, Brenda, to overcome four different challenges on the animal park – these were carefully designed to capture a range of prosodic features such as stress, intonation, and timing. Children were asked to decide: 1) whether they heard a compound noun (e.g., "ladybird") or a noun phrase (e.g., "lady", "bird"), inspired by, and adapted from, the work of Kitzen (2001), Whalley and Hansen (2006), and Wells and Peppé (2003); 2) whether or not a word was articulated correctly based on the stress pattern (e.g., "kangaroo" verses "KANgaroo"), inspired by, and adapted from, the work of Wood (2006) and Holliman et al. (2008, 2010a, 2010b, 2012); 3) whether they were being *asked* something, implied by a rise in intonation (e.g., "/the farmer milks the cow"), or *told* something, implied by a fall in intonation (e.g., "\the farmer milks the cow"), inspired by, and adapted from, the work of Hadding and Studdert-Kennedy (1974) and Wells and Peppé (2003); 4) which of two utterances matched a "Ba-Ba" utterance based on the stress pattern; for example, BA ba BA (strong-weak-strong) would correspond with "Fish and Chips" (strong-weak-strong) rather than "Spaghetti" (weak-strong-weak), inspired by, and adapted from, the work of Kitzen (2001), Whalley and Hansen (2006), and Holliman, Williams et al. (2014). In line with other research in this area (e.g., Holliman, Critten et al., 2014) performance in each task was pooled into a global measure of prosodic sensitivity. The internal reliability (Cronbach's α) was .708.

Vocabulary knowledge; Receptive vocabulary was measured using the British Picture Vocabulary Scales III (Dunn, Dunn, Styles, & Sewell, 2009). During the task, children had to point to the picture (from a choice of four) that best fitted the word that was spoken aloud by the administrator. Reliability is built into the confidence bands (Dunn et al., 2009).

Phonological awareness; Phonological awareness was measured using the rhyme awareness and phoneme identification subtests of the Preschool and Primary Inventory of Phonological Awareness (Dodd, Crosbie, McIntosh, Teitzel, & Ozanne, 2000). During the rhyme task, children had to identify the non-rhyming word from a choice of four that were spoken aloud by the administrator. During the phoneme task, children had to orally produce the first sound of a word that was spoken aloud by the administrator and accompanied by a picture of that word. Dodd et al. report internal reliability (Cronbach's α) of .83. and .92 respectively.

Morphological awareness; Morphological Awareness was measured using the Morphology Completion subtest of the Test of Oral Language Development: Primary – Fourth Edition (Newcomer & Hammill, 2008). During the task, children had to orally complete a sentence (using the appropriate morphological form) that was spoken aloud by the administrator with the last word missing. Newcomer and Hammill report internal reliability (Cronbach's α) of between .91 and .94.

Word reading; Word reading was measured using the Word Reading subtest of the British Ability Scales III (Elliott & Smith, 2011). During the task, children were presented with a list of 90 words of increasing difficulty and had to read aloud as many words as possible. Elliott and Smith report internal reliability (Cronbach's α) of .99.

Spelling; Spelling was measured using the Spelling subtest of the British Ability Scales III (Elliott & Smith, 2011). During the task, children had to write up to 75 single words that were spoken aloud three times by the administrator; first in isolation, then in a sentence, and then finally in isolation for a second time. Elliott and Smith report internal reliability (Cronbach's α) of .96.

Procedure

Participant information sheets and opt-out 'assent' forms were sent to the parents/guardians of children via the school. Data were collected in October 2013 to January 2014 by two experienced research assistants. The assessments were administered in a fixed order over three sessions: the BAS III Word Reading subtest and the Brenda's Animal Park task; the BAS III Spelling subtest and the Rhyme Awareness and Phoneme Identification task from the Primary Inventory of Phonological Awareness; and finally, the British Picture Vocabulary Scales III and the Morphology Completion subtest of the Test of Language Development: Primary – Fourth Edition.

Results

Descriptive statistics for all assessments (prosodic sensitivity, vocabulary, phonological awareness, morphological awareness, reading, and spelling) are presented in Table 1.

<TABLE 1 NEAR HERE>

The mean standardized scores (where available) on all assessments in this study fell within the normal range. Normal distributions were observed on most assessments with the exception of prosodic sensitivity (z = 2.11), which was positively skewed, and phoneme identification (z = -9.90), which was negatively skewed. The former was corrected using a log transformation. For phoneme identification, it was intended apriori that a composite measure of phonological awareness would be constructed by obtaining z-scores for each phonological measure – rhyme awareness and phoneme identification – and adding them together. This composite measure was still significantly skewed; therefore, this was corrected using reflect and a log transformation. Note: transformed variables were included in the hierarchical regression analysis that follows.

Bivariate (zero-order) correlations between these variables are presented in Table 2.

<TABLE 2 NEAR HERE>

It can be seen from the bivariate (zero-order) correlations that prosodic sensitivity was significantly correlated with all other measures in this study. In order to examine whether prosodic sensitivity can explain unique variance in word reading and spelling in early readers independently of its association with vocabulary, phonological, and morphological awareness a hierarchical regression analyses was used (Table 3). The order of entry (steps) was based on Holliman, Critten et al's. (2014) conceptual model of the prosody-literacy relation. The data met the assumptions for a hierarchical regression analysis. The transformed variables (noted previously) were included for prosodic sensitivity and phonological awareness.

<TABLE 3 NEAR HERE>

It can be seen from Table 3 that the model predicted 29.5% of the variance in word reading and 35.1% of the variance in spelling. In each case, vocabulary at Step 1 was able to make a significant contribution; however, it was unable to make an independent contribution after controlling for the other variables. After vocabulary had been accounted for, phonological awareness was able to account for an additional 7.3% of the variance in word reading, R^2 change = .073, $F(1, 86) = 7.742$, $p = .007$, and 12.6% of the variance in spelling, R^2 change = .126, $F(1, 86) = 14.748$, $p < .001$; it was also able to make an independent contribution to after controlling for the other variables. After vocabulary knowledge and phonological awareness had been accounted for, morphological awareness was able to account for an additional 6.7% of the variance in word reading, R^2 change = .067, $F(1, 85) = 7.689$, $p = .007$, and an additional 7% of the variance in spelling, R^2 change = .070, $F(1, 85) = 8.916$, $p = .004$; it was also able to make an independent contribution to after controlling for the other variables. However, once all other variables – vocabulary, phonological awareness, and morphological awareness – had been accounted for, prosodic sensitivity was able to explain a significant amount of unique variance (3.8%) in word reading, R^2 change = .038, $F(1, 84) = 4.537$, $p = .036$; however, it was unable to make a significant independent contribution to spelling, R^2 change = .016, $F(1, 84) = 2.045$, $p = .156$.

Further exploratory analysis

Prosodic sensitivity was found to account for unique variance in word reading (but not spelling); however, the word reading measure that was chosen in this study – the British Ability Scales III – did not distinguish between monosyllabic and multisyllabic words. In a further exploratory analysis, we disaggregated full scores on the word reading measure to obtain separate scores for monosyllabic and multisyllabic word reading. Recall that while prosodic sensitivity is theorized to influence both monosyllabic and multisyllabic word reading, it is considered particularly important for decoding multisyllabic words, which require the additional skill of stress assignment (one prosodic feature). A hierarchical regression analyses was once again used (Table 4) following the same entry (steps) as before to see whether prosodic sensitivity can explain unique variance in ‘monosyllabic’ and ‘multisyllabic’ word reading independently of its association with vocabulary, phonological, and morphological awareness. The measure of ‘multisyllabic’ word reading was positively skewed (z = 8.27) and subsequently corrected using a log transformation.

<TABLE 4 NEAR HERE>

It can be seen from Table 4 that the model predicted 28.1% of the variance in monosyllabic word reading and 32.6% of the variance in multisyllabic word reading. Vocabulary at Step 1 was able to make a significant contribution to monosyllabic, but not multisyllabic word reading; however, it was unable to make an independent contribution after controlling for the other variables. After vocabulary had been accounted for, phonological awareness was able to account for an additional 6.3% of the variance in monosyllabic word reading, R^2 change = .063, $F(1, 86) = 6.533$, p = .012; however, it was unable to account for additional variance in multisyllabic word reading, R^2 change = .002, $F(1, 47) = .116$, p = .735. Phonological awareness was also unable to make an independent contribution to monosyllabic or multisyllabic word reading after controlling for the other variables. After vocabulary knowledge and phonological awareness had been accounted for, morphological awareness was able to account for an additional 6.8% of the variance in monosyllabic word reading, R^2 change = .068, $F(1, 85) = 7.638$, p = .007, and a greater 13.9% of the variance in multisyllabic word reading, R^2 change = .139, $F(1, 46) = 7.902$, p = .007; it was also able to make an independent contribution after controlling for the other variables. However, once all other variables – vocabulary, phonological awareness, and morphological awareness – had been accounted for, prosodic sensitivity was able to explain a significant amount of unique variance (3.8%) in monosyllabic word reading, R^2 change = .038, $F(1, 84) = 4.461$, p = .038, and a greater 13.5% of the variance in multisyllabic word reading, R^2 change = .135, $F(1, 45) = 8.993$, p = .004.

Discussion

This study set out to examine the independent contribution of prosodic sensitivity to word reading and spelling in a sample of five and six year old early readers. It was found that prosodic sensitivity can predict word reading (but not spelling) independently of its association with vocabulary knowledge, phonological, and morphological awareness. In a further exploratory analysis, it was also found that prosodic sensitivity (and morphological awareness), when compared with vocabulary and phonological awareness, accounts for more unique variance in multisyllabic relative to monosyllabic word reading (although it is significantly predictive of both word reading measures).

As expected from the Wood et al. (2009) model and a wealth of past studies the variables suggested to mediate between prosody and literacy, namely phonological awareness comprising both phoneme and rhyme (Anthony & Lonigan, 2004; Bus & van Ijzendoorn, 1999; Cain, 2010; Snowling, 2000) and morphological awareness (e.g., Deacon et al., 2009; Kirby et al., 2008; Nunes & Bryant, 2009) were able to make independent contributions to reading and spelling when all other variables were controlled for. Vocabulary made a contribution when entered to the model alone but not when the other variables were entered supporting the assertion that its primary effect is on phonological awareness (Walley, 1993) which then in turn influences literacy as mentioned above.

However, the notable finding from the present study is the direct role of prosodic sensitivity in reading that was not predicted by the Wood et al. (2009) model. This model and the subsequent empirical assessment by Holliman, Critten et al. (2014) only considered a contribution from prosody to word reading and spelling mediated by other variables. However, we posited that prosodic sensitivity facilitates the development of phonological representations of words not only in terms of segmental phonology (e.g., phonemes and rhymes) but also suprasegmental phonology, particularly word stress. Given that reading multisyllabic words necessarily requires stress assignment, it was plausible that there would be a direct link between prosodic sensitivity and reading accuracy, as supported by the present findings and consolidating previous studies, in both English (e.g., Holliman et al., 2008) and Spanish (e.g., Calet et al., 2015; Defior et al., 2012) that had not accounted for vocabulary or morphological awareness. Indeed, the further exploratory analysis provides evidence of an enhanced effect of prosodic sensitivity on multisyllabic relative to monosyllabic word reading, which is an intuitive finding. It was, however, also able to predict monosyllabic word reading independently of its association with vocabulary, phonological awareness, and morphological awareness. Therefore, the present results can be considered as a more concrete indictment of the link from prosodic sensitivity to reading as all the relevant variables, according to the Wood et al. model, were controlled for.

Contrary to word reading, the present results show that prosodic sensitivity does not make a unique contribution to spelling, contrary to findings from other orthographies, namely Spanish (Defior et al., 2012; Gutiérrez-Palma et al., 2016). The English orthography does not include any stress marks and therefore, it could be posited that prosodic sensitivity does not play a role in the learning of a direct relationship between stress and orthography. When reading aloud a word, it is necessary to assign stress as part of word production, regardless of a word's orthography. However, when spelling a word, it is not strictly necessary to think about stress assignment. This is particularly true for orthographies that do not include any stress marks (e.g., English). In spite of that, it could be argued that there are still some stress regularities, and that prosodic (stress) sensitivity could be useful for learning them. For example, Kelly, Morris, and Verrekia (1998) found that final double letters indicate final stress in English (e.g., discuss, giraffe). Children with more prosodic sensitivity may then have an advantage when learning these regularities and thus spelling these words. However, testing this hypothesis is beyond the scope of the present study as words containing this type of regularities were not included.

Further to the aforementioned explanation, there are other possibilities to explain why we did not find a direct relationship with spelling. Prosody may only have an indirect influence mediated by phonological and morphological awareness as demonstrated by Holliman, Critten et al. (2014). A second possibility is that the relationship was not uncovered by this particular study due to limitations in the methodology and sample age. Future studies could use a spelling test containing more multisyllabic words with stress regularities of the type mentioned above. Furthermore, if a direct relationship is more likely to be found with multisyllabic word spelling (given the reading result) then a spelling test containing more multisyllabic words would have to be given to older children. The children in this sample were unable to spell the multisyllabic words presented in the test (although they were able to read many of them) as they were too young. There may be developmental differences in how prosody influences spelling compared to reading and in monosyllabic versus multisyllabic words and given multisyllabic word spelling is bound up with morphological knowledge this wouldn't necessarily be evident with a sample of this age group.

Overall, the present results add evidence that prosodic sensitivity makes a unique contribution in learning to read while its relationship to spelling requires further exploration. Although Holliman, Critten et al. (2014) did not directly test this possibility, the present results suggest that a model including a direct pathway between prosodic sensitivity and reading would be more accurate. Moreover, including such a pathway would make the model able to integrate the results obtained in other languages, such as Spanish, and then to contribute to a general science of reading (Share, 2008). Finally, a practical implication of these results is that prosodic sensitivity may be considered in assessment and intervention techniques in order to improve word reading in young children.

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Table 1

Summary statistics for children on all measure in this study

Task	Mean	Skewness	Kurtosis	Std. Dev.
Prosody (Max = 56)	35.52	2.11	-.69	6.18
Vocabulary (Max = 168)	82.46	-.92	.94	11.78
Rhyme (Max = 12)	7.02	-.49	-2.19	2.97
Phoneme (Max = 12)	11.84	-9.90	12.72	1.08
Morphology (Max = 38)	17.45	-.68	-.47	5.89
Word Reading (AS)	84.59	1.38	.06	35.09
Spelling (AS)	88.91	.16	3.52	27.64

Note. The mean scores presented above are ‘raw scores’ apart from word reading and spelling which are ability scores (AS). For those tests with associated norms these raw scores equate to a mean standardised score that falls in the ‘normal’ range.

Table 2

Correlation matrix between the measures in this study

	1	2	3	4	5
1. Prosody					
2. Vocabulary	.46***				
3. PA	.21*	.32**			
4. Morphology	.41***	.65***	.34***		
5. Word Reading (AS)	.39***	.34**	.39***	.46***	
6. Spelling (AS)	.35**	.37***	.48***	.49***	.89***

Note. Bivariate correlations (Pearson) are presented above using ‘raw scores’ for prosody, vocabulary, phonological awareness (PA), and morphology and ability scores (AS) for word reading and spelling.

*p<.05; **p<.01; ***p<.001

Table 3

Hierarchical multiple regression analysis

Predictor	Word Reading			ΔR^2	Spelling			ΔR^2
	B	*SE B*	β		*B*	*SE B*	β	
1. Vocabulary	-.088	.376	-.030	.117**	-.013	.284	-.006	.140***
2. PA	-40.722	18.625	-.216*	.073**	-46.007	14.071	-.310**	.126***
3. Morphology	1.846	.743	.310*	.067**	1.549	.561	.330**	.070**
4. Prosody	107.863	50.638	.222*	.038*	54.706	38.257	.143	.016

Note. Hierarchical multiple regression analysis predicting word reading and spelling from vocabulary (Step 1), phonological awareness (Step 2), morphological awareness (Step 3), and prosodic sensitivity (Step 4). Tabled values are presented in nonstandardized regression coefficients (*B*) with standard errors (*SE*), standardized regression coefficients (β) in the final model and changes in R^2 (ΔR^2) after controlling for variables entered at preceding steps. The inclusion of age did not alter the results and therefore was not included in the regression models.

*$p<.05$; **$p<.01$; ***$p<.001$

Table 4

Hierarchical multiple regression analysis

Predictor	Monosyllabic Words			ΔR^2	Multisyllabic Words			ΔR^2
	B	*SE B*	β		*B*	*SE B*	β	
1. Vocabulary	-.030	.119	-.032	.111**	-.009	.006	-.226	.050
2. PA	-11.527	5.902	-.195	.063*	.133	.321	.055	.002
3. Morphology	.583	.235	.312*	.068**	.033	.013	.428*	.139**
4. Prosody	33.890	16.046	.222*	.038*	2.618	.873	.417**	.135**

Note. Hierarchical multiple regression analysis predicting monosyllabic and multisyllabic word reading from vocabulary (Step 1), phonological awareness (Step 2), morphological awareness (Step 3), and prosodic sensitivity (Step 4). Tabled values are presented in nonstandardized regression coefficients (*B*) with standard errors (*SE*), standardized regression coefficients (β) in the final model and changes in R^2 (ΔR^2) after controlling for variables entered at preceding steps. The inclusion of age did not alter the results and therefore was not included in the regression models.

*p<.05; **p<.01; ***p<.001