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## On the accessibility of phonological, orthographic, and semantic aspects of second language vocabulary learning and their relationship with spatial and linguistic intelligences

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### ABSTRACT

The present study was an attempt to investigate the differences in the accessibility of phonological, semantic, and orthographic aspects of words in L2 vocabulary learning. For this purpose, a sample of 119 Iranian intermediate level EFL students in a private language institute in Karaj was selected. All of the participants received the same instructional treatment. At the end of the experimental period, three tests were administered based on the previously-taught words. A subset of Gardner's (1983) Multiple Intelligences questionnaire was also used for data collection. A repeated measures one-way ANOVA procedure was used to analyze the obtained data. The results showed significant differences in the accessibility of phonological, semantic, and orthographic aspects of words in second language vocabulary learning. Moreover, to investigate the relationships between spatial and linguistic intelligences and the afore-mentioned aspects of lexical knowledge, a correlational analysis was used. No significant relationships were found between spatial and linguistic intelligences and the three aspects of lexical knowledge. These findings may have theoretical and pedagogical implications for researchers, teachers, and learners.

**Keywords:** linguistic intelligence; orthography; phonology; semantics; spatial intelligence; vocabulary learning

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## Introduction

There is little doubt that vocabulary, as a central component of language, is crucial to a language learner (Grass & Selinker, 1994). Everyone has a mental lexicon which is a language user's knowledge of words and the representation of that knowledge about words in his/her mind. Mind is like a computer, and knowledge of words is stored there like a dictionary (Elman, 2004).

Vocabulary can be defined as the words we must know to communicate in a good way. Teachers have always desired to find ways to improve learners' vocabulary both quantitatively and qualitatively (Schmitt, 2008). Vocabulary knowledge is improved when learners encounter new words several times in context through reading and listening.

If we do not know words we cannot convey any messages, but if we do not know grammar we can somehow convey our messages. This shows the importance of vocabulary in communication and language teaching (Wilkins, 1972). Words are important because they play an important role in clarifying our thoughts. Learning vocabulary will increase one's competence; the person who has more vocabulary knowledge has more self-confidence, and is more motivated to talk and to learn (Meara, 1997).

Developing vocabulary knowledge has always been a challenge for many language learners. In order to learn words, not only should we know their definition, but also we need to pay attention to many other aspects including phonology, morphology, orthography, and semantics. All these properties together constitute word knowledge. Of particular concern here is the question of which aspect of the word is more easily activated in the process of vocabulary recall. Knowing this will be very helpful in selecting and implementing better strategies for improving the underdeveloped aspects of L2 vocabulary.

Apart from the aspect of word knowledge, another important factor to consider is the learners' intelligence profile. Students have different intelligence profiles and, according to Gardner (1983), it is very important that teachers take into account these intelligences because they cause individual differences in learners and affect the learning process. In other words, different learners may learn various aspects of words differently partially depending on the intelligence profile they have.

### *Purpose of the study*

The purpose of this study was to find out which of the different aspects of word knowledge are retrieved more easily in the process of lexical development. Another purpose of this study was to investigate the possible relationships between spatial and linguistic intelligences, on the one hand, and EFL learners' knowledge of the orthographic, phonological, and semantic aspects of vocabulary, on the other.

*Research questions*

The present study addressed the following research questions:

1. Are there any significant differences in the accessibility of phonological, semantic, and orthographic aspects of words in L2 vocabulary learning?
2. Is there any relationship between the multiple intelligences (Spatial and Linguistic) and the different aspects of lexical knowledge?

**Review of the related literature***Aspects of words*

A word involves much more than simply the knowledge of meaning and form (Aitchison, 1994). Richards (1976) holds that word knowledge involves knowing about the word's frequency, register, position, word forms, the network of associations between that word and other words, as well as the meaning and the meaning-associations of the word plus the word's part of speech. Likewise, Qian (1998) identifies the following aspects of a word: pronunciation, spelling, different meanings, connotations, inflections and derivations, syntactic properties, appropriate use, collocations, semantic associations, and idioms that contain that new word. In much the same vein, Nation (1990), Nation (2001), Schmitt (1995), and Webb (2007) identify different aspects of vocabulary knowledge that a learner needs to have. Thus, as Paribakht and Wesche (1996) rightly put it, knowledge of words should involve a little more than connecting meaning to form.

Vocabulary teaching has long been a major concern of L2 researchers and teachers. Although many studies have been carried out to find the way L2 vocabulary might be learnt more efficiently (Zarei & Arasteh, 2011), few have compared three of the most common aspects (i.e., phonological, semantic, and orthographic aspects) of vocabulary in terms of their accessibility.

Brown (2001) states that multiple aspects of word knowledge need to be mastered by learners. Furthermore, Ellis (1995) holds that there are different aspects that need to be accessed for different channels of Input/output (I/O). Zarei and Gholami (2007) maintain that studies on the mental lexicon of bilinguals indicate that words are classified into semantic and phonological networks in a way that the learned word interacts with other words on the basis of these two aspects. However, research findings on these topics are mixed.

Currently, there seems to be an ongoing controversy as to which aspect of vocabulary is accessed before the others. The following three aspects are the main focus of attention in this study.

### *Meaning*

Evans (2006) defines word meaning as a concept related to the semantic values that is associated with individual lexical items, namely words or lexical semantics. It is clear that what words mean is different from how they mean, or indeed what they intend to mean (Crystal, 2003). Thompson and Mooney (2003) define semantic lexicon as a component which is rather time-consuming to build and update.

The first step in the vocabulary acquisition process is establishing the basic form-meaning links, and this is the aim of a vast majority of vocabulary materials and activities (Schmitt, 2008). According to Aitchison (1994), there are three different but related tasks in acquiring word meaning. The first task is labeling, which refers to making a relationship between concept sign and referent. Clarke (1993) refers to this process as mapping. The second task is packaging, which refers to the process of discovering things that can be packed together under one label. The third task is called network building, which refers to the process of discovering the intentional links between words (Aitchison, 1994).

It is clear that the meaning of a concept or word should be sought in the context in which the word occurs (Erk, 2007). Dooling and Christiaansen (1977) suggest that the role of semantic aspect of vocabulary will be greater when more abstract concepts are processed.

Fluency also refers to the rate at which a person accesses the meaning of a word. Access to word meaning will be faster when word meaning becomes strengthened through different exposures (Wolf, Miller, & Donnelly, 2000).

### *Form (Phonology and Orthography)*

Knowing the written and the spoken forms (orthography and phonology) of words is very important. Orthography is defined as the phonological conversion (Fith, 1985), and the ability to show the string of letters that make up a printed word, along with the general aspects of the writing system is referred to as orthographic coding (Vellutino, Scanlon, & Tanzman, 1994).

Initially, the job of beginners is to establish a match between the graphemes of written words and the phonemes of spoken words (Ehri, 1997). Ellis, Tanaka, and Yamazaki (1994) are of the opinion that learning word forms involves different processes from those involved in learning word meaning. Previous research seems to suggest that second language learners usually have difficulty with word forms, especially the written forms (Laufer, 1989). Bogards (2001) recommends that teachers focus on more direct teaching of forms; owing to the limited processing capacity of the mind, there is a trade-off between focus on meaning and attention to forms. This implies that in vocabulary teaching there needs to be a balance in teaching different aspects of words to make learners efficient.

Orthographic information helps word recognition. A number of studies have demonstrated that semantic variables also affect word recognition processes (Lupker, 2005). Therefore, it sounds

cogent that semantic learning may lead to orthographic development. Adams (1990) acknowledges that differences in learners' knowledge of the alphabet cause variance in learners' word recognition.

In the field of experimental psychology, research on printed vocabulary recognition has been considered as one of the most active aspects. Understanding the stages of spelling development will help teachers know which word study activities are most appropriate for students. These stages of spelling development describe students' spelling behavior while they move from one level of word knowledge to another (Katz & Frost, 1992).

At the same time, the attention of many researchers has been drawn to the role of the orthographic processing skill (OPS). In spite of observations based on which recent measures of OPS are known principally as indicators of reading and spelling, OPS is usually distinct from both reading achievement and phonological aspects (Burt, 2006). Hoxhallari (2000) offers the orthographic depth hypothesis, which states that the ways leading to fluent reading are dependent on certain orthography. However, reading literature analyses do not indicate any theory in which OPS is considered to have a meaningful role in reading acquisition. Orthographic Processing Skill (OPS) organizes knowledge of spelling and fluent word identification, and there is insufficient evidence to support any directional hypothesis based on which its development relies on phonological processes (Burt, 2006).

Phonological ability or phonological awareness has also a very important role in determining the way we pronounce words (Lupker, 2005). It appears that all these processes are interrelated and that mastery over one of these aspects influences the mastery over other aspects. While semantics has to do with sentence interpretation, phonetics and phonology deal with sentence utterance. There are several reasons why phonetics and phonology are important and need to be taken into account. For one thing, the study of the phonetics of a foreign language can give us a much better potentiality to teach pronunciation. It may also provide an insight into how the human mind works (Forel & Puskas, 1986).

Another aspect of lexical knowledge is orthography. Despite the relative plethora of research on different ways of solving the problem of how to represent spoken language in print, further research is needed to investigate the nature and progress of orthographic representations in experimental studies (Burt, 2006). Katz and Frost (1992) believe that orthography is important for two reasons. First, the main purpose of writing systems is primarily to represent spoken language and, therefore, finding the imprint of spoken language within the processes leading from the printed word recognition to the comprehension of the phrase seems to be at least a plausible explanation. Second, there has been a rather large amount of data supporting this claim.

Burt (2006) defines literacy as a braid of intertwining threads in which the interwoven threads of oral language begin the braid, and an orthographic thread is interwoven while learners experiment with putting ideas on paper. Since the unique structure of an orthography related to a certain language may influence the acquisition of reading skills in that language, the threads of literacy start to bond as learners begin to read (Kerek & Niemi, 2009). Orthography, then, strengthens this bonding. This implies that the orthographic knowledge develops as the size of the braid and its

threads strengthen. Therefore, matching a string of letters with a representation of the words' orthography learned through experience with print is thought to be the identification of a visually represented word (Burt, 2006). However, there are differences in the degree to which alphabetic orthographies are regular in their representation of sounds (Hoxhallari, 2000).

The purpose of this study was to consider which of these related aspects is activated better in the retrieval process. This would help teachers and learners make more informed decisions about which aspect needs more consideration in the process of word recognition.

### *Multiple intelligences*

Intelligence is a concept that explains all mental abilities that people have in learning or doing something (Sternberg, 2005). Gardner (1999) defines intelligence as the ability to process information that people use whenever they face a problem or want to do something. Tomlinson (2001) points out that educationalists should provide opportunities for learners to identify their own differences and potentials.

Contrary to the traditional intelligence tests in which the basic underlying assumption was that intelligence is a single, inborn capacity, impossible to change. Multiple Intelligences theory refers to a philosophy that characterizes intelligence in humans as having various dimensions. It is also thought that people are not equal in terms of the development of these dimensions, but they can work on different aspects of their intelligence to improve them.

Multiple intelligences theory has important implications for teaching, in general, and for language learning, in particular (Armstrong, 2007; Azar, 2006). It provides teachers with more choices in teaching and assessing methods and allows students to learn in the way that is best suitable to their talent (Abdulaziz, 2008). Borek (2003) states that it is very good to set classes based on students' intelligence because it is important to consider intelligence differences among individuals and allow them to express themselves more; this also allows teachers to set special methods for different learners.

Learners are characterized by a wide variety of individual differences, and dealing with these differences is very important for educationalists. Thus, teachers need to adjust their methods of teaching and their evaluative considerations according to those learners' differences (Alavinia & Farhady, 2012). Armstrong (2007) maintains that by presenting solutions such as using MI theory as an instructional plan, educationalists try to detect language learning problems and get the best results.

Christon (1996) believes that applying multiple intelligences model enables EFL teachers to individualize the learning environment and to create motivation (Temur, 2007). Uzunoç (2011) also believes that this theory is effective on students' achievement and their retention success.

Nowadays, teachers try to relate multiple intelligence models with learning styles and consider the benefits of using them to enhance learners' abilities and individual needs (Soleimani, Moinzadeh, Kassaian & Ketabi, 2012).

Several researchers have investigated the relationship between Multiple Intelligences theory and learning English. For example, Hajhashemi and Amirkhiz (2011) investigated the relationship between EFL learners' multiple intelligence differences and their language learning strategies. A low correlation was found between multiple intelligences and language learning strategies. Zarei and Mohseni (2012) investigated logical, interpersonal, verbal, and intrapersonal intelligences as predictors of grammatical and writing accuracy of 190 Iranian students; the results showed that both intrapersonal and interpersonal intelligences were predictors of grammatical accuracy and intrapersonal intelligence had a significant effect on predicting learners' writing accuracy.

The findings of a study by Akbari and Hosseini (2008) on the relationship between foreign language learners' MIs scores and their use of different language learning strategies showed positive relationships between the use of language learning strategies and intelligence scores, but no relationship between strategy use and musical intelligence.

In another study, Zarei and Shokri Afshar (2012) investigated multiple intelligence types as predictors of vocabulary knowledge and reading comprehension. They concluded that musical, interpersonal, kinesthetic and logical intelligences were predictors of reading, while musical, verbal, kinesthetic and natural intelligences were predictors of vocabulary knowledge.

Saricaoglu and Arikan (2009) investigated the relationship between students' gender and intelligence types and their success in grammar, listening and writing in foreign languages. Based on the result, there was no significant gender difference in the intelligence types except between gender and linguistic intelligence. Also, negative relationships were found between grammar and bodily-kinesthetic, spatial, and the intrapersonal intelligences, whereas the relationships between musical intelligence and writing were found to be significant and positive.

In sum, multiple intelligences are an important aspect of learning languages, and discovering students' multiple intelligences is one of the most important concerns of language teachers and researchers. Research on this concept has suggested that a number of these intelligences have been confirmed to be effective in teaching and learning foreign languages. For manageability reasons, from among the multiple intelligences, this study was focused on two, namely spatial and linguistic intelligences, to see which one is more conducive to the accessibility of the phonological, orthographic, and semantic aspects of words in L2 vocabulary learning.

## Method

### *Participants*

In the present study, a sample of 119 male and female (44 males and 75 females) Iranian EFL students studying English at Intermediate level of proficiency in a private language institute in Karaj was selected. The participants were in six different classes and were selected based on cluster sampling. They attended their classes twice a week for 20 sessions, and each session lasted for 105 minutes.

### *Materials and instruments*

This study used the following materials and data collection instruments: 1. A subtest of the Michigan Test of English Language Proficiency (MTELP) 2. A pretest 3. A subset of Gardner's multiple intelligences questionnaire measuring linguistic and spatial-visual intelligences, 4. Posttests. The instrument for determining the level of vocabulary knowledge was the vocabulary subtest of MTELP. The subtest was administered to the participants prior to the treatment to homogenize them in terms of their vocabulary knowledge. The version of the MTELP vocabulary subtest used in this study contained 40 vocabulary items, in multiple-choice format. To make sure that the participants had no prior knowledge of the target words, we administered the pretest. The pretest, which was developed by the researchers, included 100 sentences in each of which there was one target word underlined. The participants were required to write down the Persian equivalent of each word in front of it. The sentences were all extracted from Oxford Advanced Learners' Dictionary.

A subset of a Multiple Intelligences questionnaire was given to all learners to specify intelligence profiles. Since the concern of the study was to investigate the orthographic, phonological, and semantic aspects of language, only two types of intelligence (Spatial-Visual and Linguistic) were chosen as the more directly related types. The questionnaire included 20 statements and was extracted from Gardner's (1983) multiple intelligences questionnaire. Students marked each of the statements that best described them. The instructional materials included four units of 'Interchange', four units of 'Select Readings', and eight units of 'Hey There'.

Three posttests were also given to the participants at the end of the treatment. Each test included 25 questions in multiple-choice format and was utilized to measure one aspect of the target words including the semantic, phonological, and orthographic aspects. The orthographic test was in multiple choice format, but in some items students had to write the correct spelling of the scrambled letter strings of the words. These tests were content valid because they were directly based on the instructed words. Still, the content validity was checked by having eight experienced MA level teachers review and confirm the content validity of the tests. To estimate the reliability of the posttests, a KR-21 procedure was used, as a result of which the reliability index of the semantic, phonological, and orthographic tests turned out to be .81, .74, and .79, respectively.



### *Procedure*

In order to determine the homogeneity of the participants, a subset of MTELP was administered. The six classes of participants were presented with the same new words and the same reading comprehension passages each session. Ten new words were taught within 40 minutes at the beginning of the class each session. Sixty new words were taught during six sessions over a six-week period.

The method used in teaching new words was as follows: First, teachers pronounced each new word three to five times while students had to close their books and listen to the teachers' pronunciation very carefully. Then, students were asked to repeat the words after the teacher. Each word was repeated by the students four to five times, both individually and chorally. This activity took 10 minutes. Then, the teacher wrote each word on the white board, and showed the students the position of stress marks in every word. Next, the teacher offered a synonym for each word and gave an example for each word to make sure students learned how to use those words in sentences. Students had to write the new words in their notebooks. The duration of this activity was 20 minutes. Finally, the teacher read the text containing the new words to students and asked some general questions about the text, to make sure students learned how to use those words in sentences. This activity took 10 minutes. At the end of the experimental period, the three posttests were administered to all the participants. In a different session, the subset of the multiple intelligences questionnaire with the afore-mentioned characteristics was also administered to all the participants. They check-marked each statement that described them. For each statement that they marked they were given one point. The points were then tallied, and each participant had a general score on the linguistic intelligence and one on the spatial-visual intelligence. The obtained data were then summarized and prepared for statistical analysis.

A repeated measures one-way ANOVA and the Pearson correlation were used to analyze the collected data and to answer the first and second research questions, respectively.

## **Results and discussion**

### *Results*

The first research question sought to investigate whether or not there were any significant differences in the participants' knowledge of phonological, semantic, and orthographic aspects of words in L2 vocabulary learning. A repeated measures one-way ANOVA was used to answer this question. Descriptive statistics, including the mean, standard deviation, etc. are summarized in Table 1.

Table 1  
Descriptive statistics

	Mean	Std. Deviation	N
Meaning	21.13	2.20	119
Dictation	17.90	3.68	119
Pronunciation	22.07	1.99	119

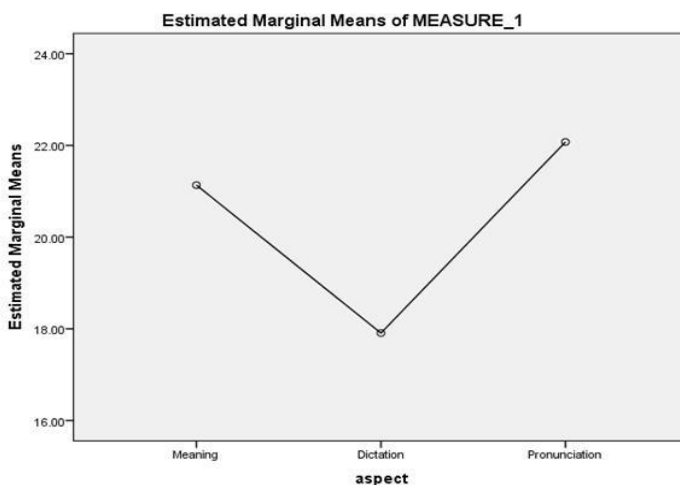


Fig 1. Performance of the participants regarding different aspects of word knowledge

To see whether or not the observed differences between the means are statistically significant, the repeated measures one-way ANOVA was used, the results of which are summarized in Table 2.

Table 2

The results of the one-way repeated measures ANOVA

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Sphericity assumed	1137.30	2	568.650	83.70	.000	.415
Greenhouse-Geisser	1137.30	1.669	681.324	83.70	.000	.415
Huynh-feldt	1137.30	1.669	672.815	83.70	.000	.415
Lower-bound	1137.30	1.00	1137.300	83.70	.000	.415

Based on Table 2, since the F-value is statistically significant ( $F= 83.70, p < .05$ ), we can safely claim that there are significant differences between the means of the different aspects of lexical knowledge. Partial Eta Squared value shows that more than 41 percent of the total variance among the groups is accounted for by the independent variable, aspect of word knowledge ( $\eta^2= .415$ ).

To locate the differences between the means, a post-hoc Scheffe' test was run, which yielded the following results:

**Table 3**

Multiple comparisons of means

(I)	Aspect aspect	(J)	Mean Difference (I - J)	Sig. <sup>b</sup>	95% Confidence interval for difference	
					Lower Bound	Upper Bound
	<b>Meaning dictation</b>		3.227*	.000	2.245	4.209
	<b>Meaning pronunciation</b>		-.941*	.003	-1.624	-.258
	<b>Dictation pronunciation</b>		-4.168*	.000	-4.936	-3.401

Based on estimated marginal means

\*The mean difference is significant at the .05 level

b. adjustment for multiple comparisons: benferroni

A look at Table 3 makes it clear that the differences between the meaning, dictation, and pronunciation aspects of vocabulary learning are all statistically significant. Therefore, by comparing the mean differences, it can be claimed that the participants' performance on the pronunciation test is significantly better than their performance on both meaning and dictation tests. At the same time, the statistically significant difference between dictation and meaning aspects indicates that meaning is significantly more accessible than dictation. In short, these results indicate that pronunciation is the most accessible and dictation is the least accessible aspect of lexical knowledge (among the three aspects studied).

The second research question attempted to investigate the relationship between the multiple intelligences (Spatial and Linguistic) and the different aspects of word knowledge. To this end, a correlation procedure was used. The results of the correlation procedure are given in the following table:

**Table 4**

Correlation between multiple intelligences and word aspects

		Dictation	Pronunciation	Meaning
Spatialintel	Pearson correlation	.120	.026	.011
	Sig.	.194	.782	.904
	N	119	119	119
Linguisticintel	Pearson correlation	.052	-.260	-.001
	Sig.	.573	.004	.990
	N	119	119	119

As Table 4 shows, there is a significant but negative relationship between linguistic intelligence and pronunciation ( $r = -.260, p < .01$ ). However, no other significant relationship can be seen between multiple intelligences under study, namely Spatial and Linguistic intelligences, and the different aspects of word knowledge, namely pronunciation, dictation, and meaning

## Discussion

The first research question of the present study attempted to investigate the accessibility of different aspects of word knowledge (pronunciation, meaning, and dictation) in EFL learners' vocabulary learning. The findings showed that there were significant differences between the phonological, semantic and orthographic aspects of word knowledge. Many studies have been carried out in the area of vocabulary and its various aspects (e.g., Laufer, 1997). However, few studies have focused on the comparison of these three aspects of word knowledge together.

The result of the present study indicates that there are statistically significant differences between the different aspects of word knowledge. This finding is in line with those of Day and Omura (1991), Dupcy and Krashen (1993), Gipe and Arnold (1979), Jenkins and Wysocki (1984), and Nagy (2005), who found that meaning and pronunciation of words are the first aspects to be activated.

One of the reasons accounting for this finding may be the communicative value of the aspects of word knowledge. In other words, pronunciation and meaning were retrieved sooner probably because they had a more salient role in communication. This may explain why orthography turned out to be the least accessible of the three aspects. It could be argued cogently that orthography is pertinent only to written communication and has no role in oral interactions. Even in written communication, spelling has no significant role. That may be why it is not attended to, and subsequently not readily available for productive use.

However, even communicative value cannot explain why pronunciation turned out to be more accessible than meaning. As in the case of orthography, it could be argued that pronunciation is only relevant in oral interactions and has no value in written uses of language. This argument aside, there is little doubt that meaning plays a much more important role in communication than pronunciation. This implies that there must be other factors involved. One such factor could be the attitude of the learners toward the target language. It might be that due to the positive attitude of this particular sample of learners in the Iranian context, they valued pronunciation and desired to sound like native speakers. Nonetheless, this counterintuitive finding calls for further research to be carried out in this little explored area.

The other finding of the present study was that there is no significant relationship between spatial and linguistic intelligences and different word aspects, namely pronunciation, meaning, and dictation. There is only one significant but negative relationship between linguistic intelligence and pronunciation. These findings are in accordance with those of Razmjoo (2008) and Saricaoglu and Arikan (2009), who found no relationship between MI types vocabulary knowledge.

## Conclusion

The results of the present study showed that among the phonological, semantic, and orthographic aspects of words in second language vocabulary learning, the phonological aspect seems to be the

most accessible, followed closely by the semantic aspect, with the orthographic aspect being the least accessible aspect.

As the results showed, it seems that phonological, semantic, and orthographic aspects of words in second language vocabulary learning are not equal in their accessibility. It can, therefore, be concluded that each of the afore-mentioned word aspects as well as their relationship with linguistic and spatial intelligences might be affected by a multitude of peripheral parameters.

To conclude, this study might have shed some light on some of the surrounding issues attributable to the accessibility of pronunciation, meaning, and dictation as word aspects in L2 vocabulary learning as well as their correlations with linguistic and spatial intelligences. However, it has to be acknowledged that more issues might have been raised here than resolved. This further signifies the need for more research on this topic.

Those who are interested in carrying out further research in this area may investigate the effect of various teaching techniques on developing the different aspects of word knowledge. The findings of this study, coupled with those of other relevant studies, can then enable educators to make more informed decisions as to which aspects of lexical knowledge to emphasize and what teaching techniques to use to develop each aspect of learners' lexical knowledge.

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