

Research Article

The Impact of Morphological Awareness Intervention in Enhancing L2 Postgraduate Students' Productive Vocabulary Breadth

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The significance of vocabulary knowledge in academic development and having a sufficient vocabulary in language learning cannot be overstated. Research has shown that postgraduate students studying English as a second language (L2) lack vocabulary and require improving it. This research study was conducted to investigate the role of morphological awareness and its relation to productive vocabulary breadth and explore the function of teaching L2 postgraduate students in intervention for improving their productive vocabulary breadth. Thirty L2 postgraduate participants were involved in an intervention. The intervention included 11 sessions of morphological awareness instructions. The students' morphological awareness was tested using the Morphological Identification Test (MIT) and the Morphological Structure Awareness Test (MSAT), while productive vocabulary breadth was tested using the Productive Vocabulary Level Test (PVL). A significant relationship was found between morphological awareness and productive vocabulary breadth. The synthetic aspect of morphological awareness was more closely related to the participants' productive vocabulary breadth than the analytic aspect. The morphological awareness intervention was effective and beneficial in increasing the students' productive vocabulary breadth. The results may indicate the benefits of teaching and learning morphology to L2 postgraduate students, especially for effective vocabulary building.

1. Introduction

Vocabulary is fundamental for learning a language and is particularly vital for English language learners [1–4]. Many studies on vocabulary L2 have shown the importance of having adequate words that can be used in the target language productively [5–9]. College learners have different goals to succeed academically [10].

Tertiary level students need a good receptive English command to have access to studies and research related to their field of study. They, nevertheless, require good productive

academic language knowledge due to the different tasks involved, including dissertations, theses, essays, and tasks [11–13]. For language learners, vocabulary is vital for developing language skills and creating meaning. The development of learners' language relies heavily on vocabulary, so they should expand their vocabulary as they progress by implementing a vocabulary-building strategy that will enable them to overcome the issue of insufficient vocabulary and allow them to succeed in their studies [14]. Having insufficient vocabulary is considered a hurdle to learners' linguistic development and causes problems for their academic success [11],

which may be attributed to their poor linguistic awareness, particularly their morphological awareness. Aldawsari [15] revealed that L2 postgraduate students at New Zealand universities had a problem of lack of general and academic vocabulary. The students had no extensive vocabulary. This inadequacy of vocabulary was caused by key factors: lack of explicit vocabulary training and inefficient and ineffective vocabulary learning strategies.

The morphological understanding of combining morphemes to construct and acquire new words is one of the vocabulary learning strategies. Kieffer and Lesaux [16] suggested that learners could increase their vocabulary by understanding the morphology. Awareness of morphology includes comprehension of meaning and sounds and knowing the rules of combining morphemes in language for word formation. Shoeib [17] indicated that morphological awareness could help promote vocabulary in an academic setting. Jiang and Kuo [18] also supported the importance of morphological awareness as a crucial factor in English vocabulary expansion and suggested that morphological awareness could facilitate the processes of understanding, retrieving, and restoring vocabularies that contain many morphemes. According to Sukying [19], "learning to recognize morphemes (affixes) and patterns within words could help learners to have a better understanding of how words relate to one another, which may facilitate the efficiency of learning new words." (p. 139).

The study of linguistic morphology involves analyzing word structure and formation, determining how the vocabulary is formed internally [20]. A morpheme is a meaningful word section that a reader can use to understand the meaning of an unknown word [21]. It is the smallest section of a word with constant form and meaning [22]. The meaning and function of a morpheme, as Coates [23] stated, are constant among words that have a relative meaning (as for *re-* in *retype* and *rebuild*).

By studying morphology, students can analyze English words from an orthographic and semantic perspective and learn how English words relate to one another. During their study of English, English learners may encounter unusual words; however, they can simplify these uncommon words by understanding the context in which English words are used and by recognizing the patterns followed. Recognizing the parts of words and understanding their meaning receptively are beyond this study's goal. The study aimed to examine how awareness of morphology and the smallest meaningful parts of a word were related to the L2 postgraduate students' productive vocabulary breadth.

Morphological awareness includes analytic and synthetic aspects [20]. The analytic aspect refers to the ability to decompose a word into its smallest meaningful parts (morphemes), while the synthetic aspect is related to the skill of deriving new forms and meanings of a word and the ability to make new words by reassembling smaller parts and meanings. Therefore, the study also investigated whether both morphological awareness aspects and the breadth of productive vocabulary between L2 postgraduate students were correlated. Additionally, the study examined

the association between morphological awareness and L2 postgraduate students' levels of vocabulary breadth. Moreover, the study examined the students' productive vocabulary breadth after receiving a morphological awareness intervention and whether teaching L2 postgraduate students about morphology could improve their productive vocabulary breadth or not.

2. Literature Review

2.1. Morphological Awareness Intervention. Theoretically, an intervention for improving morphological awareness has been shown to its significant implications among children with language deficits [24–27]. Instructions in morphological awareness have been shown to have a significant implication in enhancing children's performance with learning disabilities regarding decoding [28–30], word reading [31, 32], reading [31, 33], spelling [28, 32], and vocabulary [33, 34].

Additionally, morphological awareness interventions contributed to developing learners' phonological awareness [35–38], reading [39, 40], and their word reading abilities [41, 42]. A morphological awareness intervention was conducted in this current study among L2 postgraduate students to investigate its effect on the breadth of their productive vocabulary.

Previous studies, such as Al Farsi [43], Ferguson [44], and Khodadoust et al. [45], recommended teaching L2 learners of English about morphology in a morphological awareness intervention as an effective strategy to enhance their vocabulary development. Friedline [46] emphasized the effect of instructions in morphological awareness on improving learners' abilities to break down words into their components (i.e., affixes and roots), enabling the learners to create new words easily. Friedline [46] argued that, due to the difficulty of academic vocabulary, learners of English needed to build academic vocabulary by acquiring morphological awareness because the majority of academic words consist of word parts, and in addition to building academic words, understanding morphology would facilitate the retention of newly learned vocabulary.

Al Farsi [43] claimed that teaching morphological information can be done in various ways such as through morphological analysis and posters of affixes and related word pictures. Teachers should utilize methods that better suit the students' level and needs. Learners of English acquire morphemes based on the complexity of the morphemes. Inflectional morphemes are considered less complex than derivational morphemes since they do not affect the meaning of words where nouns, verbs, or numbers receive modification, which does not involve changes in their meanings [47]. Meanwhile, derivational morphemes establish lexical and grammatical changes and affect the meaning of words attached to them [48]. Thus, the present study focused on teaching derivational morphemes to L2 postgraduate students in a morphological awareness intervention.

2.2. Related Studies. Literature related to morphological awareness has revealed that morphological awareness was associated with L2 learners' receptive vocabulary

[3, 45, 49, 50]. The focus of the studies was to explore the relationship of morphological awareness with receptive vocabulary since high morphological awareness was hypothesized to positively influence the students' receptive vocabulary knowledge and increase their receptive vocabulary size [51].

For example, Sparks and Deacon [52] conducted a study in which they concentrated on determining the correlation of morphological awareness with receptive vocabulary knowledge. Morphological awareness was found to predict receptive vocabulary knowledge. Sumarni [50] investigated the relationship between morphological awareness and receptive vocabulary breadth (RVB). Sumarni [50] used the test to assess the RVB of the participants. The findings, unsurprisingly, revealed a link between morphological awareness and RVB. The results also revealed that the students' Morphological Identification Test (MIT) scores were higher than their Morphological Structure Awareness Test (MSAT) scores. The correlation between RVB and MSAT was insignificant, whereas vocabulary breadth was significantly associated with MIT scores. Akbulut [49] investigated the association between morphological awareness and Turkish college students' RVB. The Vocabulary Level Test developed by Nation [53] was used to evaluate the learners' RVB. A list of words was given to the students, and they were questioned whether they understood their meanings. On vocabulary tests, the scores of the experimental group were higher than those of the control group. The study concluded that morphological awareness was associated with the RVB of the participants. In the study of Tabatabaei and Yakhabi [3], the relationship between morphological awareness and Iranian students' RVB was also examined. The researchers used Nation's vocabulary test [6] for measuring the learners' vocabulary breadth, and MIT and MSAT were employed to test the participants' morphological awareness. It was concluded that morphological awareness and RVB had a significant relationship. Finally, Latifi et al. [54] explored the correlation between morphological awareness and RVB among English as a Foreign Language (EFL) students at the Qaemshahr Azad University. The study's findings provided similar results to other studies regarding the outperformance of the participants in the analytic test more than their performance in the synthetic test; however, the results showed that the participants' synthetic knowledge had more impact on their morphological awareness than the analytic knowledge.

Previous studies on morphological awareness interventions have investigated the effect of teaching English learners about morphology in a morphological awareness intervention on their receptive knowledge of vocabulary, reading comprehension, or spelling. Despite this, there is a lack of research on the role of morphological awareness in expanding L2 learners' productive vocabulary breadth. This study aims to investigate whether morphological awareness intervention enhances students' productive vocabulary breadth by examining the relationship between morphological awareness and productive vocabulary breadth.

Yucel-Koc [55] investigated how morphological awareness intervention influenced students' reading skills and

morphological awareness. Thirty-five intermediate students were involved in the intervention. The study revealed the significant influence of morphological awareness intervention on the respondents' reading skills and morphological awareness. Friedline [46] looked into the impact of morphological awareness intervention on enhancing L2 learners' derivation morphology. After receiving morphological awareness training for 5 weeks with one training session per week (each training session lasted for 20 min), the study concluded that a significant improvement existed in the posttests' derivational morphology.

Amirjalili et al. [56] carried out quasi-experimental research to examine the effect of morphological awareness with its three constituents (syntactic, relational, and distributional) on intermediate students' reading comprehension. Three aspects of morphological awareness were measured by using three different measurements. The morphological structure measure was used to test the relational aspect; the syntactic aspect was measured using the derivation suffix measure. The learners needed to select one appropriate form from the given words. The distributional aspect was examined using the judgment test adopted by Tyler and Nagy [57]. Finally, a reading comprehension measure was given to the learners. Based on the results of the experiment, it was determined that the experimental group had improved its scores compared to the control group. The intervention had more influence on the low-level students than the better ones. Correlational analysis was carried out for the three aspects of morphology with reading comprehension, which revealed that they were correlated, and the one that was highly related to reading comprehension was the morphological awareness' distributional aspect.

Previous studies investigated whether morphological awareness instructions improved students' spelling abilities. For example, Carlisle [58], using instructions in morphological awareness, studied the impact on spelling for second and third graders. The results showed that the intervention enhanced the students' spelling ability. The effectiveness of instructions in morphological awareness on improving spelling and reading among 16 primary students was examined by Kirk and Gillon [59] in an experimental study. A higher score on reading and spelling was achieved by the experimental group compared to the control group.

In previous research, morphological awareness training has been found to have a positive impact on receptive vocabulary knowledge. For example, Alsaeedi [51] conducted an experimental study for 6 weeks, and the study aimed at exploring the influence of morphological awareness intervention on receptive vocabulary and morphological awareness among Saudi learners. Morphological awareness was measured, and the results revealed a significant variation between the groups involved in the morphological awareness test experiment. The results demonstrated that morphological awareness training enhanced the learners' morphological awareness and receptive vocabulary. Crosson et al. [60] explored whether morphological analysis intervention would strengthen the adolescents' morphological analysis and vocabulary learning or not. The study's findings emphasized the

positive influence of morphological analysis instruction on problem solving the meanings of unknown vocabulary.

The literature review shows that previous studies linked to morphological awareness focused only on the L2 learners' RVB, indicating a relative scarcity of research examining the impact of morphological awareness in improving L2 learners' productive vocabulary breadth. Additionally, the study examined the effect of morphological awareness intervention on L2 postgraduate students' productive vocabulary breadth. Due to this considerable lack of research in this area, the researchers were motivated to conduct the current study. Hence, the study aims to answer the two questions listed below:

- (1) What is the relationship between morphological awareness and productive vocabulary breadth among L2 postgraduate students?
- (2) What is the impact of morphological awareness intervention on vocabulary breadth among L2 postgraduate students?

3. Method

3.1. Design of the Study. This study aimed to investigate the relationship between morphological awareness and productive vocabulary breadth among L2 postgraduate students. Additionally, it aimed to investigate the impact of morphological awareness intervention on L2 postgraduate students' productive vocabulary breadth. To achieve the objectives of the study, a morphological awareness intervention was conducted. A quantitative approach was used in this study to answer the research questions of the study. The quantitative approach indicates that numeric data is collected, groups are compared to each other, variables are examined regarding their relationships, and the results are interpreted and compared to the results of previous studies [61].

A quasi-experimental design was used in this study in which the researchers investigated the impact of the intervention on the students' productive vocabulary breadth and compared the results of the experimental group with the results of the control group to test the difference.

3.2. Sampling. This study used a cluster sampling design, which is used when selecting individual members of a population are impractical, and clusters serve as the unit of selection [62, 63]. The usefulness of cluster sampling design lies when the individuals of a population are naturally grouped [64]. Therefore, the current study included two clusters of L2 postgraduate students. Thirty postgraduate students studying intensive English at a Malaysian university were sampled in the study. They were categorized in terms of their first language, gender, and level of study. Sixteen Arabic-speaking students, five Indonesian-speaking students, six Chinese-speaking students, and three Somali-speaking students participated in the study. In addition, 17 male respondents (56.7%) and 13 female respondents (43.3%) participated in the study. The study included 19 master's program participants (63.3%) and 11 Ph.D. program participants (36.7%).

TABLE 1: Research measurements.

Variable	Test
Morphological awareness	MIT
	MSAT
Productive vocabulary breadth	PVLT

3.3. Research Instruments. The measurements intended to be used in the study were administered to the participants of the research (see Table 1). The independent variable (morphological awareness) was examined using two adapted tests (MIT and MSAT) to test both of its aspects (analytic and synthetic). The students' productive vocabulary breadth was tested using the adapted Laufer and Nation's [65] Productive Vocabulary Level Test (PVLT). Table 1 shows the research instruments employed in the current study.

For ensuring the content validity of the tests, the three tests were examined by three language experts (senior lecturers with more than 10 years of experience in teaching English). Content validity requires asking for consultation from a small group of experts to evaluate whether the selected items of an instrument are appropriate to assess a construct [48, 66]. A draft of the three tests was distributed to the three senior lecturers to get feedback regarding the content, suitability, adequacy of the tested items, and layout. The experts confirmed that the tests were appropriate and suitable for L2 postgraduate students.

3.3.1. Morphological Awareness Tests. The morphological awareness of L2 postgraduate students was assessed by administering two tests. To measure analytic ability, MIT breaks words down into morphemes, which are the smallest meaningful components. The test contained 24 questions. The test was adapted from Al Farsi [43], piloted and reliable at 0.912 in Cronbach's alpha test. The synthetic aspect of morphological awareness was examined using MSAT. The assessment involved the participants synthesizing morphemes and creating a new word form. Adapted from Wilson-Fowler and Apel [67], 24 items were also included in the test and were found to be reliable, with a 0.834 reliability coefficient.

3.3.2. Vocabulary Test. The adapted productive version of Laufer and Nation's [65] vocabulary test was distributed to the current study's respondents. The test measures the breadth of the productive vocabulary across five frequency levels: 2k, 3k, 5k, University Word List, and 10k. However, the pilot study showed that most questions at the last frequency level (10k) were incorrect or left unanswered. Thus, this level was excluded, and the other four levels were tested instead (2k, 3k, 5k, and University Word List).

3.4. Procedure. A consent form was provided to the participants after permission was obtained to conduct the study. The respondents in both groups were first pretested by administering the morphological awareness tests and PVLT. After that, the morphological awareness intervention started in which the experimental group of the current study received 11 sessions of instructions and training in

TABLE 2: Descriptive statistics.

	N	Mean	Std. deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Standard error	Statistic	Standard error
MIT	30	34.231	9.3267	-.018	.427	-.602	.833
MSAT	30	8.50	4.1210	.179	.427	.167	.833
Morphological awareness	30	42.731	12.8293	.014	.427	-.389	.833
PVLT	30	25.385	17.0012	.683	.427	1.031	.833

TABLE 3: Relationship results.

		Productive vocabulary breadth	Morphological awareness
Productive vocabulary breadth	Pearson correlation	1	.659**
	Sig.		.000
Morphological awareness	Pearson correlation	.659**	1
	Sig.	.000	

**Significant at the 0.01 level.

morphological awareness, while the control group received traditional classes scheduled for an intensive English course. The participants were posttested on the same tests administered in the pretest at the end of the course.

Every intervention session started with an overview of the purpose of the intervention and the importance of doing it so that they become motivated to be involved in the intervention sessions, and understand what the intervention was about and the rationale of doing it. After reminding the students about the purpose of the intervention, the researchers taught them the meaning and function of some affixes, which were taught based on the title of the lesson. Examples were given and students were urged to provide more examples if they knew any. After that, a text was given to them for making them attempt to identify any word with a root and affixes.

The morphological awareness intervention was carried out in which L2 postgraduate students in the experimental groups were instructed about the meaning of morphology, the morphological rules, the meaning of affixes, identifying the morphemes of a word, analyzing morphological words, combining morphemes, and structuring words by being aware of morphemes and morphological rules.

3.5. Data Analysis. Data analysis was performed using SPSS, version 26. The descriptive statistics of the variables and tests included in the study were presented. The test of the Pearson correlation coefficient was performed to test the relationships under investigation among L2 postgraduate students. Table 2 provides the study variables' descriptive statistics and the two subtests of morphological awareness. Statistics were described (i.e., the mean, skewness, and kurtosis), as shown in Table 2. The results of productive vocabulary breadth in both pretest and posttest were compared by conducting a paired-sample *t*-test, which examined whether the experimental group significantly benefited from the morphological awareness intervention more than the control group. Ho [68] mentions that the paired-sample *t*-test is used in repeated measures or

correlated groups' design, in which each subject is tested twice on the same variable. A common experiment of this type involves before and after design.

4. Results

4.1. Question 1. This study investigated whether morphological awareness is related to the breadth of productive vocabulary. To examine this relationship, the Pearson coefficient analysis test was used [69, 70]. Before conducting the Pearson coefficient analysis test, some assumptions for correlational analysis needed to be tested, which were: normality, outliers detection, linearity, and homoscedasticity [69, 71]. Based on George and Mallery [72], kurtosis and skewness values between -2 and $+2$ indicate that data are normally distributed. Table 2 reveals that the current study's data was distributed normally as the skewness and kurtosis values fell within the allowed range between -2 and $+2$. The skewness values were between -0.018 and 0.683 , while kurtosis values were between -0.602 and 1.031 . Table 3 show the cases of the correlation between productive vocabulary breadth and morphological awareness.

The researchers referred to Tabachnick and Fidell [71] in testing outliers in the present study data, as outliers are defined as cases with standardized residuals that are lower than -3.3 or higher than 3.3 . Figure 1 demonstrates a regression residual scatterplot. It can be seen in Figure 1 that there were no outliers obtained in the standardized residuals to be less than -3.3 or more than 3.3 . Figure 2 shows a linear correlation between morphological awareness and productive vocabulary breadth. It was cigar-like and did not show U-shaped or other curvilinear shapes [69]. Regarding the homoscedasticity assumption, according to Tabachnick and Fidell [73], the normality assumption is related to the homoscedasticity assumption. Since it was proven that the study's data was normally distributed, the homoscedasticity assumption was also met.

Table 3 presents the Pearson coefficient analysis test outcome, which shows that a significant relationship between

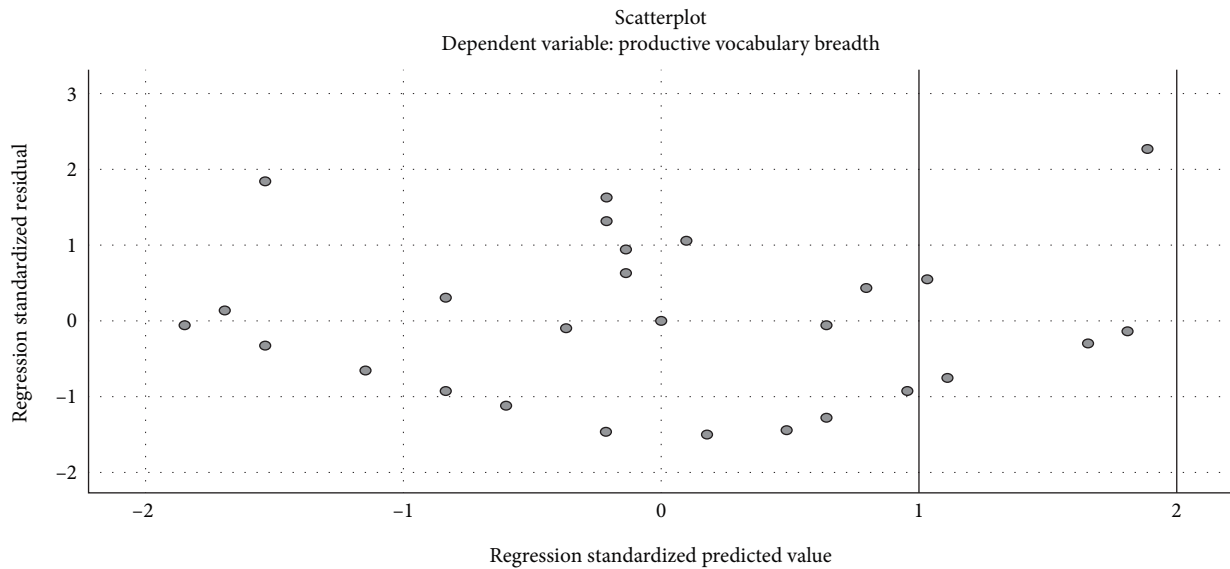


FIGURE 1: Regression residuals scatterplot.

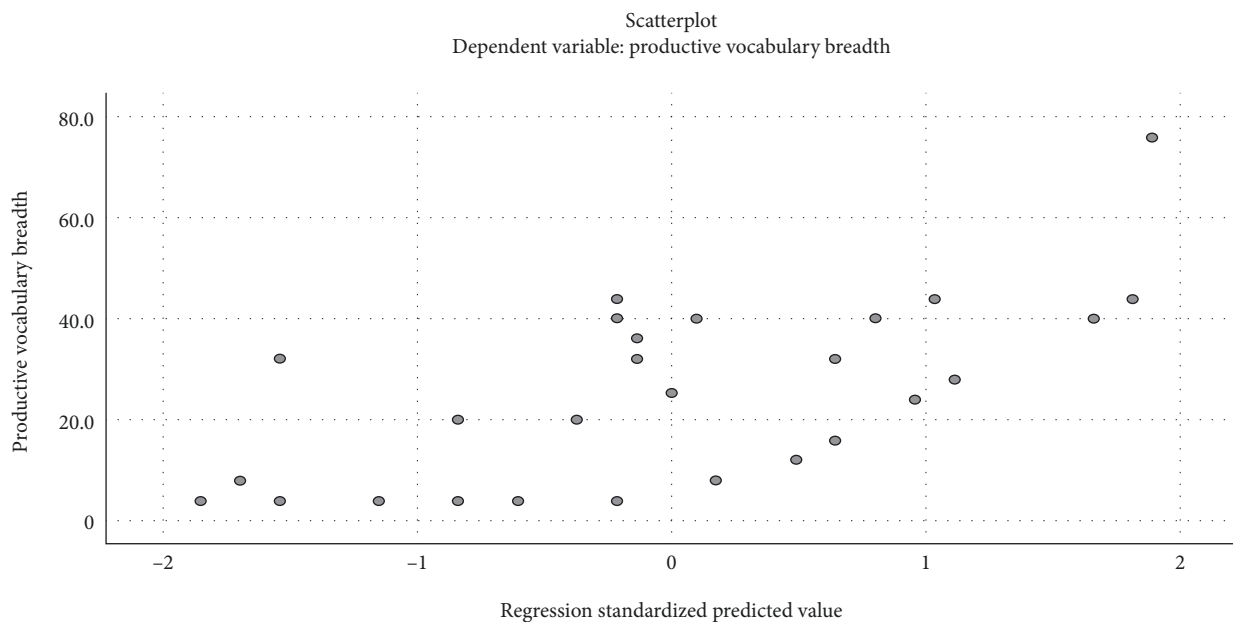


FIGURE 2: Scores scatterplot.

morphological awareness and productive vocabulary breadth existed ($r = .659, P = .000$).

4.1.1. Additional Analysis. Table 4 demonstrates the Pearson coefficient test outcome for the correlation between the scores of the two morphological awareness aspects (analytic and synthetic) and the score of productive vocabulary breadth. The results showed that both morphological awareness aspects were significantly related to the L2 postgraduate students' productive vocabulary breadth; however, as shown in Table 4, the correlation between the synthetic aspect and the students' productive vocabulary breadth ($r = .769, p = .000$) was more significant than the correlation between

the analytic aspect and the students' productive vocabulary breadth ($r = .567, p = .001$).

The results of the Pearson coefficient test that demonstrates the relationship between morphological awareness and frequency levels of productive vocabulary breadth are presented in Table 5. There was a significant relationship between morphological awareness and all frequency levels of productive vocabulary breadth ($r = .350, .554, .466, \text{ and } .486; p = .029, .001, .009, \text{ and } .007$).

4.2. Question 2. The second objective of this current study was to investigate the impact of morphological awareness intervention on productive vocabulary breadth among L2

TABLE 4: Correlation between the aspects of morphological awareness and productive vocabulary breadth (N = 30).

		PVLT	MSAT	MIT
PVLT	PC	1	.769**	.567**
	Sig		.000	.001
MSAT	PC	.769**	1	.789**
	Sig.	.000		.000
MIT	PC	.567**	.789**	1
	Sig.	.001	.000	

PC = Pearson correlation. **Significant 0.01 level.

TABLE 5: Correlation between morphological awareness and the frequency levels of productive vocabulary breadth (N = 30).

		MA	2k level	3k level	5k level	University Word List
MA	PC	1				
	Sig.					
2000 level	PC	.559**	1			
	Sig.	.001				
3000 level	PC	.467*	.553**	1		
	Sig.	.009	.002			
5000 level	PC	.573**	.532**	.408*	1	
	Sig.	.001	.002	.025		
University Word List	PC	.522**	.553**	.507**	.591**	1
	Sig.	.003	.002	.004	.001	

PC = Pearson correlation, MA = Morphological awareness. **Significant 0.01 level. *Significant 0.05 level.

TABLE 6: Paired-sample *t*-test for productive vocabulary breadth.

Group	Pair (posttest and pretest)	Mean	Standard deviation	<i>t</i> -value	Sig. (two-tailed)
Experimental	Productive vocabulary breadth	16.7179	9.1763	7.056	.000
Control		.9846	8.4972	.449	.660

postgraduate students. The participants' vocabulary breadth was assessed first, and it was found that the participants possessed a low size vocabulary (21%) compared to the threshold of productive vocabulary breadth (83%) [74]. A paired-sample *t*-test was conducted to investigate the difference in the students' performance in both pretest and post-test of productive vocabulary breadth and explore the students' increase in their productive vocabulary breadth. Table 6 demonstrates the paired-sample *t*-test findings for productive vocabulary breadth. As shown in Table 6, a significant difference existed in the performance of the experimental group in the productive vocabulary breadth ($p < .01$), whereas the *p* values of productive vocabulary breadth for the control group ($p > .05$) showed no significant difference between the results of the posttest and pretest.

The effect size is another value required to be considered to know the different sizes between the two groups of study and measure the intervention's effectiveness [62]. The Cohen's *d* calculation was employed to calculate the

morphological awareness intervention's effect size on the participants' productive vocabulary breadth.

$$\text{Cohen's } d = [M1 - M2] / \sqrt{[(sd1^2 + sd2^2) / 2]}, \quad (1)$$

(experimental group mean = $M1 = 16.7179$, control group mean = $M2 = .9846$, standard deviation of experimental group = $sd1 = 9.1763$, and standard deviation of control group = $sd2 = 8.4972$).

$$\begin{aligned} \text{Cohen's } d &= [16.7179 - .9846] / \sqrt{[(9.1763)^2 + (8.4972)^2] / 2} \\ &= 2.48100388 \text{ integrated into } 1.78. \end{aligned} \quad (2)$$

According to Cohen et al. [62], if Cohen's *d* value is larger than 1, it shows that there is a strong effect. Therefore, the value of Cohen's *d* above shows that the impact of

intervention in morphological awareness on the L2 postgraduate students' productive vocabulary breadth was strong.

5. Discussion

This study examined whether morphological awareness correlated with productive vocabulary breadth. Morphological awareness and productive vocabulary breadth were found to be significantly correlated. In other words, by understanding morphology, students would perform better on the productive vocabulary test and increase their productive vocabulary breadth.

RVB and morphological awareness were significantly correlated in several studies, which predicted the results of this study [3, 45, 49, 50, 52]. Since the results of previous studies have supported the positive relationship between morphological awareness and RVB, the present study hypothesized that morphological awareness had a significant relationship with the L2 postgraduate students' productive vocabulary breadth. Sparks and Deacon [52] conducted a study in which they focused on determining the direction of the relationship between morphological awareness and receptive vocabulary knowledge; out of them, which one is predicting the other? Peabody Picture Vocabulary Test was used to test receptive vocabulary knowledge. Word Analogy Task was used to test the learners' morphological awareness. It was found that morphological awareness predicted receptive vocabulary knowledge, but receptive vocabulary knowledge did not predict morphological awareness among the respondents of the study.

Additionally, the researchers investigated whether there was an association between the students' two aspects of morphological awareness (analytic and synthetic) and their productive vocabulary breadth. The outcome of the Pearson coefficient test showed that both aspects of morphological awareness had a positive and significant relationship with productive vocabulary breadth. However, the synthetic aspect was more related than the analytic aspect to the L2 postgraduate students' productive vocabulary breadth.

A previous study conducted by Tabatabaei and Yakhabi [3] on the association of morphological awareness with the students' RVB revealed that morphological awareness was correlated with the learners' RVB. Another finding obtained in a study carried out by Tabatabaei and Yakhabi [3] showed that the two aspects of morphological awareness (analytic and synthetic) were significantly correlated, and the analytic aspect was more related than the synthetic aspect to the learners' RVB. The findings of previous studies compared with the findings obtained in this current study can be justified concerning the type of vocabulary under investigation. The current study investigated the students' productive vocabulary breadth, whereas the previous study investigated the learners' RVB. According to Aronoff and Fudeman [20], the analytic aspect of morphological awareness is linked with the capability of understanding and realizing the meaning of the morphemes of a word and breaking that word down into its meaningful parts. The students just needed to receive the meaning of the morphemes included in the

word and separate them. On the other hand, the synthetic aspect of morphological awareness is linked with the productive ability to produce morphological structures and combine the morphemes together to create words. Therefore, it is reasonable that the synthetic aspect of morphological awareness to be more related to the students' productive vocabulary breadth than the analytic aspect in the present study.

The researchers were curious about investigating the association between morphological awareness and the frequency levels of productive vocabulary breadth among L2 postgraduate students. The Pearson coefficient test results show that morphological awareness was related to all frequency levels of productive vocabulary breadth. The present study's findings were consistent with the findings revealed in Latifi et al.'s [54] study, which revealed a significant correlation between morphological awareness and the 2,000 and 3,000 frequency levels of receptive vocabulary size among the participants.

The second research question aimed at investigating the impact of morphological awareness intervention on productive vocabulary breadth among L2 postgraduate students. The paired-sample *t*-test demonstrated in Table 6 revealed a significant difference between the scores of productive vocabulary breadth in the posttests and the pretests scores among L2 postgraduate students. The results suggested that morphological awareness intervention helped enhance the L2 postgraduate students' productive vocabulary breadth.

Many studies have demonstrated the significant influence of instructions in morphological awareness on improving vocabulary knowledge [44, 49, 51, 60, 75, 76]. However, previous studies have focused on exploring the effect of instructions in morphological awareness on the learners' receptive vocabulary knowledge. For example, Akbulut [49] carried out a study to investigate the influence of morphological awareness intervention on the participants' RVB in a quasi-experimental study. The study revealed that the intervention contributed to an increase in the learners' RVB. Similarly, Alsaeedi [51] revealed that morphological awareness instructions were beneficial to the learners' receptive vocabulary knowledge and morphological awareness. The research shows that the training in morphology had an effect on participants' performance and indicates that morphology played a major role in enhancing the students' receptive vocabulary. Therefore, this current study was conducted to fill up this gap addressed in the previous studies and investigate the effect of teaching L2 postgraduate students in an intervention to teach about morphology on the breadth of their productive vocabulary.

The findings of the current study reveal that morphological awareness could become useful to L2 postgraduate students. Bowers et al. [75] carried out a meta-analysis of 22 studies involving morphological interventions to deeper comprehend the link between morphological awareness and literacy skills. The authors found a correlation between the students' increasing awareness of morphology and literacy development. Based on Perfetti and Hart's lexical quality hypothesis [77], Bowers et al. argued that morphological intervention, which strengthens morphological awareness,

“will increase understanding about oral and written features of morphology at the sublexical level that, in turn, will influence literacy skills at the lexical level (e.g., word reading, spelling, and vocabulary)” (p. 145). A person with a high level of underlying linguistic awareness may have more accurate and efficient lexical representations as a result of strong and accurate integration of these underlying linguistic processes and increased exposure to multimorphemic words [78].

6. Limitations and Recommendations

The present study provided empirical findings regarding the relationship between morphological awareness and productive vocabulary breadth. It also shed light on the significant impact of morphological awareness intervention on L2 postgraduate students' productive vocabulary breadth. It would be desirable to replicate the current study by including a larger sample size in longer morphological awareness intervention time, and it would be interesting to see the results. Conducting another morphological awareness intervention in a second language context with students of different ages (children and adults) and levels of study (school, undergraduate, and postgraduate) is recommended, and the investigation could bring out different results. Research work can never be achieved without limitations. The small number of L2 postgraduate students was a limitation. A longer morphological awareness intervention period and a larger sampling size are recommended for replication of the present study.

7. Conclusion

The study aimed to investigate the correlation between morphological awareness and their productive vocabulary breadth and investigate the effect of teaching the participants in a morphological awareness intervention about morphology and affixes on their productive vocabulary breadth. An association was found between morphological awareness, including its aspects (analytic and synthetic) and productive vocabulary breadth among the participants. However, the synthetic aspect of morphological awareness was related more to productive vocabulary breadth than the analytic aspect was. In connection with the study's findings, some pedagogical implications can be indicated regarding the usefulness and significance of morphological awareness to increase the L2 postgraduate students' productive vocabulary breadth. The results revealed that the more morphological awareness students possess, the more vocabulary breadth they gain and foster to use productively.

The findings have also revealed that morphological awareness was significantly associated with the frequency levels of productive vocabulary breadth, especially with higher vocabulary levels (3,000 and 5,000) and academic vocabulary. L2 postgraduate students may have the benefits of raising their morphological awareness to increase the academic words used productively in their academic studies and enhance the quality of the vocabulary used productively. Morphological awareness seems to be an effective strategy

to increase the breadth of productive vocabulary among L2 postgraduate students; however, future research may replicate this study by including more L2 postgraduate students or comparing students at different levels of study (undergraduates vs. postgraduates). The results also revealed the possible benefits of teaching the students in a morphological awareness intervention to increase their productive vocabulary breadth.

Data Availability

The dataset is available upon request from the first author.

The data used to support the findings of this study are available from the corresponding author upon request.

Consent

Informed consent was obtained from all subjects involved in the study.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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