The role of morphological awareness in L2 postgraduates’ academic writing: is vocabulary knowledge a mediating variable?

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ABSTRACT
This research explores the relationship between morphological awareness (MA) and linguistic aspects by examining how MA affects postgraduates' academic writing, particularly in English as a second language (L2), dealing with writing challenges and vocabulary issues. This study investigates the relationship between MA and academic writing and the potential benefits of a morphological awareness intervention for improving writing ability. The study also investigates whether the relationship between MA and writing performance is mediated by vocabulary knowledge. The study included thirty postgraduate students whose writing was evaluated before and after receiving morphological awareness instruction. The findings indicate that vocabulary knowledge acts as a mediator between MA and writing, implying that increases in vocabulary proficiency significantly impacted students' writing skills. As a result of the intervention, the participants' writing abilities significantly improved. These findings highlight the importance of morphological awareness in academic writing, as well as the importance of incorporating focused morphological instruction into writing curricula. The study also calls for more research into the complex relationship between MA, vocabulary proficiency, and writing skills in various populations and contexts. Understanding this interplay can aid in developing more efficient techniques for improving academic writing abilities, particularly for L2 learners who struggle in this area.

1. Introduction

Academic writing is challenging for many second language (L2) learners, especially at the postgraduate level, yet it is crucial. Vocabulary proficiency is one aspect that affects academic writing (Asaad & Shabdin, 2021; Lin & Morrison, 2021; O'Leary & Steinkrauss, 2022). A strong vocabulary is crucial for achieving academic success because it enables learners to understand academic concepts deeply and improve their academic performance (Douglas, 2013). Vocabulary is especially essential for college students because it enables them to communicate their ideas clearly and comprehend academic texts (Yunus et al., 2016).

Academic writing for postgraduates is crucial for their English language development and academic success (Al Badi, 2015). It also involves using complex morphological vocabulary (Nagy & Townsend, 2012). The words that students encounter change according to their level of study, and they can expect to face more difficult words as they progress (Northey et al., 2016). In addition, students need more words with complex morphology to express their sophisticated ideas; as a result, they must utilize strategies and tools to expand their vocabulary with varying degrees of complexity. One strategy is to recognize word structure patterns. Individual English words are not necessary for students to memorize...
(Carlisle & Fleming, 2003) (eg Enhance, Enhanced, Enhancing, Enhances, Enhancement, Enhancer, Enhancive, Enhancively, and Unenhanced) if they can realize the pattern of these words so that they can become successful learners in writing.

The ability to understand, identify, and use prefixes, suffixes, and roots as meaningful word parts is referred to as MA. This ability influences language and literacy development, including vocabulary, reading, and writing (Apel & Lawrence, 2011). Research has shown that MA positively correlates with vocabulary breadth (Asaad et al., 2022). MA and vocabulary are essential for academic writing, which requires sophisticated and precise language to effectively communicate ideas (Hyland & Shaw, 2016).

In order to produce a text, a writer needs to choose appropriate words that would convey the message intended. Choosing appropriate words to construct the writing sentences requires knowing and understanding the exact meaning of those words. Morphology provides information about the parts of words in terms of their structure and semantic properties. Thus, morphology has an important role in understanding the meanings of those words and, accordingly, plays a role in choosing the appropriate words needed for generating sentences in writing (Carlisle, 2016). Awareness of morphology can help a writer realize the right formation of a word based on its grammatical category and its appropriate usage in a sentence, such as using the suffix -ly to be added only to verbs to produce adverbs. When students are aware of morphology, it gives them choices to make various forms of a word in their writings (Carlisle, 2016; Green et al., 2003; Nagy et al., 2014).

2. Literature review

2.1. Importance of morphological awareness to writing

According to several studies (Koda, 2000; Lee et al., 2023; Nagy et al., 2014; Tyler & Nagy, 1990), MA encompasses a wide range of cognitive and linguistic capacities, such as segmentation, recognition, structural sensitivity, online processing, and explicit knowledge. One general cognitive processing ability is MA, which entails abstracting lexicosemantic information from words with complicated morphology. It is worth mentioning that morphological decomposition emphasizes the abstraction of word form and partial meaning in both the implicit processing and explicit awareness modules (Zhang, 2021; Zhang & Lin, 2021). Deacon and Kirby (2004) and Nagy et al. (2006) asserted that morpheme form sensitivity facilitated the spelling and decoding of English words for students by enabling them to activate the phonemes of familiar word components in morphologically complex and decipherable words.

The ability to create complex words and a heightened sensitivity to the morphological and orthographic representations in such words are important indicators of progress in writing. Word-level and text-level inference of unknown meanings are skills for writers to employ appropriate words in semantics and textual contexts (Zhang, 2021). The ability to spell or dictate is an essential fundamental writing skill that significantly impacts learners’ proficient production of written language. Morphological sensitivity in print facilitates students’ understanding of how orthography represents words with complex morphological characteristics and how words are formed or deconstructed. MA enables students to produce accurate grapho-morphological segments within intricate words. Furthermore, MA facilitates the development of advanced text generation skills, including the composition of essays and passages, in addition to aiding in the production of phonemes and graphemes (Berninger et al., 2011b; Guan et al., 2014; Guan et al., 2019; McCutchen et al., 2014). MA in written composition can be advantageous, fostering vocabulary growth and writing proficiency. Proficiency in applying morphological transformations is critical for academic literacy and language abilities because English academic genres are distinguished by the use of nominalization and the complexity of word structure (Lawrence et al., 2010; Nagy & Townsend, 2012; Zhang, 2021).

2.2. Relationship with writing

Writing effectively requires writers to choose the right words that convey their ideas and thoughts. However, many L2 higher-education students struggle with writing because of their limited lexical knowledge (González, 2017). They also encounter various grammar, syntax, and vocabulary difficulties when writing (Singh, 2015). Vocabulary is essential for effective writing and improves L2 writing performance
and fluency. The quality of writing usually improves when writers use a diverse range of vocabulary, including words of different frequency levels and complex phrases (McNamara et al., 2009).

Academic writing is essential for postgraduates to succeed in their fields and improve their English language skills (Al Badi, 2015; Asaad & Shabdin, 2019). It involves using words with complex morphological structures (Nagy & Townsend, 2012). As students progress through different levels of study, they face more complex vocabulary that demands them to broaden their vocabulary to communicate their ideas effectively (Northey, 2013). Students can use strategies and tools to increase their vocabulary size, such as knowing word structure patterns.

Morphological awareness can enhance writing skills because it helps students comprehend words’ meaning and structure, enabling them to produce effective texts. For instance, changing the structure of words, such as nominalization, can help create fluent sentences and reduce working memory demands during writing. Good writing often includes a variety of syntactic patterns, which can be achieved through modifying the form of a word, such as transforming a verb into an adjective. For example, write ‘She is an inspirational person’ instead of ‘She is a person who inspires others’. Therefore, understanding the morphological rules can help writers easily manipulate word forms and revise sentence syntax, leading to better writing.

Advanced writing skills are important for academic performance and professional success (Kellogg & Raulerson, 2007). To construct sentence structures, writers need to understand the morphology and grammar of vocabulary (Berninger et al., 2011a). MA helps writers create complex sentence structures using different word forms and manipulating written language to achieve their rhetorical goals. Proper word choice and organization can help writers convey their ideas more effectively to their target audience. Knowledge about the morphological structure of a word and its grammatical function links the lexical knowledge level to the ability of learners to create sentence structures (Berninger et al., 2011a; Carlisle, 2016). The results of a study conducted on fifth graders by McCutchen and Stull (2015) showed that MA affected the accuracy of producing words in spelling and combining sentences to make longer complex ones.

### 2.3. Role of vocabulary knowledge in academic writing

A student’s primary goal at the college level is academic success rather than learning English solely for communication. Academic writing uses a language different from communication (Nagy & Townsend, 2012). Modifying the vocabulary's syntactic and structural patterns allows for the creation of abstract and dense academic vocabulary. This includes the process of nominalization, which involves changing the classification of specific parts of speech. Derivations are commonly used to alter parts of speech (Nagy & Townsend, 2012).

Second-language learners can use various aspects of vocabulary knowledge to determine which words to use in their writing (Coxhead, 2012). Effective writing requires two types of vocabulary proficiency: a diverse set of words and a thorough understanding of their meanings (Brun-Mercer & Zimmerman, 2015). L2 learners must have a large lexical repertoire in academic writing and be able to choose appropriate high-frequency and academic vocabulary (Laufer & Nation, 1995). Nonetheless, learners must have a larger repertoire of less commonly used words, as previous research has shown a link between a low-frequency vocabulary and proficient writing skills in a second language (Coniam, 1999; Johnson et al., 2016). Writing requires a strong command of vocabulary, particularly the ability to use academic terms effectively. L2 learners must understand the meanings, forms, and applications of words commonly used in writing (Nation, 2001).

Dabbagh and Janebi Enayat (2017) examined the connection between vocabulary knowledge (breadth and depth) and the scores of the descriptive writing tests. Additionally, they examined if vocabulary breadth and depth were predictors of the vocabulary used in the descriptive writing of the respondents and examined the role of the vocabulary frequency levels used in writing to predict the results of the descriptive writing. Sixty seven Iranian undergraduate students, who were studying English as a major at Gonbad Kavous University in Iran, were participating in the study. Results of correlations and stepwise regressions indicated that vocabulary breadth was predictive of the overall assessment of descriptive writing while vocabulary depth only correlated with the overall assessment; vocabulary
breadth was also predictive of the vocabulary component of L2 descriptive writing, but vocabulary depth was correlated with the vocabulary component and knowledge of low-frequency words was a strong factor in explaining the variance in the vocabulary component.

2.4. Mediation of vocabulary knowledge

Several studies have found that MA positively correlates with vocabulary knowledge (Rabadi, 2019; Nagy et al., 2006). Nagy et al. (2006) found that students with stronger MA skills had better vocabulary knowledge than those with weaker MA skills. Furthermore, it has been discovered that MA predicts reading comprehension (Carlisle & Stone, 2005; Kieffer & Lesaux, 2012).

An increasing body of empirical evidence indicates that vocabulary knowledge mediates the association between MA and reading comprehension (Choi, 2015; James et al., 2020; Kieffer & Box, 2013; Levesque et al., 2017; Zhang, 2016; Zhou, 2022). According to Kieffer and Lesaux (2012), there was an indirect relationship between MA and reading comprehension in English language learners, mediated by vocabulary knowledge. The effects of MA and lexical inferences on adult Chinese readers' L2 vocabulary knowledge and comprehension were investigated by Zhang and Koda (2012). It was found that students' lexical inferencing abilities partially mediated the influence of MA on their vocabulary knowledge. Researchers drew the following conclusions from their study: (1) students with higher MA were better able to learn new words and acquire a wider vocabulary, and (2) morphology played a significant role in word learning and comprehension. Vocabulary knowledge also mediated the association between MA and reading comprehension.

Reading comprehension was studied concerning MA by Levesque et al. (2017). The researchers also looked at how other factors mediated the connection between MA and comprehension. Two hundred twenty-one third graders who spoke English were included in the research. Reading ability was found to correlate with MA. The findings also revealed that morphological decoding through word reading and morphological analysis only mediated the link between MA and reading comprehension. Vocabulary knowledge, however, did not serve as a moderator in this connection.

The impact of MA on readers’ ability to understand text was investigated by Zhang (2016). This study's findings demonstrated that MA significantly affects students' reading comprehension and can predict their performance on standardized reading tests. It also demonstrated the intermediate role of lexical inferences in the association between MA and reading comprehension. Choi’s (2015) study on the effect of vocabulary knowledge mediation on L2 reading comprehension revealed that morphological knowledge contributed directly and indirectly to L2 reading comprehension. This study assessed syntactic, relational, and distributional aspects of derivational morphological knowledge through sentence grammatical judgment, word segmentation, and word production. The study results showed that knowing a language's derivational MA and vocabulary directly aided in understanding text written in that language.

Therefore, the study investigates the vocabulary knowledge mediation between MA and academic writing among L2 postgraduates. In other words, this inquiry aimed to consider how vocabulary knowledge mediates the impact of MA on writing.

The study addresses the following questions:

1. How does morphological awareness intervention impact L2 postgraduates’ academic writing?
2. What is the relationship between morphological awareness and academic writing?
3. Does vocabulary knowledge mediate the relationship between morphological awareness and academic writing?

3. Materials and method

3.1. Data analysis

The study utilized a pre-and-posttest design. Thirty postgraduates received MA intervention for eleven sessions. The vocabulary knowledge mediation in the association between MA and academic writing
was investigated using two analysis methods. One method was running the Sobel test (Sobel, 1982) after running linear regressions and then using the coefficient and standard deviation results of two linear regressions to calculate the Sobel test. The mediator and the independent variable (MA and vocabulary knowledge) were involved in the first linear regression, and the second was between the mediator and the dependent variable (vocabulary knowledge and academic writing). Measuring the mediation of vocabulary knowledge was also conducted using the Hayes’ process macro in SPSS to provide immediate results on mediation and indirect relationships (Hayes, 2013; Preacher & Hayes, 2004).

This current study used two statistical tests based on the comparison groups. If it was intended to compare two different groups at a certain time, an independent sample t-test was used. If the comparison was meant to be identified for the same group on two different occasions, a paired sample t-test was used (Dörnyei, 2007). Differences in mean scores between the two tests for L2 graduate students were examined. The effect size test was utilized to determine the intensity of the MA intervention effect on the academic writing of L2 postgraduates.

The researcher tested the assumption of normality and outliers. Based on George and Mallery (2016), the data was normally distributed as both skewness and kurtosis values fell within the range of −2 and +2 as shown in Table 1.

For testing the outliers in the present study’s data, the researcher referred to Tabachnick and Fidell (2007) as they define outliers as the cases with standardized residuals displayed in the scatterplot, which are less than −3.3 or more than 3.3. 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.

### 3.2. Participants

The study was conducted as part of a PhD research, and the university permitted data collection from 30 L2 postgraduate students who attended an intensive English course in two intact groups at a Malaysian university and participated in the study. The participants signed the consent letter to participate voluntarily. The researcher was aware of the importance of obtaining permission before collecting data by asking permission from the institution where the study was conducted or requesting the participants to participate in the current study voluntarily. The participants were informed that they had the right to withdraw from the experiment whenever they wanted. Keeping the respondents’ identity anonymous in the current study was maintained in order to protect the respondent’s anonymity of the study. The study included 16 Arabic-speaking students, five Indonesian-speaking students, six Chinese-speaking students, and three Somali-speaking students. The study also consisted of seventeen male respondents and thirteen female respondents. This research employed a cluster sampling method, where clusters rather than individual members of a population were chosen due to impracticality (Cohen et al., 2007). When a population’s members are naturally grouped, cluster sampling is advantageous (Wiersma & Jur, 2005). For this reason, the study selected two clusters of L2 postgraduates, with a sample size of thirty postgraduates studying an intensive English course at a Malaysian university.
3.3. Instruments

Table 2 provides a detailed list of the tools employed in analyzing this research. The researcher utilized several assessments to gather the necessary data to analyze the research questions and achieve the study's objectives. The morphological awareness of the postgraduate students in L2 was assessed by administering two tests. The ‘Morphological Identification Test’ (MIT) assessed the analytical aspect of morphological awareness. The students were instructed to deconstruct the given words into their constituent morphemes, the smallest meaningful units. The examination comprised a total of 24 test items. The test was derived from Al Farsi (2008) study. The test underwent a pilot phase and demonstrated a high level of reliability, with a coefficient of 0.912. The ‘Morphological Structure Awareness Test’ (MSAT) assessed the synthetic dimension of morphological awareness. Participants were tasked with synthesizing morphemes to generate a modified form of a word with a distinct meaning. The test was derived from Wilson-Fowler and Apel (2015). The test underwent a pilot study and was determined to have a reliability coefficient of 0.834.

3.4. Measurement of vocabulary knowledge mediation

Different techniques and methods have been used in the literature to test mediation (Hayes, 2018; Hayes & Preacher, 2010; Shrout & Bolger, 2002). There are three major and most-used approaches for testing mediation (Hayes, 2009; Hayes & Preacher, 2010; Koschate-Fischer & Schwille, 2018). The causal steps method involves conducting a series of independent regressions to demonstrate mediation (Baron & Kenny, 1986). Besides the significant association between the predictor X and the outcome Y (the total effect c), the mediator M and the predictor X have a significant relationship, and when the predictor X is also included in the regression equation, the mediator is connected with the outcome Y (Jose, 2013; Koschate-Fischer & Schwille, 2018). Although this approach has been remarkably influential, it has been criticized (Hayes, 2009, 2013, 2018; Hayes & Preacher, 2010; Koschate-Fischer & Schwille, 2018).

It has been criticized that causal steps require a significant total effect for establishing mediation. There was an argument about the possibility of significant mediation even if there was no significant impact of X on Y. The approach was criticized for making separate path testing in the mediation model and not just focusing on directly testing the indirect effect (Koschate-Fischer & Schwille, 2018). MacKinnon et al. (2004) claimed that using the traditional approach to test the indirect effect’s significance had low statistical power and imbalanced confidence limits. They recommended using two alternative methods: one based on the productive coefficient approach and the second on the basis of resampling methods; bootstrapping.
The second method is the product of the coefficient method, the Sobel test (Sobel, 1982, 1986). This approach solved the issue of not testing the indirect effect directly, which was highlighted and criticized in the causal steps approach. It is possible to calculate a confidence interval for the indirect effect by computing the standard error of the effect. However, several critics have criticized the Sobel test due to the assumption that the distribution of indirect effects is normal, resulting in erroneous conclusions regarding mediation. (MacKinnon et al., 2002).

A third approach is bootstrapping, which creates intervals around indirect effects through resampling (Bollen & Stine, 1990; Koschate-Fischer & Schwille, 2018; MacKinnon et al., 2004). In comparison to the causal steps method and the distribution of product approach, bootstrapping provides statistical advantages since it empirically determines the sampling distribution of indirect effects through resampling without making assumptions previously made. Other advantages of bootstrapping are represented in the better performance and accuracy in relation to statistical power with sustaining Type I error at a reasonable rate (Fritz & MacKinnon, 2007; Koschate-Fischer & Schwille, 2018; MacKinnon et al., 2004). Koschate-Fischer and Schwille (2018) and Shrout and Bolger (2002) recommended using the bootstrap method, especially with small to moderate samples, to obtain better power. Hayes (2009) recommended choosing the bootstrapping method for mediation analysis as it is a valid and powerful method for examining the intervening variable effects. Accordingly, the bootstrap method was used in this study to test the mediation analysis. Additional mediation analyses were performed to compare the results of the bootstrapping method.

3.5. Morphological awareness intervention

During the pretest and posttest sessions, the experiment participants sat for the Vocabulary Test and Academic Writing Test. Three subtests were included in the Vocabulary Test (MIT, MSAT, and Vocabulary Level Test). Each test was administered on a separate day to minimize the anxiety and fatigue of groups and retrieve true feedback from them. The tests were administered in the same classroom. The time limit for each test was 45 minutes, which was considered suitable by the language experts and in line with the time given in previous research (Aini, 2016; Al Farsi, 2008; Friedline, 2011). The intervention texts were taken from Friedline’s (2011) study and the reading textbook of the intensive English course. The instructional procedures used in the morphological awareness intervention of the current study were in line with the procedures followed by Varatharajoo (2016), in which the activities were conducted in five stages: preparation, presentation, practice, evaluation, and expansion (Table 3).

The control group received the writing instructions from the subject’s regular instructor. The Intensive English Course involved teaching the L2 postgraduate students language skills (Writing, Reading, Listening, Grammar, and Speaking) in separate sessions. In the present morphological awareness intervention, the experimental group was receiving training in MA in the writing skill class time only as the researcher was interested in investigating the effect of the intervention on academic writing. The posttests were delivered immediately the week after conducting the training sessions. The posttests were administered in two subsequent days (one day for the academic writing test and another day for the vocabulary and morphological awareness tests).

| Table 3. Instructional procedures used in the morphological awareness intervention. |
|-------------------------------------|---------------------------------------------------------------|
| Procedure                          | Description                                                                                                                                 |
| Preparation                        | It is a preparatory stage in which the instructor activates the students’ previous knowledge and prepares them for the intervention session. |
| Presentation                       | In this stage, the instructor presented the affixes of a session using PowerPoint slides, a whiteboard, and a model of reading text. The instructor provided examples of the affixes and explained their uses to the students. |
| Practice                           | The instructor provided opportunities for the students to practice the taught affixes in the intervention session by giving activities to be answered by the students individually, in pairs, or groups. |
| Evaluation                         | Students were asked to evaluate the other students and themselves at the end of the provided activities. |
| Expansion                          | The instructor provided the students with practice opportunities by providing homework assignments and various tasks to strengthen their knowledge of the affixes taught in the session. |
4. Results

4.1. Question one

This research question examined whether MA intervention affected L2 postgraduates’ academic writing. The scores of academic writing for L2 postgraduates for the pretest and posttest (based on the ESL Composition Profile) were compared. In order to find out whether there was an effect of the MA intervention on L2 postgraduates’ academic writing, an independent sample t-test was performed to ensure that the student’s academic writing in the pretest for the two groups was not significantly different.

Table 4 shows the statistical results of the academic writing pretest based on the ESL Composition Profile. It shows that the study’s groups were nearly identical and did not significantly differ from one another ($p = .645$). The $p$-value was much larger than .05, which shows the gratitude of similarity between the two groups of the MA experiment.

Two raters were involved in evaluating the L2 postgraduates’ academic writing performance. The raters rated the essays analytically by following the rating scale (ESL Composition Profile), which included five subscales: content, language use, vocabulary, organization, and mechanics (see Appendix A). Each subscale carried a different weight, ranging from content with the highest mark at 30% to mechanics with only 5%. Language use, vocabulary, and organization carried moderate weights (25%, 20%, and 20%). Another comparison was made in the subscales of the ESL Composition Profile (Table 5).

It can be seen that the two groups of the experiment were almost similar as the significance level shows ($p > .05$) that The two groups did not differ statistically from one another; this similarity could also be seen in the mean of the two groups in all subscales of the ESL Composition Profile. In order to determine whether or not the MA intervention led to a statistically significant improvement in the experimental group, the pre-and-posttest scores on the academic writing task were compared between the experimental and control groups using the paired sample t-test.

The paired t-test outcomes are demonstrated in Table 6. Both the p-values and the t-values indicate that the experimental group’s pre-and-posttest scores on the academic writing test and its subscales differed significantly ($p = .000$), except for the mechanics’ subscale, which seemed to be not statistically different ($p = .068$). However, the significance value of mechanics was close to .05.

$$Cohen's\ d = \frac{(M_1-M_2)}{\sqrt{\frac{(sd_1^2 + sd_2^2)/2}} = \frac{(66.85 - 51.15)}{\sqrt{(11.957)^2 + (12.185)^2)/2}}/2 = 1.3005798934623887\ integrated\ into\ 1.3$$

The value of Cohen’s $d$ calculated above reveals a strong effect size of the MA intervention on the result of academic writing of L2 postgraduates.

### Table 4. Statistical results of academic writing.

<table>
<thead>
<tr>
<th>Test</th>
<th>Group</th>
<th>Mean</th>
<th>SD</th>
<th>Sig(2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Writing</td>
<td>Experimental</td>
<td>53.86</td>
<td>12.673</td>
<td>.645</td>
</tr>
<tr>
<td>Control</td>
<td>51.64</td>
<td>12.488</td>
<td></td>
<td>.645</td>
</tr>
</tbody>
</table>

### Table 5. Academic writing pretest results.

<table>
<thead>
<tr>
<th>Group</th>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Sig.(2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>Content</td>
<td>17.79</td>
<td>3.886</td>
<td>.341</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td>16.50</td>
<td>3.082</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>Organization</td>
<td>10.79</td>
<td>2.833</td>
<td>.844</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td>10.57</td>
<td>2.875</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>Language Use</td>
<td>12.50</td>
<td>3.632</td>
<td>.809</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td>12.14</td>
<td>4.092</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>Vocabulary</td>
<td>9.71</td>
<td>2.054</td>
<td>.872</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td>9.57</td>
<td>2.563</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>Mechanics</td>
<td>3.07</td>
<td>0.917</td>
<td>.530</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td>2.86</td>
<td>0.864</td>
<td></td>
</tr>
</tbody>
</table>

E: Experimental; C: Control.
**4.2. Question two**

Table 7 displays the relationship between an MA and academic writing as determined by a Pearson coefficient analysis. The table indicates that, at the 0.01 significance level, there was a significant association between academic writing and MA ($p = 0.000; R = 0.763$).

Regarding the strength of the correlation between MA and academic writing, it seems to be large, based on Cohen (1988) guidelines ($r = 0.763 > 0.50$).

**4.3. Question three**

After running the SPSS PROCESS macro, results were obtained regarding the three mediation analysis approaches (the causal steps approach, the distribution of product approach, and the bootstrapping approach). Several separate linear regressions were performed to meet the causal steps approach requirements. Figure 2 shows the results of linear regressions performed in the mediation model. The first linear regression was between MA and academic writing. The result showed that MA was significantly related to academic writing (Total effect = path $c = 0.763, p < .001$).

The second linear regression was conducted between MA and vocabulary knowledge. A significant correlation was discovered between MA and vocabulary knowledge. (Path $a = 0.698, p < .001$). Finally, the third linear regression was between academic writing, vocabulary knowledge, and MA. The results revealed a significant association between academic writing and vocabulary knowledge (Path $b = 0.345, p < .05$) and MA (Path $c = 0.535, p < .01$). It can be seen that all linear regressions were significant.
Therefore, vocabulary knowledge was acting as a mediator between MA and academic writing, according to Baron and Kenny (1986).

The Sobel test's outcome for the indirect effect of MA on academic writing through vocabulary knowledge was also reported. Table 8 shows that the $z$-value was larger than 1.96, and the significance value was less than $p<0.05$ ($Z = 2.9363, p = 0.0033$). It can be concluded from the table that the vocabulary knowledge mediated between MA and academic writing (Yay, 2017).

The bootstrapping analysis result was also reported. Table 9 shows that the indirect influence of MA via vocabulary knowledge was significant, as evidenced by an effect of 0.3851 and a 95% confidence level of confidence intervals of 0.1599 to 0.6493, which did not contain a zero (Hayes, 2013; Koschate-Fischer & Schwille, 2018; Yay, 2017).

Based on the results of the three mediation approaches conducted in the current study, it can be concluded that vocabulary knowledge mediated the association between MA and academic writing.

Kim (2019) states, 'Multicollinearity is present when the VIF is higher than 5–10'. The result shown in Table 10 reveals no multicollinearity problem as the VIF is less than 5.

### 5. Discussion and conclusion

The results revealed a significant difference between the academic writing scores in the pretest and posttest. The results suggested that MA intervention was beneficial to L2 postgraduates in enhancing their academic writing. There is considerable evidence in the literature about the contribution of MA intervention to improve several language skills, such as reading comprehension (Amirjalili & Jabbari, 2018; Díaz Contreras, 2018; Lesaux et al., 2010; Yucel-Koc, 2015), word reading (Li & Chen, 2016), vocabulary breadth (Akbulut, 2017; Alsaedi, 2017; Asaad et al., 2022; Lin, 2017), and spelling (Bryant et al., 2006; Carlisle, 2016; Kirk & Gillon, 2009). However, there is a lack of research on the effect of MA intervention on L2 postgraduates’ academic writing.

The findings of the present study were predicted. Improving MA could assist writers in managing grammatical choices by helping them fluently change verbs into nominalizations or from nouns into verbs by manipulating suffixes. The ability to manipulate words already in their lexical knowledge by changing suffixes would help students express their intended meaning more concisely and precisely. A good understanding of morphemes could help bridge between the word level and the sentence level syntax by manipulating words, which could later assist writers in generating texts efficiently, fulfilling larger rhetorical goals, and sustaining syntactic accuracy during writing by reducing working memory loads to achieve those goals.
However, the results were anticipated by those of earlier research that looked at the effect of MA intervention on other English language skills, such as reading comprehension, word reading, and spelling. For example, the results of recent studies conducted by Amirjalili and Jabbari (2018) and Díaz Contreras (2018) showed that ‘the experimental group outperformed the control group, and there was a significant difference between the scores of the reading comprehension pretest and posttest, ‘which indicated the impact of the MA intervention on the learners’ performance. Similar results were found in previous studies related to reading comprehension (eg Apel & Diehm, 2014; Baumann et al., 2002; Lesaux et al., 2010), word reading (eg Li & Chen, 2016), and spelling (eg Carlisle, 2016; Kirk & Gillon, 2009).

The experimental group’s posttest performance was significantly higher than their pretest performance on the academic writing pretest (including the components of the ESL composition profile). One exception was found to be not significantly different in one of the components of the ESL composition profile, and that was Mechanics. Binti Shukor and Noordin (2014) found similar outcomes in their research on the effects of Facebook writing groups on the academic writing of international students learning English as a second language at the undergraduate level. Results from the posttest were compared to those from the study’s pretest, and the researchers found no statistically significant improvement in the participants’ performance in mechanics.

The same result was found in another study by Nik et al. (2010) in which the researchers aimed to compare two groups (Diploma students and Matriculation students) in terms of their writing performance. The ESL composition profile was used to assess the student’s performance. It was found that the score of Mechanics was not different between the two groups, and Mechanics did not contribute to the student’s writing performance. The researchers attributed the reason for the non-significance of the result of Mechanics by stating that Mechanics do not significantly impact writing performance because it consists only of capitalization and writing conventions that make formal writing appear as expected. According to the results of the second question, those with higher MA degrees appear to excel in academic writing. That is to say, a person’s proficiency in academic writing will improve in proportion to mastery of morphemes and the ability to recognize and combine words.

The finding showed similar results to the results of previous studies in which MA was correlated with several language skills (eg Apel & Diehm, 2014; Carlisle, 2000; Choi, 2015; Deacon & Bryant, 2006; Deacon et al., 2018; Deacon et al., 2006; Fracasso et al., 2016; Levesque et al., 2017; Li & Chen, 2016; McCutchen & Stull, 2015; Shoeib, 2017; Xue & Jiang, 2017; Zhang, 2016).

The main aim of the current study was to examine the role of vocabulary knowledge in mediating the association between MA and academic writing among L2 postgraduates. Results concerning vocabulary knowledge mediation were reported based on three major and most used approaches in the mediation analysis testing (Hayes, 2009; Hayes & Preacher, 2010; Koschate-Fischer & Schwille, 2018). The causal steps approach showed that all the linear regression tests conducted were significant and, therefore, vocabulary knowledge acted as a mediator in the association between MA and academic writing.

The second mediation analysis approach (the distribution of product approach) also confirmed the vocabulary knowledge mediation after conducting the Sobel test, which revealed that vocabulary knowledge significantly mediated the association between MA and academic writing among L2 postgraduates. This result was emphasized after conducting the bootstrapping analysis test, which showed the lower and upper confidence intervals to be both positive (there is no zero between the two intervals). Therefore, the relationship between MA and academic writing among L2 postgraduates was mediated by vocabulary knowledge.

The results suggest that MA indirectly affected the students’ academic writing via vocabulary knowledge. The literature review related to MA has shown that there were a few previous studies that investigated the vocabulary knowledge mediation between MA and reading comprehension (Choi, 2015; Levesque et al., 2017; Zhang & Koda, 2012; Zhang, 2016); however, those previous studies showed that there were contradictory results concerning the mediating role of vocabulary knowledge. Some of them found that vocabulary knowledge was mediating the relationship between MA and reading comprehension (Kieffer & Box, 2013; Zhang & Koda, 2012; Zhang, 2016), and other researchers revealed that vocabulary knowledge did not act as a mediator (Choi, 2015; Levesque et al., 2017).
The results of the current study showed that teaching L2 postgraduate students in a morphological awareness intervention contributed to improving their academic writing directly and indirectly by increasing the student’s vocabulary knowledge, building up a deeper meaning of vocabulary knowledge to perform better in their academic writing. Therefore, it appears that teachers of the English language are encouraged to educate themselves about the different methods and techniques of teaching morphemes and word formation in a classroom, and they are also encouraged to come up with teaching materials to help learners of English achieve and meet their needs of enhancing their vocabulary knowledge and academic writing eventually. To researchers, the findings of the study could contribute to the field of English language research and inspire other researchers as a basis for future research, as the findings could provide considerable information for other researchers to conduct further investigations concerning the phenomenon of learning and teaching morphology in ESL/EFL classes. It is recommended to conduct other morphological awareness interventions with students of different ages (children and adults) or levels of study (school, undergraduate, postgraduate).

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About the author

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References


# Appendix A

## ESL Composition Profile

<table>
<thead>
<tr>
<th>Score</th>
<th>Level</th>
<th>Criteria</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-27</td>
<td>Excellent to Very Good: knowledgeable • substantive • thorough development of thesis • relevant to assigned topic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26-22</td>
<td>Good to Average: some knowledge of subject • adequate range • limited development of thesis • mostly relevant to topic, but lacks detail</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21-17</td>
<td>Fair to Poor: limited knowledge of subject • little substance • inadequate development of topic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16-13</td>
<td>Very Poor: does not show knowledge of subject • non-substantive • not pertinent • OR not enough to evaluate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-18</td>
<td>Excellent to Very Good: fluent expression • ideas clearly stated/supported • succinct • well-organized • logical sequencing • cohesive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17-14</td>
<td>Good to Average: somewhat choppy • loosely organized but main ideas stand out • limited support • logical but incomplete sequencing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13-10</td>
<td>Fair to Poor: non-fluent • ideas confused or disconnected • lacks logical sequencing and development</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9-7</td>
<td>Very Poor: does not communicate • no organization • OR not enough to evaluate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25-22</td>
<td>Excellent to Very Good: sophisticated range • effective word/idiom choice and usage • word form mastery • appropriate register</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21-18</td>
<td>Good to Average: adequate range • occasional errors of word/idiom form, choice, usage • but meaning not obscured</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17-11</td>
<td>Fair to Poor: limited range • frequent errors of word/idiom form, choice, usage • meaning confused or obscured</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-5</td>
<td>Very Poor: essentially translation • little knowledge of English vocabulary, idioms, word form • OR not enough to evaluate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Excellent to Very Good: demonstrates mastery of conventions • few errors of spelling, punctuation, capitalization, paragraphing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Good to Average: occasional errors of spelling, punctuation, capitalization, paragraphing • but meaning not obscured</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Fair to Poor: frequent errors of spelling, punctuation, capitalization, paragraphing • poor handwriting • meaning confused or obscured</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Very Poor: no mastery of conventions • dominated by errors of spelling, punctuation, capitalization, paragraphing • handwriting illegible • OR not enough to evaluate</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total Score:** Reader Comments