EXPLORING LINGUISTIC PREDICTORS OF ACADEMIC READING COMPREHENSION AMONG ESL UNDERGRADUATES AT A PUBLIC UNIVERSITY: A PRELIMINARY STUDY

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Abstract: For many years, ESL educators have placed significant emphasis on improving the reading abilities of primary and secondary education students. Nonetheless, despite these efforts, many university students still encounter difficulties in comprehending academic reading materials. This inadequacy in reading comprehension may be ascribed, at least in part, to the insufficient development of metalinguistic competence, which includes a set of linguistic skills, such as morphology, syntax, and vocabulary. Previous empirical studies have provided compelling evidence of the role of morphological awareness, syntactic awareness, and lexical knowledge in reading comprehension across various age groups such as children and adolescents. Notwithstanding these findings, the precise role and contributions of each determinant remains inconclusive and contradictory, particularly for university students. Hence, this pilot study aimed to validate the adapted instruments used and to bridge the existing scientific lacunae on the linguistic determinants that could predict reading comprehension among Malaysian ESL undergraduates. This study draws upon three prominent theoretical underpinnings: the Reading Systems Framework, the Vocabulary Knowledge-Reading Comprehension Model, and the Automaticity Reading Theory. This study adopted a quantitative approach with a correlational design and recruited ESL undergraduates (n=35)

from a public university. Five tests were administered, which included Morphological Awareness Test, Syntactic Awareness Test, Vocabulary Levels Test, Word Associates Test, and Reading Comprehension Test. Data were analysed using statistical techniques, such as descriptive statistics, normality testing, reliability, and Pearson product-moment correlation analysis. The findings revealed significant correlations between all linguistic determinants and reading comprehension, establishing promising groundwork for further large-scale study. This preliminary work not only contributes to the validation of measurement instruments in the Malaysian ESL context but also offers valuable insights into the metalinguistic dimensions of academic reading at the tertiary level so as to address a crucial scientific lacunae in the literature on L2 reading comprehension.

Keywords: lexical knowledge, Malaysian ESL undergraduates, morphological awareness, reading comprehension, syntactic awareness

INTRODUCTION

Reading comprehension is a fundamental skill that builds a foundation for academic success and lifelong learning. In the context of higher education, proficient reading comprehension abilities are crucial for students to effectively engage with and learn from advanced academic texts across various disciplines (Nergis, 2013; Pretorius, 2002; Jones, 2001; Richardson, 2004; Holschuh & Paulson, 2013; Howard et al., 2018). However, despite its importance, many university students struggle with achieving adequate levels of reading comprehension, which can hinder their academic performance and learning outcomes (Gorzycki et al., 2020; Shen, 2013; Noor, 2010). This issue is particularly prevalent among ESL and EFL learners, who often face additional challenges in comprehending academic texts due to linguistic barriers and cultural differences (e.g., Rets et al., 2022; Zhang & Zou, 2020; Choi & Todaro, 2022; Villanueva, 2022; Tzivinikou, et al., 2021; Alghail & Mahfoodh, 2016; Meniado, 2016). Although the importance of reading in higher education has been well-established, the issue of university-level academic reading and its associated pedagogy has received surprisingly little attention in the literature (Stahl & King, 2018; Armstrong & Stahl, 2017; Desa et al., 2020). Additionally, Stahl and King (2018) assert that it is puzzling how college-level reading is still not considered a worthy research topic compared to other subfields of literacy despite college reading being recognized as an area of research within the field of literacy for over a century.

While an extensive body of research has explored the cognitive and linguistic factors that contribute to reading comprehension (e.g., Grabe & Stoller, 2011; Jeon & Yamashita, 2014), there remain gaps and inconsistencies in our understanding of how these factors interact and manifest in the higher education context, particularly among ESL university students. For instance, the roles of morphological awareness, syntactic awareness, and lexical knowledge have been widely studied in relation to reading comprehension (Deacon & Kieffer, 2018; Kieffer & Lesaux, 2012a; Proctor et al., 2012), but the relative contributions and interplay of these components in predicting reading comprehension performance among ESL university students are still not well-established. Furthermore, existing studies have predominantly focused on reading comprehension in primary education settings (e.g., Simpson et al., 2020; Deacon & Kieffer, 2018; Shen & Park, 2018; Tong & McBride, 2017; Mokhtari & Thompson, 2006), adolescents and high-schoolers (e.g., Brimo et al., 2017; Azizifar, 2011; Atai & Nikuinezhad, 2012; Kolavani & Khodareza, 2015), with fewer investigations specifically targeting the unique challenges and characteristics of reading comprehension in higher education (Gorzycki et al., 2020; Martínez et al., 2015). The complex academic texts and disciplinary variations in discourse patterns encountered by university students may pose distinct demands on their reading comprehension skills, which have been underexplored in the

literature (Bharuthram, 2012; Rosenfeld et al., 2001). Additionally, there is a lack of consensus on the most effective instructional approaches and interventions for enhancing reading comprehension abilities among ESL university students, particularly those with diverse linguistic and educational backgrounds (Meniado, 2016; Ronaldi et al., 2021).

BACKGROUND OF THE STUDY

The present study is firmly grounded in three theoretical frameworks that highlight the roles of linguistic knowledge, vocabulary knowledge, and automaticity in reading comprehension. Firstly, the Reading Systems Framework (RSF) (Perfetti & Stafura, 2014) posits that reading comprehension is a complex process that involves the interaction of various linguistic and cognitive components, such as word identification, syntactic parsing, and meaning construction (Perfetti et al., 2005). Secondly, the Vocabulary Knowledge-Reading Comprehension Model (Qian, 1998) emphasises the key role of vocabulary knowledge in reading comprehension. This model suggests that both vocabulary breadth and depth contribute significantly to reading comprehension performance (Qian & Schedl, 2004). Thirdly, the Automaticity Reading Theory, proposed by LaBerge and Samuels (1974), highlights the importance of automaticity in lower-level reading processes. These include word recognition and syntactic parsing for efficient reading comprehension. The Automaticity Reading Theory suggests that when lower-level processes become automatic, readers can allocate more cognitive resources to higher-level processes that involve more on meaning construction and text integration (Samuels, 1994). By integrating these theoretical lenses, the present study aims to provide a better understanding of the linguistic predictors that may contribute to reading comprehension performance among ESL learners in the context of higher education.

The present study addresses critical gaps in the understanding of ESL reading comprehension at the tertiary level, focusing on the relationships between key linguistic components and reading proficiency among Malaysian undergraduates. Through rigorous instrument validation and correlation analysis, the study aims to:

1. Examine the relationships between morphological awareness, syntactic awareness, lexical knowledge, and reading comprehension among Malaysian ESL undergraduates.
2. Validate the reliability and internal consistency of adapted instruments measuring these linguistic components in the Malaysian tertiary context.
3. Identify which specific dimensions of morphological awareness (derivational, relational, distributional), syntactic awareness (word order, judgment, sentence completion), and lexical knowledge (breadth, depth) demonstrate the strongest associations with academic reading comprehension.

The findings of this study may contribute to the existing body of knowledge in the field of reading and applied linguistics, providing practical implications for educators and researchers working with undergraduate students. By recognising the key linguistic factors of reading comprehension that may be beneficial for comprehending advanced reading materials at the tertiary level, this study can make recommendations to the development of evidence-based instructional approaches and curriculum designs that support reading comprehension skills.

LITERATURE REVIEW

Reading comprehension is a complex, multi-componential ability (Nassaji, 2003; Hermida, 2014). It is fundamental to academic achievement and success across educational levels (Pey et al., 2014). In the context of higher education, strong reading comprehension skills are crucial for university students to effectively engage with and learn from the diverse and complex academic texts they encounter in their university coursework. The ability to understand written material proficiently reinforces their capacity to acquire new knowledge, think critically, and communicate within their respective disciplines effectively (Vaseghi et al., 2012). Given the crucial role of reading comprehension in facilitating learning and academic performance in general, understanding the key factors and processes that contribute to skilled reading comprehension has been an active area of research across various fields, including education, psychology, language acquisition and applied linguistics.

Reading in Higher Education

Reading comprehension is a critical skill for academic success in higher education. University students are expected to engage with advanced complex academic texts across various disciplines, and this often requires advanced reading comprehension abilities (Bharuthram, 2012; Rosenfeld et al., 2001). Nevertheless, many students, particularly those from diverse linguistic backgrounds, struggle with the demands of academic reading (Alghail & Mahfoodh, 2016; Shen, 2013). These difficulties can be attributed to various factors such as limited vocabulary knowledge, unfamiliarity with discipline-specific discourse genres, and lack of effective reading strategies (Gorzycki et al., 2020; Nergis, 2013). Similarly, a significant number of Malaysian undergraduates still grapple with difficulties in understanding academic texts (e.g., Kung & Aziz, 2020; Azmuddin et al., 2020; Singh, 2019; Aroo, 2019; Yusri & Or-Kan, 2019; Al-Jarrah & Ismail, 2018; Rahmat et al., 2018; Romly et al., 2018).

For many years, it has been observed that Malaysian undergraduate students demonstrate inadequate linguistic competence, particularly in terms of their grammatical knowledge (Lin et al., 2018; Zin et al., 2014; Wahi, 2015; Nath et al., 2017; Singh et al., 2017; Fen et al., 2020). They often struggle to comprehend the central thesis or main argument of a given text, which can be attributed to their limited vocabulary and lack of consistent reading habits when it comes to English language materials (Lin et al., 2018; Ab Manan et al., 2017; Yunus et al., 2016). Furthermore, these students frequently report feeling pressured due to insufficient time allocated for reading. Consequently, many of them have not fully developed the linguistic skills, critical thinking and reasoning skills necessary for effectively navigating and analyzing academic texts required for their level of education (Asraf et al., 2019; Zin et al., 2014; Nambiar, 2007).

The Role of Morphological Awareness in Reading Comprehension

Morphological awareness is the ability to recognize and operate the smallest meaningful units of words (i.e., morphemes), and it has been identified as a significant contributor to reading comprehension in multiple studies (Carlisle, 2000; Deacon & Kieffer, 2018). Several studies have demonstrated that morphological awareness plays a key role in word recognition, vocabulary acquisition, and reading comprehension across various age groups and language backgrounds (Kieffer & Lesaux, 2012a; Kieffer & Lesaux, 2012b; Nagy et al., 2006). In the context of higher education, morphological awareness has been found to be particularly important for ESL learners, as it helps them decode sophisticated academic vocabulary and

understand the relationships between word parts (Metsala et al., 2019; Bilikozen & Akyel, 2014; Maag, 2007).

In prior studies, morphological awareness has been consistently shown to play a unique role in reading comprehension across various contexts, such as native English speakers, ESL/EFL learners, and individuals with reading difficulties. Several studies have also looked at the relationship between morphological awareness and reading comprehension by employing a range of methodologies such as structural equation modeling (SEM), experimental designs, correlational and longitudinal studies. For example, in the context of native English speakers, Guo et al. (2011) found that morphological awareness directly influenced reading comprehension in adult native English speakers, while also highlighting the importance of syntactic awareness and vocabulary knowledge in this relationship. Kotzer et al. (2021) further emphasized the significance of morphological awareness as an individual difference factor for skilled adult readers, while Metsala et al. (2019) found that awareness of different word forms is particularly important for improving reading skills in university students with a history of reading difficulties. Additionally, Tighe and Binder (2015) revealed the significant contribution of morphological awareness to reading comprehension among low-proficient adults.

On the other hand, in EFL contexts, several experimental studies have shown the effectiveness of morphological awareness interventions in improving reading comprehension skills. Akbulut (2019) and Amirjalili and Jabbari (2018) both found that explicit morphological awareness instruction led to significant improvements in reading comprehension performance among Turkish and Iranian university EFL students, respectively. These studies also highlighted the importance of different aspects of derivational morphology, with the distributional aspect exhibiting the strongest correlation with reading comprehension. Bar-Kochva (2016) implemented a morpheme-based intervention program for Hebrew university students with dyslexia, resulting in small but positive impacts on reading and spelling skills. Similarly, Asgharzade et al. (2012) showed that explicit morphological practice can improve the reading comprehension skills of intermediate-level Iranian EFL students. In another study conducted by Vaknin-Nusbaum et al. (2018), they revealed that morphological awareness significantly predicted reading comprehension performance among second-grade Hebrew-speaking students, with different aspects of morphological awareness being important depending on the students' decoding abilities.

The Role of Syntactic Awareness in Reading Comprehension

Syntactic awareness, which involves the understanding of grammatical structures and sentence construction, has also been identified as a crucial predictor of reading comprehension (Cain, 2007; Mokhtari & Thompson, 2006). Studies have showed that students with higher levels of syntactic awareness tend to exhibit better reading comprehension performance, as they can effectively parse complex sentence structures and extract meaning from texts (Brimo et al., 2017; Zipke, 2011). In the higher education context, syntactic awareness is particularly crucial for ESL learners, who may struggle with the complex syntax and discourse patterns found in advanced academic texts (Nergis, 2013; Zhang, 2012).

In the past years, numerous research has delved into the relationship and roles between syntactic knowledge and L2 reading comprehension. Several researchers have also investigated the relative contributions of these factors to L2 reading comprehension, with varying results depending on the various demographics such as proficiency levels and language backgrounds of the participants. To illustrate, Taşçı and Turan (2021a; 2021b) revealed that syntactic knowledge was a better predictor of L2 reading comprehension for high-proficiency Turkish university learners, while lexical breadth was more important for intermediate and low-proficiency university learners. Similarly, Raeisi-Vanani and Baleghizadeh (2022) observed

that vocabulary knowledge was a better predictor of reading comprehension for high-proficiency learners, while grammar (syntax) played a slightly more significant role for low-proficiency learners. Shen and Park (2018) also highlighted the importance of syntactic awareness, along with metacognitive strategies and working memory capacity, as reliable predictors of L2 reading comprehension among Chinese learners.

Other studies have further explored the relative contributions of syntactic and lexical knowledge to L2 reading comprehension. Yalin and Wei (2011) found that syntactic knowledge was a stronger predictor than lexical knowledge for Chinese sophomores, regardless of their proficiency levels. In contrast, Chen (2014) concluded that lexical and syntactic knowledge were equally important predictors of L2 reading comprehension among Taiwanese students from various academic majors. Maftoon and Tasnimi (2014) also emphasized the importance of syntactic knowledge, particularly for self-regulated Iranian EFL university students, supporting the interactive model of reading that acknowledges the influence of both lower-level linguistic processes and higher-level non-linguistic processes on reading comprehension. Nergis (2013) and Shiotsu and Weir (2007) further underscored the significance of syntactic awareness as a strong predictor of academic reading comprehension and L2 text reading comprehension, respectively, even when accounting for factors such as vocabulary depth and prior reading ability.

The Role of Lexical Knowledge in Reading Comprehension

Lexical knowledge, which encompasses both vocabulary breadth (i.e., the number of words known) and depth (i.e., the extent of knowledge about each word), has been consistently linked to reading comprehension performance (Qian, 1998, 2002; Schmitt et al., 2011). Studies have shown that students with larger vocabulary and deeper word knowledge tend to exhibit better reading comprehension skills, as they can more easily access the meaning of words and integrate them into the overall context of the text (Jeon & Yamashita, 2014; Proctor et al., 2012). A study by Lee and Wong (2020) reported that there was a strong correlation between vocabulary size and critical reading ability among high school students in Malaysia, with larger vocabulary size enabled better comprehension and critical analysis. In higher education settings, vocabulary knowledge undoubtedly becomes more important for ESL learners as they are bound to encounter a wide range of discipline-specific vocabulary, academic jargon and terminology (Paiman et al., 2015; Gorzycki et al., 2020; Heppt et al., 2022).

The relationship between vocabulary knowledge and reading comprehension in L2 learners has been extensively researched, with studies focusing on the key role of both lexical breadth and depth in predicting reading comprehension across various age groups and L1 backgrounds. For instance, In L1 contexts, Nation and Snowling (2004) and Ricketts et al. (2007) found that vocabulary knowledge remained a strong predictor of reading comprehension among young children, even after controlling for factors such as age, nonverbal IQ, and decoding skills. Similarly, Ouellette (2006) and Tannenbaum et al. (2006) investigated the relative contributions of vocabulary breadth and depth to reading comprehension in fourth-grade students, with mixed results regarding the dominance of either factor. In another study, Binder et al. (2017) further emphasized the importance of both lexical breadth and depth in contributing to reading comprehension among university students with advanced L1 proficiency.

In L2 (ESL and EFL) contexts, numerous studies have explored the impact of vocabulary knowledge on reading comprehension. Notably, Qian (1998, 2002) found significant and positive correlations between lexical breadth, depth, and L2 reading comprehension among adult ESL learners from diverse L1 backgrounds, concluding that lexical depth is equally crucial as breadth in university-level ESL settings. Rashidi and Khosravi (2010) and Horiba

(2012) further supported these findings, as they found there is a strong association between vocabulary breadth, depth, and reading comprehension in Iranian and East Asian EFL learners (Chinese, Korean, Japanese), respectively. However, the relative contributions of lexical breadth and depth may vary depending on the learners' L1 background and the nature of the reading tasks, as evidenced by Li and Kirby (2014) and Zhang and Yang (2016). Additionally, Alavi and Akbarian (2012) and Nassaji (2003) highlighted the significance of vocabulary knowledge in predicting reading comprehension, surpassing the influence of syntactic knowledge and inferential skills. Zhang (2012) further confirmed the dominance of vocabulary knowledge over grammatical understanding in predicting reading comprehension among advanced Chinese EFL learners using structural equation modeling analysis. Similarly, Daller and Xue (2009) investigated the relationship between vocabulary knowledge and academic success, including reading proficiency, among Chinese students in UK universities and found that vocabulary skills strongly correlate with academic success, particularly reading proficiency, as the test emphasizes vocabulary breadth and lexical diversity.

Scientific Lacunae

Despite the growing body of research on the linguistic determinants influencing reading comprehension, there remain several gaps in the literature, particularly in the context of higher education and ESL learners in Malaysia. First, few studies have simultaneously examined the relative contributions of morphological awareness, syntactic awareness, and lexical knowledge to reading comprehension among university students (e.g., Guo et al., 2011; Zhang, 2012). Second, the majority of existing studies have focused on primary and secondary school students (e.g., Brimo et al., 2017; Azizifar, 2011; Atai & Nikuinezhad, 2012), with limited attention given to the unique challenges faced by university ESL students, particularly those from diverse linguistic backgrounds (Gorzycki et al., 2020; Martínez et al., 2015). In the Malaysian context, no studies have been conducted on the relationships and contributions of morphological and syntactic awareness on reading comprehension across age groups. It is also noted that there is a lack of research on the specific dimensions of these linguistic components that are most predictive of reading comprehension performance in the higher education context (Bilikozen & Akyel, 2014; Heppt et al., 2022). This gap significantly constrains the ability to develop targeted interventions for enhancing academic reading competence among university students.

METHODOLOGY

Research Design

This pilot study employed a quantitative approach with a correlational design to examine relationships between linguistic variables in reading comprehension at a Malaysian public university. The study focused on validating five measurement instruments: the Morphological Awareness Test (MAT), Syntactic Awareness Test (SAT), Vocabulary Levels Test (VLT), Word Associates Test (WAT), and Reading Comprehension Test (RCT). Beyond assessing internal consistency of these instruments, the research evaluated testing procedures, time allocation, and administration protocols. Through this preliminary investigation, we refined the research methodology and established baseline data for a subsequent large-scale investigation of linguistic predictors in ESL reading comprehension at the tertiary level.

Participants

Samples were drawn from 35 first-year undergraduate students enrolled in two English classes at the faculty of education in a public university in Malaysia. The students, with a proficiency range of bands 3 and 3.5 in the Malaysian University English Test (MUET), voluntarily consented to participate in the study. Due to time constraints and the approaching end of the semester, the cohort consisted of the only two available groups who were willing to participate in the pilot study: 17 students were from the first group and 18 students from the second group. The participants were briefed about what they were expected to do before consenting to participate in the study.

Measures

In the current study, five measures were administered to the participants. The measures were: (1) the Morphological Awareness Test (MAT), (2) the Syntactic Awareness Test (SAT), (3) the Vocabulary Levels Test (VLT), (4) the Word Associates Test (WAT), and (5) the Reading Comprehension Test (RCT). The tests employed an impartial evaluation method to assess the participants' current level of knowledge in each respective domain. The testing method utilised binary-choice and multiple-choice formats, which are commonly used to measure participants' comprehension of specific structural aspects (Nicol, 2007). The instruments and the adapted and adopted sources are presented in Table 1 below.

Table 1. List of adapted and adopted measures

No	Instruments	Dimensions measured	No. of items	Sources of adaptation / adoption
1.	Morphological Awareness Test (MAT)	Derivational Aspect	30	Mahony (1994)
		Relational Aspect	40	Mahony (1994)
		Distributional Aspect	20	Tyler and Nagy (1989)
2.	Syntactic Awareness Test (SAT)	Syntactic Word Order	20	Cain (2007)
		Syntactic Judgement	20	Nassaji (2003)
		Sentence Completion	20	Phillips (2001)
3.	Vocabulary Levels Test (VLT)	Vocabulary Breadth	150	Webb et al. (2017)
4.	Word Associates Test (WAT)	Vocabulary Depth	40	Read (1998)
5.	TOEFL iBT Reading (RCT)	Reading Comprehension	30	ETS (2021)

Research Procedures

The research procedures took into account the following concerns: the administration of the tests, time allocation for the tests, scoring and evaluation protocols, as well as the collection of student and instructor feedback regarding the research procedure and test administration.

Test Administration and Counterbalancing

The five instruments were administered online in a computer laboratory using Microsoft Forms and Google Forms, with two instructors and a researcher as proctors. To minimize control order effects, which include practice effect, fatigue effect, boredom effect, and carryover effect, tests were administered in two counterbalanced sessions. Group 1 (n=17) completed the MAT, SAT, and WAT in the first session, followed by the RCT and VLT in the second session. Group 2

(n=18) followed the reverse order. The MAT, SAT, VLT, and WAT were administered through Microsoft Forms, while the RCT utilised Google Forms for its superior interface capabilities.

Time Allocation and Completion

The test duration was meticulously observed and regulated throughout the pilot testing. Time limits were set at 25 minutes each for the MAT and SAT, 30 minutes each for the VLT and WAT, and 60 minutes for the RCT. Actual completion times were notably shorter: MAT (20 minutes), SAT (22 minutes), VLT (24 minutes), WAT (27 minutes), and RCT (55 minutes). This data provided valuable insights for time allocation in the main study.

Scoring Protocol

The scoring system employed in all tests utilises a combination of multiple-choice and binary-choice formats. The scores were automatically computed by advanced algorithms integrated within the Microsoft Forms and Google Forms tools. These algorithms generate one point for each correct answer, while providing a score of zero for incorrect responses. Notably, no mark deduction is incurred for erroneous answers. The utilisation of automated algorithms to dictate the scoring process ensures an efficiency and accuracy of marking and eliminates potential sources of human error.

Participant Feedback

Post-administration feedback from eight students and two instructors revealed concerns about cognitive load, particularly regarding the administration of multiple tests in a single sitting. Some participants reported needing additional time for certain tests. These insights prompted reconsideration of test scheduling and time allocation for the main study.

RESULTS AND FINDINGS

This pilot study examined the reliability of five adapted and adopted instruments and their relationships through several statistical analyses. The investigation encompassed descriptive statistics to understand score distributions, normality testing to verify statistical assumptions, reliability analyses to establish internal consistency, and correlation analyses to examine relationships between linguistic variables and reading comprehension.

Descriptive Statistics

Table 2 provides a summary of the results, including the participants' minimum and maximum scores in the MAT, SAT, LK, VLT, WAT, and RCT, along with the mean scores, standard errors and standard deviations. Based on Table 3, the MAT yields scores ranging from 44.00 to 81.00, with a mean score of 64.91, and is characterized by a moderate degree of variability as demonstrated by a standard deviation of 8.913. On the other hand, the overall SAT yields scores ranging from 27.00 to 55.00, with a mean score of 41.14, and is indicated by a standard deviation of 7.409. In the VLT, the scores range from 128.00 to 145.00, with a mean score of 136.86. A low standard deviation of 4.654 indicates that there is little variability in the scores amongst participants. By contrast, the scores obtained from the WAT ranged from 84.00 to 122.00, with an average mean score of 104.57, as indicated by a standard deviation of 9.407. Additionally, the assessment of LK, comprising scores of the VLT and WAT, provides an

aggregate measure of lexical knowledge. With a score range of 212.00 to 264.00, the mean score of 241.43 indicates a higher overall performance compared to individual tests. Finally, the RCT yields scores ranging from 11.00 to 26.00, indicating relatively poorer performance compared to other tests. The mean score of 19.20 and low standard deviation of 3.56288 suggest the low amount variability in the scores.

Table 2. Descriptive statistics

Tests	N	Min. score	Max. score	Optimal score	Mean	Std. Error	SD
Morphological Awareness Test (MAT)							
Derivational Aspect (DA)	35	8.00	27.00	30	17.94	.780	4.614
Relational Aspect (RA)	35	26.00	40.00	40	34.80	.686	4.057
Distributional Aspect (DIA)	35	6.00	18.00	20	12.17	.649	3.839
Overall MAT	35	44.00	81.00	90	64.91	1.507	8.913
Syntactic Awareness Test (SAT)							
Syntactic Word Order (SWO)	35	6.00	19.00	20	13.57	.618	3.656
Syntactic Judgement (SJ)	35	4.00	18.00	20	12.29	.620	3.667
Sentence Completion (SC)	35	9.00	20.00	20	15.29	.540	3.195
Overall SAT	35	27.00	55.00	60	41.14	1.252	7.409
Lexical Knowledge (LK)							
Vocabulary Levels Test (VLT)	35	128.00	145.00	150	136.86	.787	4.654
Word Associates Test (WAT)	35	84.00	122.00	160	104.57	1.590	9.407
Overall LK	35	212.00	264.00	310	241.43	2.211	13.082
Reading Comprehension Test (RCT)	35	11.00	26.00	30	19.20	.602	3.562

Normality Test

The normality of data was analysed to evaluate the shape and distribution of the data, focusing on skewness and kurtosis. Table 3 displays the descriptive statistics of skewness and kurtosis values for each instrument. Based on the results, the data for the MAT, SAT, LK, and RCT can all be considered approximately normally distributed, as the values fall within the acceptable range for kurtosis and skewness. The skewness and kurtosis values for all tests fall within the acceptable range of -2 to +2 for skewness and -7 to +7 for kurtosis (George & Mallery, 2010). This indicates that the data are considered approximately normally distributed for all tests.

Table 3. Descriptive analysis of data normality

	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
Morphological Awareness Test (MAT)					
Derivational Aspect (DA)	35	.100	.398	-.310	.778
Relational Aspect (RA)	35	-.471	.398	-.742	.778
Distributional Aspect (DIA)	35	-.016	.398	-1.187	.778
Overall MAT	35	-.364	.398	.024	.778
Syntactic Awareness Test (SAT)					
Syntactic Word Order (SWO)	35	-.519	.398	-.600	.778
Syntactic Judgement (SJ)	35	-.371	.398	-.616	.778
Sentence Completion (SC)	35	-.350	.398	-.824	.778
Overall SAT	35	-.199	.398	-.778	.778
Lexical Knowledge (LK)					
Vocabulary Levels Test (VLT)	35	-.279	.398	-.426	.778

continued

Word Associates Test (WAT)	35	-.162	.398	-.359	.778
Overall LK	35	-.282	.398	-.510	.778
Reading Comprehension Test (RCT)	35	-.368	.398	-.289	.778

Reliability of Measures

Based on the results of the pilot study, it is noted that each measure, namely the MAT, the SAT, the VAT, the WAT, and the RCT yielded a high level of reliability. The dependent variable, which is the RCT, yielded a Cronbach's alpha of 0.703. the independent variables demonstrated strong internal consistency, with the MAT, SAT, and LK measures (comprised of the VLT and WAT) exhibiting Cronbach's alpha coefficients of 0.808, 0.795, and 0.908, respectively. The LK measures, when analyzed separately, yielded Cronbach's alpha values of 0.728 for the VLT and 0.904 for the WAT. Notably, the Cronbach's alpha coefficient for the majority of variables exhibited values exceeded 0.7, indicating strong reliability for further analysis. Upon combining all of the instruments used in the study, a highly strong Cronbach's alpha coefficient of 0.935 was obtained. The comprehensive set of instruments combined adds up to a total of 370 items. The reliability statistics for each instrument is presented in Table 4.

Table 4. Reliability of the measures

Tests	No. of Items	Cronbach's Alpha
Morphological Awareness Test (MAT)		
Derivational Aspect (DA)	30	0.705
Relational Aspect (RA)	40	0.751
Distributional Aspect (DIA)	20	0.709
Overall MAT	90	0.808
Syntactic Awareness Test (SAT)		
Syntactic Word Order (SWO)	20	0.723
Syntactic Judgement (SJ)	20	0.710
Sentence Completion (SC)	20	0.701
Overall SAT	60	0.795
Lexical Knowledge (LK)		
Vocabulary Levels Test (VLT)	150	0.728
Word Associates Test (WAT)	40	0.904
Overall LK	190	0.908
Reading Comprehension Test (RCT)	30	0.703
All instruments combined	**370**	**0.935**

Pearson Product-Moment Correlation Analysis

In order to measure any potential relationships between the scores of participants across five tests, namely, the MAT, SAT, VLT, WAT, and RCT, a Pearson product-moment correlation analysis was performed. The findings of correlation analysis are displayed in Table 5, presenting a correlation matrix for the aforementioned variables. In reference to Table 5, an analysis of the pilot study revealed a positive and significant correlation among all the variables. The results indicate that the MAT, SAT, and LK hold a positive correlation with the RCT, with respective statistical values of the MAT ($r = 0.690$, $p < 0.01$), SAT ($r = 0.735$, $p < 0.01$), and LK ($r = 0.505$, $p < 0.01$).

Table 5. Pearson correlation matrix for all study variables

	MAT	SAT	LK	RCT
MAT	1	.501**	.471**	.690**
SAT	.501**	1	.517**	.735**
LK	.471**	.517**	1	.505**
RCT	.690**	.735**	.505**	1

** Correlation is significant at the 0.01 level (2-tailed).

Furthermore, an analysis was also conducted to examine the relationships between individual dimensions of MAT, SAT, and LK, and their correlations with the RCT. The results in Table 6 revealed that all dimensions of MAT, SAT, and LK had significant correlations with RCT. Within the MAT, the Relational Aspect (RA) demonstrated the strongest correlation with RCT ($r = 0.654$**, $p < 0.01$), followed by the Distributional Aspect (DIA; $r = 0.458$**, $p < 0.01$) and the Derivational Aspect (DA; $r = 0.376$*, $p < 0.05$). Similarly, for the SAT, the Sentence Completion (SC) exhibited the highest correlation with RCT ($r = 0.563$**, $p < 0.01$), closely followed by the Syntactic Judgment (SJ; $r = 0.520$**, $p < 0.01$) and the Syntactic Word Order (SWO; $r = 0.476$**, $p < 0.01$). Both LK tests, namely the WAT and the VLT, showed comparable levels of significant correlation with RCT ($r = 0.468$** and $r = 0.474$**, respectively, both with $p < 0.01$). These findings highlight the importance of morphological awareness, syntactic awareness, and lexical knowledge in contributing to reading comprehension, with Relational Aspect of the MAT, Sentence Completion and Syntactic Judgment aspects of the SAT, and both lexical knowledge tests demonstrating the strongest correlations with the RCT.

Table 6. Pearson correlation matrix for individual dimensions in all variables

		MAT			SAT			LK		RCT
		DA	**RA**	**DIA**	**SWO**	**SJ**	**SC**	**VLT**	**WAT**	
MAT	**DA**	1	.155	.233	.175	.411*	.245	.112	.203	.376*
	RA	.155	1	.414*	.180	.342*	.461**	.511**	.443**	.654**
	DIA	.233	.414*	1	-.016	.373*	.065	.309	.322	.458**
SAT	**SWO**	.175	.180	-.016	1	.016	.482**	.133	.318	.476**
	SJ	.411*	.342*	.373*	.016	1	.264	.320	.267	.520**
	SC	.245	.461**	.065	.482**	.264	1	.454**	.517**	.563**
LK	**VLT**	.112	.511**	.309	.133	.320	.454**	1	.697**	.474**
	WAT	.203	.443**	.322	.318	.267	.517**	.697**	1	.468**
RCT		.376*	.654**	.458**	.476**	.520**	.563**	.474**	.468**	1

** $p < 0.01$

[MAT = Morphological Awareness Test, SAT = Syntactic Awareness Test, LK = Lexical Knowledge (VLT + WAT), VLT = Vocabulary Levels Test, WAT = Word Associates Test, RCT = Reading Comprehension Test, DA = Derivational Aspect, RA = Relational Aspect, DIA = Distributional Aspect, SWO = Syntactic Word Order, SJ = Syntactic Judgement, SC = Sentence Completion]

DISCUSSION

The investigation into the linguistic dimensions of reading comprehension among ESL undergraduates revealed intriguing patterns in the relationship between metalinguistic awareness and reading comprehension proficiency. The correlation analyses demonstrated robust positive correlations between all variables, with morphological awareness ($r = 0.690$, $p < 0.01$), syntactic awareness ($r = 0.735$, $p < 0.01$), and lexical knowledge ($r = 0.505$, $p < 0.01$) showing significant relationships with reading comprehension. These strong associations align

with previous research highlighting the crucial role of metalinguistic skills in advanced reading comprehension (Carlisle, 2000; Nagy et al., 2006; Proctor et al., 2012).

A detailed analysis of dimensional components yielded particularly noteworthy insights. Within morphological awareness, the relational aspect demonstrated the strongest correlation with reading comprehension ($r = 0.654$, $p < 0.01$), followed by the distributional aspect ($r = 0.458$, $p < 0.01$) and derivational aspect ($r = 0.376$, $p < 0.05$). This hierarchical pattern suggests that students' ability to recognise and manipulate relationships between morphologically related words may be especially crucial for comprehending academic texts. The finding aligns with Deacon and Kieffer's (2018) assertion about the fundamental role of relational morphological knowledge in advanced reading comprehension.

Syntactic awareness emerged as a particularly robust correlate of reading comprehension, with all three components showing significant relationships: sentence completion ($r = 0.563$, $p < 0.01$), syntactic judgment ($r = 0.520$, $p < 0.01$), and syntactic word order ($r = 0.476$, $p < 0.01$). This comprehensive relationship between syntactic awareness and reading comprehension resonates with previous studies emphasising the significance of syntactic competence in academic reading contexts (Taşçı & Turan, 2021a, 2021b; Cain, 2007; Mokhtari & Thompson, 2006). The strong correlation of sentence completion abilities suggests that students' capacity to process and complete complex syntactic structures may be particularly important for comprehending academic texts.

Meanwhile, the relationship between lexical knowledge and reading comprehension revealed interesting patterns. Both vocabulary breadth ($r = 0.474$, $p < 0.01$) and depth ($r = 0.468$, $p < 0.01$) showed moderate correlations with reading comprehension, demonstrating remarkably similar strengths of association. This finding suggests that both dimensions of vocabulary knowledge contribute relatively equally to reading comprehension in this sample, contrasting with some previous studies that found differential effects (Qian, 2002; Schmitt et al., 2011).

However, the relatively moderate strength of these lexical correlations, compared to morphological and syntactic awareness, presents an unexpected finding that warrants careful interpretation. This pattern might reflect the homogeneous nature of the pilot study's sample, all drawn from the same faculty and MUET band (bands 3 and 3.5). The limited sample size (n=35) may have also constrained the ability to detect more nuanced relationships between vocabulary knowledge and reading comprehension. These methodological constraints, while limiting generalisability, provide valuable insights for optimising the design of the subsequent large-scale study.

The internal consistency of the instruments, as indicated by Cronbach's alpha coefficients ranging from 0.701 to 0.904 for individual tests and 0.935 for all instruments combined, suggests robust reliability of the measurements. This high reliability strengthens confidence in the observed relationships between variables, despite the pilot nature of the study.

Taken together, the findings extend current understanding of how linguistic skills interact in advanced L2 reading contexts, particularly in Malaysian higher education settings. The strong correlations of morphological and syntactic awareness with reading comprehension suggest that these skills might be especially crucial for academic reading proficiency even at the tertiary level. This insight has important pedagogical implications, suggesting that explicit instruction in morphological analysis and syntactic structures might be beneficial for enhancing students' academic reading abilities. However, the complex interplay between these linguistic components, coupled with the preliminary nature of this study, highlights the need for further investigation with a larger, more diverse sample.

CONCLUSION AND RECOMMENDATION

This pilot study explored the intricate relationships between metalinguistic awareness and reading comprehension among ESL undergraduates at a public university in Malaysia. The findings revealed significant correlations between morphological awareness, syntactic awareness, lexical knowledge, and reading comprehension, illuminating the complex interplay of linguistic skills in academic reading. The study's methodological rigor, evidenced by high internal consistency measures, establishes a reliable foundation for future investigations into ESL reading comprehension at the tertiary level. Looking ahead, the study recommends expanding this investigation to include a larger, more diverse sample across different faculties and proficiency levels. Future research should explore how these linguistic relationships manifest across different academic disciplines and text genres. Additionally, longitudinal studies could provide valuable insights into the development of these linguistic competencies throughout university study. The validated instruments from this pilot study offer robust tools for such expanded investigations.

LIMITATIONS

Several methodological constraints warrant consideration when interpreting the findings. The sample size, while adequate for a pilot study, limits statistical power and generalisability. The homogeneous nature of the study's sample—all participants from the same faculty and similar MUET bands (3 and 3.5)—may not capture the full spectrum of linguistic abilities among Malaysian ESL undergraduates. The correlational design, while appropriate for exploring relationships between variables, precludes causal inferences about the impact of specific linguistic skills on reading comprehension. Time constraints necessitated convenience sampling, potentially introducing selection bias. Participants' voluntary participation may have attracted students with particular characteristics or motivations, possibly affecting the representativeness of the findings. These limitations, while typical of pilot studies, provide valuable methodological insights for designing more comprehensive investigations of ESL reading comprehension in higher education contexts.

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