Scientific articles

Relación del lenguaje académico y la comprensión lectora con la escritura académica en educación superior en pandemia

Relationship of Academic Language and Reading Comprehension with Academic Writing in Higher Education

Relação da linguagem acadêmica e da compreensão de leitura com a escrita acadêmica no ensino superior durante uma pandemia

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Resumen

La escritura en la universidad es una habilidad en la que intervienen otras destrezas básicas de corte cognitivo, discursivo y lingüístico. Sin embargo, se ha identificado que, con frecuencia, los alumnos de nuevo ingreso a la educación superior presentan dificultades para escribir dentro de su disciplina, lo cual puede afectar su desempeño académico. Por eso, el objetivo de este estudio fue evaluar las relaciones que existen entre tres variables predictoras sustentadas en investigaciones previas (vocabulario académico, lenguaje académico y comprensión lectora) con la escritura académica. Para ello, el método de investigación empleado fue de corte cuantitativo transversal y correlacional. Tres grupos de estudiantes universitarios de primer año (n = 61) fueron evaluados

en las variables predictoras y la escritura académica durante la pandemia del covid-19. Los resultados mostraron que los estudiantes presentaban un dominio relativamente alto en vocabulario académico, medio en habilidades del lenguaje académico, bajo en comprensión lectora, y muy bajo en escritura académica. En la submuestra que completó todas las pruebas (n = 42), se identificaron correlaciones significativas de moderadas a fuertes entre las variables evaluadas y la escritura académica, excepto para el vocabulario académico. Estos hallazgos sugieren que las habilidades del lenguaje académico, especialmente el uso adecuado de los conectores, y la comprensión lectora, pudieran ser candidatos ideales para los esfuerzos de intervención que ayuden a fortalecer el proceso de escritura académica de los estudiantes de nuevo ingreso a la universidad.

Palabras clave: escritura académica, lenguaje académico, comprensión lectora, educación superior.

Abstract

University-level writing is a skill in which other basic cognitive, discursive, and linguistic skills are involved. First-year higher education students often have difficulties writing in their chosen discipline, which may affect their academic performance. This quantitative cross-sectional and correlational study aims to evaluate the relationships between three predictor variables supported by previous research (academic vocabulary, academic language, and reading comprehension) and academic writing. Sixty-one first-year college students were assessed on the predictor variables and academic writing during the Covid-19 pandemic. The results show that students have a relatively high mastery of academic vocabulary, a medium mastery of academic language skills, a low mastery of reading comprehension, and a very low mastery of academic writing. In the subsample that completed all assessments (n=42), significant moderate and strong correlations were identified between variables and academic writing, except for academic vocabulary. Results suggest that academic language skills, particularly connectors, and reading comprehension could be ideal candidates for intervention efforts that help strengthen the academic writing process of new college students.

Keywords: Academic Writing, Academic Language, Reading comprehension, Higher education.

Resumo

Escrever na universidade é uma habilidade na qual intervêm outras habilidades cognitivas, discursivas e linguísticas básicas. Porém, identificou-se que, frequentemente, os alunos ingressantes no ensino superior apresentam dificuldades de escrita dentro de sua disciplina, o que pode afetar seu desempenho acadêmico. Portanto, o objetivo deste estudo foi avaliar as relações existentes entre três variáveis preditoras apoiadas em pesquisas anteriores (vocabulário acadêmico, linguagem acadêmica e compreensão de leitura) com a escrita acadêmica. Para isso, o método de pesquisa utilizado foi quantitativo, transversal e correlacional. Três grupos de estudantes universitários do primeiro ano (n = 61) foram avaliados quanto às variáveis preditoras e à escrita acadêmica durante a pandemia de Covid-19. Os resultados mostraram que os alunos tinham proficiência relativamente alta em vocabulário acadêmico, média em habilidades linguísticas acadêmicas, baixa compreensão de leitura e muito baixa em redação acadêmica. Na subamostra que completou todos os testes (n = 42), foram identificadas correlações significativas moderadas a fortes entre as variáveis testadas e a escrita acadêmica, exceto o vocabulário acadêmico. Estas descobertas sugerem que as competências linguísticas académicas, especialmente o uso adequado de conectores, e a compreensão da leitura, podem ser candidatos ideais para esforços de intervenção para ajudar a fortalecer o processo de escrita académica dos novos estudantes universitários.

Palavras-chave: redação acadêmica, linguagem acadêmica, compreensão de leitura, ensino superior.

Introduction

Difficulties in expressing oneself in writing negatively impact academic success and other daily life activities (health, employment, or personal development; Graham & Perin, 2007). Unlike other countries, where writing is evaluated as a requirement for university admission, in Mexico and other nations, that skill is not considered an admission filter. This situation represents an opportunity and a challenge since universities must have effective methodologies and strategies for teaching academic writing regardless of the initial level with which students enter university. This becomes even more relevant when considering that students have come from a period of isolation due to the covid-19 pandemic.

Writing is a complex, cognitively demanding activity that allows the construction and transformation of information, which involves mental operations at different levels (Graham and Perin, 2007; Ruffini *et al*., 2023). Furthermore, it differs from school writing, which is cognitively

less demanding, shorter and of less syntactic complexity, normally prepared with a single reference, and where the content is usually copied and pasted (Concha *et al.*, 2014). On the other hand, academic writing implies mastery of general academic language and disciplinary terminology, linguistic resources (syntactic and morphological) and knowledge of discursive structures, among others.

In the context of research on academic writing in higher education in Latin America, most of the work has focused on carrying out descriptive studies of the pedagogical methodology to teach the writing process based on discursive genres (Camps & Castelló, 2013; Navarro, 2019; Vine-Jara, 2020), in the development of teaching materials for academic writing in higher education (Navarro & Mora-Aguirre, 2019), or to compare the differences between novice and mature writers, as well as their relationship with the academic performance at the university (Gaeta -González *et al.*, 2020). Other studies have focused on identifying, from the students' perspective, what are the greatest difficulties they face in academic writing (Rey-Castillo & Gómez-Zermeño, 2021; Calle-Arango & Ávila-Reyes, 2020; Olave-Arias *et al.*, 2013).

However, a gap has been recognized in research in terms of identifying the main components that build academic writing, as well as interventions that facilitate the development of said components to achieve better mastery of this skill. The closest research precedent is the study carried out by Concha *et al.* (2014), which focuses on the evaluation of eight macro- and micro-discursive criteria related to academic language and communicative approaches to measure the impact of the intervention on the development of academic writing.

Two components, at the middle- and high-school levels, have been identified in the literature as closely related to academic writing: academic language and reading comprehension. However, these have not been equally explored at the university level. Regarding reading comprehension, there is a broad research base that describes the shared areas between this skill and writing (Fitzgerald & Shanahan, 2000; Graham & Harris, 2017; Shanahan, 2016). For its part, academic language (Schleppegrel , 2004) has been identified as an important component of reading comprehension in English and Spanish (Foorman *et al.*, 2018; Meneses *et al.*, 2018; Romero-Contreras *et al.*, 2021).

The importance of academic language implies that students must resort to their knowledge about the meaning and meaning of words, the complex syntactic structure, the organizational structure of discourse and high-level cognitive processes to obtain good results in reading comprehension (Llorens -Tatay *et al.*, 2011; Snow & Uccelli, 2009; Snow, 2002; Uccelli & Meneses, 2015).

Although writing and reading share underlying skills, the relationship that academic language has with academic writing has not been as widely studied for higher education in Latinamerica in a quantitative study. That is, there are studies related to writing, but from a qualitative approach. Because most of these studies have been carried out at basic educational levels and have focused more on reading than writing, it was considered that there is an opportunity in researching the relationship between all these variables to investigate how they are associated. with academic writing, and to identify what elements could be the object of attention in interventions in academic writing in higher education.

Therefore, the objective of this research is to examine the link between this set of variables — academic vocabulary and language skills, and reading comprehension— with academic writing in a sample of students new to university in Mexico. The data obtained will allow us to identify which of the skills evaluated could be ideal candidates to focus intervention efforts on the academic writing process of first year university students.

Literature Review

The review of the scientific literature is presented as follows. First, the theoretical models of writing development are briefly described (mainly, how one learns to write from cognitive psychology and psycholinguistics). Then, correlational and experimental studies that suggest an association or influence of reading comprehension towards writing are examined. Finally, the same types of studies associated with academic language and comprehension or with writing are described.

Theoretical Models of Writing Development

Although there is a great diversity of writing development models, four of them are presented here. The first is the Flowers and Hayes (1980) model, which initially focused on writing as a process and evaluating competent adult writers, while later revisions have integrated elements of context and reading (Hayes, 2012). Based on this model, numerous investigations focused on the creation of writing goals/objectives and the teaching of strategies to intervene in writing.

Similarly, Scardamalia and Bereiter's (1987, 1992) cognitive approach initially focused on distinguishing models of writing development to characterize novice and expert writers. In this way, the act of "telling knowledge", and "transforming knowledge" was differentiated. These authors proposed that achieving this leap is possible with the appropriate teaching strategies, since this represents a cognitive restructuring, and not just a change in the ability to write.

On the other hand, the Simple Writing view (Berninger *et al*., 2002) is a model of writing development that differentiates spelling skills from written composition. Some later versions of this model, such as the Not-so-simple Writing model, included the integration of executive functions and transcription fluency (Berninger & Winn, 2006). An advantage of this model is that it distinguished between Transcription processes (orthographic mapping or *encoding; decoding* in reading) and the processes that make up Composition (planning, performing revision). However, a problem with both models is that the most complex component of Composition was left too broad to be of practical use. Therefore, for the purpose of this work with university students, Transcription skills would no longer be as relevant, as their usefulness is limited for higher education.

A more recent model in which strengths of previous models are integrated is the Direct and Indirect Effects of Writing (DIEW) by Kim and Schatschneider (2017). Its advantage is that, effectively, it describes the Composition component of the Simple Writing Model more broadly into language subcomponents, such as vocabulary and grammar, as well as higher cognitive abilities, such as the ability to make inferences (which are also important for oral comprehension in reading). These skills specify more precisely what could be the focus for the development of writing skills of university students. However, more evidence is required to support their emphasis on institutional writing skills programs.

Relationship between Reading Comprehension and Academic Writing

There are several approaches to analyze the relationships between reading and writing. One of these defines that both processes are nourished by shared knowledge (Fitzgerald and Shanahan, 2000), that is, that both require knowledge of what is read and written: metalinguistic knowledge of the use and characteristics of the language; of metacognitive knowledge, the purposes for which it is read and the intention for which it is written; of the procedural knowledge necessary to predict, summarize and analyze what is read and to direct what is written, and of the knowledge of the genre and structure of the text that is read. Therefore, if any of this shared knowledge is addressed with reading activities, writing could, at the same time, be developed (and vice versa).

Recently, a meta-analysis on the causal relationship between reading and writing from preschool to high school (Graham *et al*., 2018) showed that intervening in reading can benefit writing development. However, the results of this work cover a very broad window of development, which mixes the initial processes of reading and writing with the more complex linguistic and cognitive processes related to reading comprehension and academic writing. In fact, when reviewing in more detail those meta-analysis studies that report comprehension processes, it

is observed that, indeed, there is a diversity of strategies to relate more complex aspects of academic writing.

Among the studies reported in Graham *et al.* (2018), twelve of them focused on teaching reading comprehension strategies and obtained a significant effect size of $d = .66$ ($p <. 001$). In the same work, other more indirect strategies were reported that increased the number of interactions between the reader and the text, such as increasing the number of texts read (9 studies), observing readers' reactions while reading or using texts for some activity (8 studies), and reading and analyzing texts written by someone else (5 studies). All showed moderate to strong significant effects (effects of $d = .29, .62$ and $.43$, respectively; all $p \leq .001$).

Since this evidence comes from experiments or quasi-experiments selected for their methodological quality, it is possible to infer that teaching with the aim of developing reading skills (at least using these strategies) can influence writing skills. However, all studies included in this meta-analysis focus only on high school or pre-school students. Therefore, if you want to carry out studies of this type focused on higher education, it is necessary to first identify the relationships between reading comprehension and writing at said educational level.

Relationships between Academic Language and Reading Comprehension or Writing

The term *academic language* has been defined as that which belongs to school texts or science, and that differs from colloquial language. It is used to support the expression and understanding of school content and scientific learning (Schleppegrell, 2004). Academic language includes the abstract vocabulary typical of scientific disciplines, the complex syntactic and morphological structures, and the logical connectors and position markers that support precise and organized communication in a logical and reflective way (Meneses *et al*., 2018; Uccelli & Snow, 2009; Nagy & Townsend, 2012). In other words, academic language makes use of more precise vocabulary, more complex syntactic structures and a denser discursive structure (Truckenmiller & Petscher, 2019). In addition to its relevance in reading comprehension, the use of academic language is necessary to master the complex system of oral and written communication in the scientific field. However, this latter relationship has not been widely investigated in higher education.

In recent research, an instrument has been developed that reliably and validly evaluates the construct of key academic language skills in different disciplines in the last two grades of primary school and the first two grades of secondary school (middle- *school*). CALS-I (*Core Academic*

Language Skills) is an instrument developed for the English language that has robust characteristics useful for predicting reading comprehension levels in monolingual and bilingual students in English (Uccelli and Meneses, 2015). This instrument measures specialized vocabulary, complex syntactic and morphological structures, connectors and referential relationships, organization of argumentative texts, and identification and production of the academic record.

Based on the general structure of the CALS-I, Meneses *et al.* (2018) developed an equivalent instrument respecting the linguistic characteristics of Spanish. Furthermore, they distinguished between academic vocabulary (S-AVoc) and academic language. The ELA test (*Evaluación del Lenguaje Académico* in Spanish, or Academic Language Assessment) aims to examine how each construct relates to reading comprehension in monolingual Chilean students from 4th to 8th grade (n = 810). In this work, it was found that 8th grade students had an average of 68% correct items for academic language and 70% for academic vocabulary. This study was replicated in Mexican students with an adaptation to Spanish from that country (Romero-Contreras *et al*., 2021). By relating language and academic vocabulary (measured with S-Voc and an experimental WordGen test) with the reading comprehension of primary and secondary students in Mexico, the authors found that both variables together predicted 22% of the variability in comprehension reading in secondary school students (1st and 2nd grades) in Spanish.

Evidence of a causal relationship between academic language and reading comprehension comes from experimental studies of academic vocabulary development with the Word Generation program in English (WordGen; Jones *et al*., 2019). The objective of this intervention program is to improve students' reading comprehension by developing their vocabulary, academic language, and perspective-taking skills through oral discussion in classes of different subjects. There is evidence that this two-year program, applied to students in the last two grades of primary school and the first two grades of secondary school in the US, achieved improvements in mastery of specific academic vocabulary taught explicitly in both years, although the effects on reading comprehension were only seen until the second year at both education levels (Jones *et al* ., 2019).

However, the relevance of academic language as a predictor of academic writing has been even less investigated. A study by Truckenmiller and Petscher (2019) takes academic language skills as a determinant of quality writing instruction and explores the role of academic language skills, academic vocabulary, and reading comprehension in composition outcomes. Results indicate that these factors predict 65% of the variance in passing rates on a written composition assessment for 4th graders and 86% for 8th graders, suggesting that these skills could be important for higher education students.

As described in this review, most of the works aimed at studying the influence of academic language on reading comprehension academic writing have focused on primary and secondary school students. Investigating the role that these skills have in academic writing processes in higher education in a comprehensive manner is important at a theoretical and practical level, since knowledge of these skills is relevant when planning activities aimed at obtaining quality academic writings in university students.

Given the context raised by this review of the literature, where associations and causal relationships have been established between reading comprehension and academic writing, as well as academic language and vocabulary towards reading comprehension at previous educational levels, the present research aims to evaluate these variables to observe these relationships in first-year university students, in the context of virtual education due to the pandemic.

Specifically, the research questions that guide this study are the following:

1. What is the general level of mastery of academic vocabulary, academic language skills, reading comprehension and academic writing in students new to university under pandemic conditions?

2. How is the mastery of academic vocabulary, academic language skills and reading comprehension related to academic writing skills in students new to university under pandemic conditions?

Methodology

Type of study

This research work was quantitative, descriptive, transversal due to the nature of the sample and correlational due to the type of analysis.

Participants

The study included students from three first-year groups attending the School of Psychology at a university located in the north-central region of Mexico. One group was enrolled into the Psychology degree, and the other two, into the Psychopedagogy degree. The latter were attending an introductory linguistics course and a writing course as part of their curricular plan, in the same semester in which they were evaluated for this study. The group selection was by convenience: groups as defined by enrollment lists, and whose teachers agreed for data collection to take place during their classes, were selected.

Instruments

To achieve the stated objectives, four tests were used, in addition to an academic writing elicitation protocol and an evaluation rubric. The selection was made from instruments that measured the study variables, and from those which had been applied in contexts close to the target population (either due to geographical-cultural similarity, or educational level). As detailed below, a balancing of these criteria was performed to select suitable instruments.

Academic Vocabulary

To measure academic vocabulary, two tests were used: S-Avoc and WordGenM-Voc. The first is a section of the 15-item ELA test (Meneses *et al*., 2018), revised and adjusted for Mexican students (Romero-Contreras *et al*., 2021). The reported reliability was Cronbach's α =.70. The second test is the WordGenM-Voc, which is made up of 28 academic vocabulary words selected from the Word Generation Mexico program. (Word Generation https://www.serpinstitute.org/wordgen-mexico). The word *interpret* was repeated in both tests, so in this application it was omitted from the list of items. The reported reliability of this test without repetition of this word is adequate (Cronbach's α =.80).

Academic Language Skills

The ELA test (Meneses *et al*., 2018) is a one-hour group-administered instrument that measures academic language skills and has been reviewed and adjusted for Mexican students. Although this is not designed for higher education, no other similar test was found in which had robust psychometric properties that evaluated the construct of academic language in Spanish. The ELA test is made up of 53 items and has a good reliability index (Cronbach's α = .89) in upper primary (fifth and sixth grade) and secondary school students for the academic language skills section; in other words, it does not include the academic vocabulary subtest.

Reading Comprehension

To measure reading comprehension, the CompLEC test (Llorens-Tatay *et al*., 2011) was used. CompLEC is a group application test, developed from the theoretical framework proposed by the PISA report and the new definition of reading competence, which reflects the demands of understanding, use and analysis of written texts to achieve the reader's objectives and develop their knowledge and possibilities to participate in a literate society. Although this test was developed for secondary school students, it is considered to have the complexity required to evaluate academic

reading, since it includes five textual genres: expository, descriptive and argumentative, and some in multimodal format (with text, graphs and diagrams).

The tasks are oriented to reading situations where students are asked to read and answer a series of questions for each text (20 questions in total). These are divided into five information retrieval items, 10 information integration items, and five reflection-on-text content items (Llorens -Tatay *et al*., 2011). In addition, 17 of the questions are multiple choice with four answer alternatives. The remaining three are open format questions. This test presents an acceptable reliability index (Cronbach's $\alpha = .74$) for high-school students in Spain.

Academic Essay

Academic Essay Elicitation Instrument

To elicit the students' written essays, the Academic Essay Elicitation Instrument developed by Romero-Contreras (2018) was used. For the essay to be similar to the tasks that students face in their classes, this protocol specifies that the content must be prepared from two readings of the discipline that the participants are studying. The essay must also have a specific minimum structure and planning.

In this instance, the readings were two short articles of no more than eight pages, written by specialists. In them, diverse positions are presented on a chosen topic that is related to the curricular plan of the participants (the texts referred to topics on education, psychology and psychopedagogy).

Academic Essay Assessment Rubric

To evaluate academic essays, Romero-Contreras' (2018) adaptation of the Concha *et al.* (2015) *Assessment Rubric was used*, which aims to improve the objectivity of the evaluation. This instrument measures eight categories at the macro and microstructural levels: 1) text structure, 2) local coherence, 3) accentual and literal spelling, 4) punctual spelling, 5) lexicon, 6) grammatical level resources, 7) paragraph structure, and 8) transformation of knowledge. Each of these categories is measured on a scale from 0 to 4 (32 is the highest score). Regarding the validity and reliability of the rubric, the agreement rates reported from the original instrument by Concha *et al*. (2015) had not been considered optimal (from .41-.60 on the Landis and Koch scale; Concha *et al*., 2015), and the rubric adapted from Romero-Contreras is in the experimental phase, so it was decided to use the latter and evaluate its reliability with the writings of the present study.

The evaluation of the academic essays was carried out by blind evaluation, so all the essays were anonymized, and the registry of the authors was kept in a separate list. Two seventh-semester students of the bachelor's degree in Psychopedagogy with an emphasis on language were trained to serve as judges. The calibration process was carried out in three rounds of 10% of the collected trials, where the evaluation given by each judge to each category was compared to discuss and agree on the meaning of each score from 1 to 4. The degree of agreement of the evaluation of the judges was calculated with the Pearson correlation coefficient throughout the three rounds of evaluation. The calculated coefficients indicated that the judges began to converge in their evaluations, since they went from a correlation of $r = 0.58$ in the first, to 0.72 in the second, and 0.88 in the third. In this last calculation, when a coefficient close to .90 was obtained, it was considered that there was an acceptable degree of agreement between evaluators and all the essays were judged.

Administration and Analytic Procedures

All tests were adapted as digital questionnaires and were administered in the virtual classroom with the presence of the class teacher and the voluntary participation of the students for each test. These students signed an informed consent for participation. The data from the questionnaires were downloaded as an Excel database.

To obtain the written essays, the administration time was two hours. During the first hour, participants read two articles and developed a thematic outline. Afterwards, they took a 10-minute break. In the second hour of application, the academic essay was written. The minimum elements of the assessment were made explicit on the instruction sheet. The plans and academic essays were integrated into a Word file database. Once the samples were obtained, it was checked that all the data provided by the participants were correct and written in the same format and order. During the data collection period, the number of participants varied depending on the day of application of the instruments. The data of the categories and values obtained were processed for analysis in the IBM SPSS Statistics program, version 24. Table 1 presents the list of the instruments used to measure each variable, as well as their sample size.

Table 1. Summary of instruments and number of participants for each test.

Variables	Instruments	No. _
Academic vocabulary	WordGen Test: 27 Academic Words ELA-Mexico S-Avoc Test: 15 words (Meneses *et al*., 2018)	57
academic language	ALS-Mexico (Meneses *et al*., 2018)	57
Reading Compression	CompLEC (Llorens-Tatay *et al*., 2011)	54
academic writing	Elicitation to obtain academic essay (Romero-Contreras, 2018) Evaluation rubric of the academic essay (Romero-Contreras, 2018)	42
Total students who took all tests		42

Source: The authors

Analysis Plan

To answer the research questions, a descriptive analysis was carried out for each of the variables. With this, a general overview was obtained that allowed us to observe the degree of student performance for each variable. Subsequently, a correlational analysis was carried out between the variables in the subsample that answered all the tests, and another one between the categories of academic writing and the variables evaluated, to obtain a more specific view of the components of academic writing.

Results

The results section is organized as follows. To answer the 1st question: What is the general level of mastery of academic vocabulary, academic language skills, reading comprehension and academic writing in students new to university under pandemic conditions?, the descriptive results of the predictor variables of academic vocabulary, academic language and reading comprehension were examined. These results can be compared to those published at other academic levels. Next, descriptive findings of academic writing, which lack comparable results, are presented. Subsequently, to make the data more concrete, examples are offered that illustrate the results of the four lowest categories in academic writing. Finally, three correlational analyses are reported to address the 2nd research question: How is the mastery of academic vocabulary, academic language

skills and reading comprehension related to academic writing skills in students new to university? under pandemic conditions?

Data on Vocabulary, Academic Language, and Reading Comprehension Skills

Table 2 shows the percentages of total correct answers obtained by each assessment instrument: S-Avoc and WordGenM-Voc for academic vocabulary; ELA-Mexico for key academic language skills, and CompLEC for reading comprehension skills, as well as data published in other studies (Llorens-Tatay *et al*., 2011; Romero-Contreras *et al*., 2021). Although an optimal comparison would be with students of the same level and from the same population, data from different levels and/or contexts are presented as an indirect reference.

Table 2. Percentages obtained by variable and category in the present study, and others

previously published

Variables	Categories	Results of the present study	Results from other studies
Academic vocabulary (n=57)	WordGenM-Voc	84.2%	58.8% [a] (2nd secondary school-Mexico)
	S-Avoc (ELA-Mexico)	82.9%	56.4% [a] (2nd secondary school-Mexico)
Key academic language skills (n=57)	Total percentage of ALS tests-Mexico	64.4%	47.9% [a] (2nd secondary school-Mexico)
	Identifying academic record	88.8%	
	Following ideas	76.9%	
	Connecting ideas	75.6%	
	Understanding purposes	75.1%	
	Interpreting points of view	69.3%	
	Organizing texts	65.7%	
	Ordering sentences	58.6%	
	Assembling and disassembling ideas	38.5%	
	CompLEC test total percentage	48.0%	70.0% [b] (3rd secondary school-Spain)
Reading compression (n=54)	Information recovery	62.0%	
	Reflection and evaluation	62.0%	
	Information integration	40.0%	

Sources: The authors based on the data obtained (2023) from the tests applied; the percentages of

the tasks of each instrument have been placed from highest to lowest value. [a] Romero *et al.*,

(2021); [b] Llorens-Tatay *et al*., (2011)

The results allow us to observe that, in relation to knowledge of academic vocabulary, students in the second semester of university do not present difficulties. The data on percentages of correct answers per test show that the participants obtained the following scores for correct answers for academic vocabulary: WordGenM-Voc 84.2% and S-Avoc 82.9% in comparison with the reference data, 58% and 56.4% for 2nd year of secondary school (Romero-Contreras et al., 2021). These data indicate that university students have a higher percentage rate compared to secondary school students from the same context.

In the ELA-Mexico instrument tasks, the participants obtained a relatively high percentage of correct answers in the skills of establishing cohesive relationships, use of connectors and understanding points of view, that is, in these categories: Following Ideas 76.9%, Connecting Ideas 75.6%, Understanding Purposes 75.1% and Interpreting Points of View 69.3%.

On the contrary, skills related to the morphological and syntactic level were the tasks with the lowest percentages: Organizing Texts 65.7%, Ordering Sentences 58.6% and Assembling and Disassembling Ideas with 38.5%. These data can provide insight into the academic language skills where college freshmen struggle and where intervention could be made. When comparing the percentages of correct answers for the academic language test (Meneses *et al*., 2018), the participants obtained a total of 64.4% in relation to the percentage of 47.9% obtained by secondary school students in Mexico (Romero-Contreras *et al*., 2021).
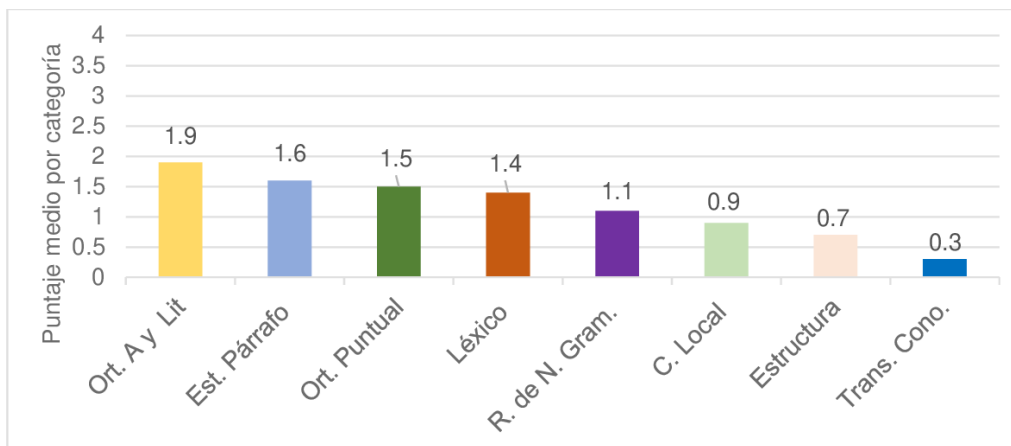
Regarding reading comprehension, the data indicate that students achieve 40% in information integration, while they obtained 60% for the literal questions of information retrieval and the inferential questions of reflection and evaluation. This implies that the students had greater difficulties in relating information found in places other than the text, than in making inferences with their prior knowledge, which could also be the focus of attention for interventions in reading comprehension.

When contrasting the percentage obtained by university participants in this test designed for high school students, a relatively low percentage of 48.0% was observed compared to the 70% obtained by 3rd year high school students in Spain (Llorens-Tatay *et al*., 2011). Although the comparison data presented are not equivalent to the educational level being studied, they do provide us with a general context of reference.

Descriptive Data of Academic Writing Skills

For the descriptive results of the academic essay evaluation, there is no published reference data. Even so, the study's data provide a comparison of the relative strengths and weaknesses for each category. The maximum possible number of points for each category is four and the minimum is zero. The total to be obtained for the eight categories is 32. On average, the participants obtained 9.4 points. The minimum range of points obtained was 3.0 and maximum 27 with a standard deviation of 4.1. This marks a low level in the Total results. In this case, percentages of correct answers are not presented, but rather average scores obtained for each category. In Figure 1, the average scores in descending order are presented.

Figure 1. Average score obtained for each category of the academic essay in descending order.

Abbreviations: Ort. A and Lit = Accents & spelling, Est. Párrafo = Paragraph structure, Ort. Puntual = Punctuation, R. de N. Gram. = Grammatical resources, C. local = Local coherence, Estructura = Structure, Trans. Cono. = Knowledge transformation.

Source: The authors

The categories that present the lowest average scores are knowledge transformation with 0.3, text structure with 0.7 and local coherence with 0.9. In contrast, the highest categories are punctuation with 1.5, paragraph structure with 1.6, and accents and spelling with 1.9. Students show, comparatively, fewer difficulties in mastering spelling rules, and greater problems in aspects of local coherence, grammatical level resources (cohesion, coherence and resources to avoid ambiguities). It is relevant that the lexical category, related to academic vocabulary, was comparatively high. Therefore, in this type of knowledge, students show a relative strength, since in general they obtained 1.4 points out of a possible 4, even though it is a low score in absolute terms.

Representative Examples of the Lowest Categories

This section presents segments taken from the texts that make up the sample to illustrate some of the studied categories of writing analyzed. Due to the length of this document, representative examples have been selected from the four categories with the lowest results, in order from lowest to highest. To begin, Table 3 shows evidence of the *Knowledge Transformation* category, which focuses on the student's ability to reformulate and cite the information on the topic consulted (Meneses *et al*., 2018) and which turned out to be the lowest in the entire sample. The transcription is included faithful to the original document.

Table 3. Excerpt illustrating the *Knowledge Transformation* category (essay 01.A.01.01.13, score 0 out of 4)

Example	Rating Description
(…) Educational psychology aims to provide education with advances in learning processes, knowledge about child development and cognitive processes involved in school learning. Among the functions of the educational psychologist is the diagnostic evaluation of dysfunctions in the development of learning, detection of problems according to the educational context. In addition, these professionals offer advice to students, parents or teachers and have community intervention to correct, prevent and optimize situations in the learning process. Pedagogy is a branch of psychology that offers work with children who have learning difficulties. (…)	There is no presence of citations, reformulation or paraphrasing sequences accompanied by parenthetical citations that allow a critical reading of the topic to be observed. Although references are added at the end, they are not observed in the body of the work.

Source: The authors

Next, the *Structure* category refers to the students' ability to adjust the text to the academic essay genre (Meneses *et al*., 2018). The title is short, attached to the content and summarizes the author's point of view. The introduction contextualizes the reader and presents the thesis. The development presents arguments and counterarguments. The conclusion takes up the thesis and arguments and foreshadows where the topic is going (Meneses *et al*., 2018). An example of the *Structure* category is shown in Table 4.

Table 4. Extract illustrating the *Structure* category (essay 01.C.01.01.06, score 1 of 4)

Example (Due to the length of the text, the macrostructure of the essay is presented)	Rating Description
Title: Psychology and Education Introduction: This essay has the purpose of […]. Also, it mentions factors that […]. Development: Educational psychology has […]. Among the functions of the educational psychologist is […]. In addition, these professionals offer […]. Pedagogy is […]. Their professional work is […]. Pedagogy can offer […]. Special education is a field […]. Educational psychology and psychopedagogy have […] and seek […]. Conclusion: Educational psychology and psychopedagogy represent […]. Due to many studies and research, it has been achieved […]. It encourages students to […].	The text does not correspond to the structure of an essay. The content does not present an argument nor a point of view. The information presented is more of a descriptive type. The document is more related to a reading report or summary than to an essay. There is no presence of words or phrases that give logical-argumentative continuity to the sentences, or that determine thematic sequentiality, for example: *but*, *however*, *however, since*, *in addition*, among others. No use is made of direct, indirect, narrated or parenthetical quotations.

Source: The authors

Next, the category of *Local Coherence* refers to the ability of students to articulate content relationships between sentences and sequences of sentences through resources such as connectors that establish logical relationships, anaphoric connections (Meneses *et al*., 2018). An example of the *Local Coherence* category is shown in Table 5.

Table 5. Excerpt illustrating the *local coherence* category (essay 01.A.01.01.13.E, score 1 of 4)

Example	Rating Description
(…) To begin educational psychology that became known in the 20th century hand in hand with psychology as an autonomous science. The main function of this science is to publicize the advances that have been made throughout research in the fields of learning, taking into account that it has a much smaller field of study than that of psychology. Being this science, it had everything to go hand in hand with pedagogy, but psychology focused more on the subject than on the issues that surrounded it. Psychopedagogy, for its part, with the help of Piaget, new contributions were discovered from the scientific and experimental side, which was what gave us to understand that it was something more than educational psychology, but with the arrival of Vygotsky it was discovered that the subject and his learning had It also has to do with the environment in which it develops and with the forms of work that the teachers teach, so it was no longer just about the problems that the subject may have but also the problems that hindered the environment. (…)	There is the presence of discordant relationships between the subject and the verb of the sentence. There is little use of logical type connectors, or their use is incorrect. There is little thematic relationship between sentences. There are no resources establishing the anaphoric relationships.

Source: The authors

Finally, the *Grammatical Resources* category refers to the ability of students to create texts appropriate to an academic communication situation, including using resources to change the grammatical category of a word (for example: from *describe* to *description*, from *analysis* to *analyze*). Likewise, it refers to using language resources to establish temporal and spatial sequences, as well as avoiding grammatical errors that affect the coherence of the text such as the incorrect use of prepositions or the excessive use of the preposition *que* (of), of the relative pronoun *que* (that) or the structure *de que* (of which) (Meneses *et al*., 2018). An example of the G*rammatical Resources* category is shown in Table 6.

Table 6. Extract illustrating the *Grammatical Resources* category (essay 01.B.02.01.05.E, score 1 of 4)

Example	Rating Description
(…) Educational psychology is derived from psychology, focusing on students as a way to guide comprehensive development. It also contributes with its knowledge, planning strategies, being able to detect problems or special cases that may affect the expected learning, it has also served a lot to be able to teach the educational service to provide a better way of treating students and in each specific case provide a better education. Its discipline is to study nature and how human beings process information in a contextualized, formal way and with its alterations. Basically, its function would be as an intermediary in case of bullying, professional and vocational advice. (…)	The text is presented with multiple errors that affect the coherence of the text: incorrect use of gerunds; there is a lack of resources that allow the sequential organization of the content of the text, such as textual and discursive connectors of time, and reference organizers. There is misuse of or missing prepositions, which causes the content to be received telegraphically.

Source: The authors

As can be seen, the lowest categories of the academic essay are related to other variables such as reading comprehension and the tasks of the ELA-Mexico assessment *Assembling and Disassembling Ideas* and *Interpreting Points of View*, since a lower understanding of the content of a text affects the processes of reformulation of ideas, thematic organization and the presentation of the author's position on a topic, which are related to the categories *Knowledge Transformation,* and *Structure*. On the other hand, the ELA-Mexico assessment tasks *Organizing Texts* and *Ordering Sentences* are linked to the categories of *Local Coherence* and *Grammatical Resources* because the lack of resources to organize sequences of ideas affects the coherence between them and in the global construction of the text's content.

Correlational Results of the Variables Studied

This section seeks to answer the question "How are mastery of academic vocabulary, academic language skills and reading comprehension related to academic writing skills in first-year university students?" To answer it, Spearman's *rho* correlation coefficients were calculated, and the correlations established between the evaluations of linguistic and discursive skills were examined. Before conducting the correlational analyses, it was decided to combine the two academic vocabulary instruments into a single composite variable to relate the variables, not the

instruments. This was done by adding the totals of each subtest to later obtain the total percentages. These correlations are shown in Table 7.

Table 7. Spearman's *rho* non-parametric correlations from the raw scores of the assessments between the variables and the academic essay (n = 42)

	1	2	3	4
1. Composite academic vocabulary	--			
2. Academic language	.68**	--		
3. Reading comprehension	.61**	.75**	--	
4. Academic writing	.32	.57**	.59**	--

Note: **$p<.01$. Source: The authors.

Table 7 shows that the correlations between the variables *Academic Vocabulary*, *Academic Language* and *Reading Comprehension* present significant moderate to high coefficients in some of them. There is a moderate to strong and significant relationship between the total average of reading comprehension and the subtotal of academic language *(rho = .75)*. Likewise, a moderate to strong and significant correlation is found between the academic language subtotal and the composite variable of academic vocabulary with a correlation coefficient of (*rho = .68*).

Likewise, a moderate to strong and significant correlation coefficient is observed between the total average of the academic essay and the total score of reading comprehension *(rho = .59)* and between the total academic essay with the subtotal of academic language. In contrast, the correlation coefficient between the total academic vocabulary composite (WordGen and S-Avoc) and the total academic essay score was not significant, showing a low to moderate correlation (*rho = .32*).

Correlations between Variables and the Subcategories of the Academic Essay

To know how academic vocabulary, academic language skills and reading comprehension correlate with the subcategories of the academic essay, non-parametric correlations were carried out to measure the degree of association between the variables in their raw scores per test. These correlations are shown in Table 8.

Table 8. Nonparametric Spearman's *rho correlations* from raw test scores between variables and subcategories of the academic essay (n = 42)

	1	2	3	4	5	6	7	8	9	10	11
1. C. Ac. Voc.	--										
2. Ac. Language	.68**	--									
3. CompLec	.61**	.75**	--								
4. AE-Structure	.32	.31	.25	--							
5. AE-Loc. coherence	.31	.58**	.40**	.29	--						
6. AE-Acc. and Spell.	.37*	.48**	.49**	.30	.38*	--					
7. AE-Punct.	.36	.49**	.51**	.15	.51**	.30	--				
8. AE-Lexicon	.07	.24	.44**	.06	.31	.22	.38**	--			
9. AE-RN Gramm. R.	.03	.27	.32	.29	.58**	.28	.46**	.52**	--		
10. AE-Paragraph Str.	.37*	.35*	.39*	.36*	.28	.48**	.23	.33*	.45**	--	
11. AE-Know. Transf.	.16	.28	.40*	.20	.54**	.31	.40*	.28	.55**	.05	--

Abbreviations: C. Ac. Voc. = Compound academic vocabulary (S-AVoc and WordGenM-Voc); Ac. Language. = Academic language subtotal; CompLec = Reading comprehension total; AE = Academic essay; AE-Structure = Structure subtotal; AE-Loc. coherence = Local coherence subtotal; AE-Acc. and Spell. = Accents and spelling subtotal; AE-Punct. = Punctuation subtotal; AE -Lexicon = Lexicon subtotal; EA-Gramm. R. = Grammatical resources subtotal; AE- Paragraph Str. = Paragraph structure subtotal; and AE Know. Transf. = Knowledge transformation subtotal; **$p < 0.01$, *$p < 0.05$.

Source: The authors

The results show that there is a correlation between most of the variables and the subcategories of the academic essay. The highest correlations, medium to strong, are between the academic language subtotal and the total average of the academic essay subcategories (all significant): local coherence (*rho* =.58), accentual and literal spelling (*rho* =. 48) and punctual spelling (*rho* =.49). A moderate relationship was also found between the subtotal of academic language and the total average of paragraph structure (*rho* =.35). Finally, another significant correlation, moderate to strong, was found between the total sum of reading comprehension with local coherence (*rho* =.40), accentual and literal spelling (*rho* =.49) and punctual spelling (*rho* =.51), lexicon (*rho* =.44), paragraph structure (*rho* =39) and knowledge transformation (*rho* =.40). The data suggest a greater relative importance of academic language skills (morphological, syntactic and discursive knowledge) over academic vocabulary for writing in higher education.

Discussion

The descriptive data converge with those reported by previous research in younger students (Meneses *et al*., 2018; Romero-Contreras *et al*., 2021; Uccelli *et al*., 2014) in English and Spanish. Regarding knowledge of academic vocabulary, first-semester university students present satisfactory mastery and show relative growth with high school students from the same population at another time (Romero-Contreras *et al*., 2021). It should be noted that, given that the instrument was designed for upper primary and secondary school, it is possible that this good performance could reflect the fact that the set of words that the instrument measures is relatively easy for university students. However, this methodological issue should be further explored in future studies.

Regarding knowledge of academic language, university students presented an average percentage of correct answers of 64.4%, which represents growth compared to data published on high school students from the same geographical area (Romero-Contreras *et al*., 2021). However, when comparing performance in this assessment's categories, it is identified that students still present a relative difficulty in the category *ordering sentences* (syntax) with 58.6%, and *assembling and disassembling words* (morphology) with 38.5%. which represent aspects of the language that have been left out of educational programs.

The descriptive data also show a low level of reading comprehension in university students during the pandemic with a percentage of 48.0% compared to the average percentage of 70% obtained by Llorens-Tatay *et al*., (2011) in 3rd year secondary school students in Spain. The

reading comprehension results of Romero-Contreras *et al.* (2021) are not directly comparable despite coming from the same geographical area, because these authors used a shorter version of the CompLec instrument. Although the comparison between younger Spanish students and Mexican university students during the pandemic is not entirely optimal, it illustrates the learning challenges of Mexican students and suggests that the instrument could continue to be used to measure reading comprehension at this level in future studies.

Finally, the descriptive results of academic writing showed that students are at low levels in most of the categories evaluated, even when considering there were no previous published results with which to perform a contrast. In the section of representative examples of the lowest categories, it can be seen how the four lowest categories of the academic essay are the ways in which students recognize the academic genre that they are going to develop, organize the information and content using the resources of the academic language, use resources to give coherence to the content and use academic language resources to project communicative intentions, that is, transform knowledge, and create well-structured texts with linear coherence and local coherence. Therefore, it is recognized that the greatest difficulty in writing was in the *Knowledge Transformation* category, which means that the university writers evaluated are still in a novice stage, according to the Scardamalia and Bereiter's proposal (1987).

On the other hand, correlational data show that there is a moderate and high relationship between reading comprehension and academic writing in higher education. This converges with other authors' theoretical proposals and empirical findings in English for primary and secondary levels (Fitzgerald and Shanahan, 2000; Shanahan and Lomax, 1986) and in Spanish for primary school students (Jiménez Pérez *et al*., 2020), and extends it to first-year university students. These correlational results could represent a first step in replicating the findings in previous levels of a causal influence of reading comprehension towards writing (Graham *et al*., 2018). For now, these correlational findings at the start of university suggest that addressing reading comprehension skills could represent a scaffolding approach to develop students' academic writing skills.

Altogether, the data obtained in this work allow us to have a general overview of the knowledge and use of the linguistic and discursive skills involved in reading comprehension and academic writing. This allows identifying potential areas of opportunity and intervention when developing programs for higher level students with the objective of strengthening the skills involved in the academic writing process.

Limitations

Despite the novel findings of this research, the study has several limitations. For example, the sample size is relatively small and limits the generalizability of the findings. Therefore, it is necessary to apply to a larger sample, especially if it is considered that not all students answer all the tests. The assessments to evaluate academic vocabulary (WordGenM-Voc and S-Avoc), academic language skills (Meneses *et al*., 2018), and the reading comprehension test, CompLEC (Llorens-Tatay *et al*., 2011) are assessment instruments designed for basic and intermediate level students, which restricted data comparisons, since no university-level data was found for contrast.

Even so, these instruments were used because they were the most appropriate in terms of construct validity, as this research intended to measure said variables. In any case, the reading comprehension variable was complex enough to capture variability in this sample of university students in a pandemic, as well as to capture variability in academic language. That the students have shown mastery in the words of the composite vocabulary test could indicate that it needs to be replaced by another of greater complexity. In short, expanding the sample in future research will allow evaluations of the reliability of the instruments.

Conclusions

The results of this research study allowed us to identify areas in which interventions can be developed aimed at strengthening academic writing, academic language and reading comprehension. Likewise, it can be inferred that academic vocabulary could be related to writing, but it must be evaluated with instruments more appropriate for the university level.

Future lines of research

The present study suggests that academic language, as well as academic vocabulary and reading comprehension skills, could be targeted skills for intervention that affect academic writing. Therefore, future studies should establish causal relationships through experimental interventions with these variables. Additionally, a more sensitive measure of academic vocabulary should be explored because the measure developed by CALS was not found to be sensitive enough in this population.

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