

# Influential Psycholinguistic Factors in the Development of Linguistic Competence in English as a Foreign Language

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## Abstract

This study investigated the influence of cognitive and metacognitive psycholinguistic factors on English linguistic competence among university students enrolled in a Language Center at a national university in Peru. The sample consisted of 153 students selected through convenience non-probabilistic sampling from a pre-intermediate level. A virtual form instrument was designed for data collection, which was validated through factorial analysis, showing a good model fit with two factors and good internal consistency. This study employed multiple linear regression (MLR) as the statistical method to investigate the relationship between psychosocial factors and linguistic competence. The results showed high statistical significance in the global model test, suggesting that the analyzed factors explain 21.8% of the variability in linguistic competence. The analysis of effect sizes, with  $\epsilon^2$  values of 0.161 and 0.023 for cognitive and metacognitive factors, respectively, supports the stronger influence of cognitive factors on linguistic competence. This study highlights the importance of considering psycholinguistic factors in developing linguistic competence and provides a basis for further research.

**Keywords:** Psycholinguistic factors, linguistic competence, ESL, cognitive factors, metacognitive factors

## 1. Introduction

Linguistic competence in a foreign language (FL) is an essential element that reflects the level of proficiency in a language. According to the definition by the European Council, linguistic competence refers to the mastery and ability to use a language's formal and structural elements, enabling the construction of coherent, well-formed, and meaningful messages across its different grammatical categories (Little, 2020). Achieving such mastery can be particularly challenging as it involves reconfiguring grammatical and syntactic patterns that differ from those of the native language (Madlener-Charpentier & Liste Lamas, 2022). Therefore, for a speaker of an FL, assimilating the grammatical structures of another language can pose a considerable challenge, given that these structures adhere to a different form of linguistic organization, in addition to the processes involved in the learner's cognitive apparatus, independent of linguistic knowledge per se (Chaudron, 1985; Friedenberget al., 2022).

Despite the difficulty evidenced by many FL learners, especially in language centers, it is interesting to observe that other students learn more quickly and effectively. This phenomenon suggests the presence of certain factors that influence the success of these students with a foreign language. Some researchers have pointed out that age, neuronal plasticity, and cognitive abilities influence the innate capacity to acquire and process language (Gass et al., 2016). Additionally, linguistic aptitude, which includes aspects such as verbal memory, auditory perception, and grammatical ability, plays a crucial role in acquiring language skills (Han & Tarone, 2014). These premises support the notion of internal cognitive processing processes and the consideration of metacognition in developing English linguistic competence.

English is one of the most widely spoken languages globally, with about 1.5 billion speakers in 2022, surpassing Mandarin Chinese's 1.1 billion (Ly, 2022). It is an official language in 67 countries and 27 non-sovereign entities (Lalljee, 2022; Rao, 2019). It is also spoken in many countries where it is not officially recognized (Assi, 2022; Statista Research Department, 2023, as cited in Mazlan et al., 2023).

Peru has globalized policies that recognize the English language as a lingua franca. In recent years, plans have been developed to prioritize the development of communicative competence, including the linguistic dimension, in schools, universities, and language centers (Ministerio de Educaci3n del Per3, 2019).

In this sense, this article aims to determine the impact of psycholinguistic factors on the development of linguistic competence in FL and examine the most influential factors. The findings of this study provide valuable information that can be used to suggest teaching strategies that promote more effective FL learning.

### 1.1 Cognitive Psycholinguistic Factors

According to studies by Pinker (1999) and Jackendoff (2002), cognitive psycholinguistic factors represent crucial elements that intertwine the psychological and linguistic aspects of language processing and embody how individuals perceive, understand, and generate language based on their cognitive and mental processes.

In this sense, language acquisition and processing, as the first element, have received more significant focus in applied linguistics research

since Corder posited the difference between acquisition and input (as cited in Zhaohong & Rast, 2014). Recently, more attention has been paid to input processing in the initial contact with a second language, aiming to understand how learners process information naturally and how much input they can handle (Chang & Ma, 2018). Input is considered a fundamental condition for FL acquisition as it constitutes raw data from which learners derive meaning and awareness of the rules and structures of the target language (Chaudron, 1985; Zhou et al., 2024). Without good input, there will be no competence.

Carroll (1999) offered a technical definition where input refers to the objective properties of the stimulus set without the effects of selective attention. Input serves to exemplify the use of the target language in communicative situations. It provides the necessary data for learners to formulate, confirm, and revise hypotheses about the target language, facilitating the development of a new linguistic system (Alberth et al., 2019).

The quantity and quality of input are crucial in the acquisition's mechanism, process, and outcome. So, researchers, especially from a usage-based perspective, have argued that learning is a statistical process in which learners count elements in the input, with frequency being a guiding factor (Ellis & Collins, 2009; Xiaoning & Feng, 2017). The more frequently an element appears in the input, the higher the probability that the learner will mentally register it (Rahimi et al., 2019). However, it is also recognized that second language learners may behave against frequency effects (Gass & Mackey, 2002), meaning that despite their high frequency, some input aspects do not become salient to the learner and thus go unnoticed. Gass stated that some language data reach the learner, and some do not (Gass et al., 2016).

While input is what is available to the learner, intake is internalized and regulated through an internal mechanism, often known as an internal curriculum, together with the learner's current knowledge about language. The process by which input becomes intake remains a mystery, although there are various speculations, most of which indirectly address the asymmetry between input and intake. For example, Krashen's Input Hypothesis (Zhaohong & Rast, 2014) suggests that input must be comprehensible to become intake. Krashen asserts that humans learn language by grasping the meaning of messages or receiving understandable input (Rees-Miller, 2017; Lichtman & VanPatten, 2021).

The study by Rast and Dommergues (2003) provided insight into how learners acquire a language through exposure during their initial contact with it. In a subsequent study, the emergence of a recognizable interlanguage was observed with just 8 hours of exposure, concluding that the influence of global exposure on language processing can be predicted based on factors such as word length, word stress, phonemic distance, transparency, position, and frequency (Zhaohong & Rast, 2014).

The acquisition of second languages largely depends on the input provided to learners (Kurz et al., 2023). The study of input processing and its influence on linguistic development is essential for understanding the process of second language acquisition and improving pedagogical practices in foreign language teaching. Therefore, the teacher's discourse provides linguistic input to students, influencing their learning and linguistic development (Xie & Tu, 2023).

Another cognitive psycholinguistic element identified is linguistic aptitude. Carroll defined *aptitude* as an intrinsic and relatively immutable characteristic of several essential subcomponents. Among these subcomponents, linguistic aptitude stands out, encompassing verbal memory, auditory perception, and grammatical ability (Carroll, 1973; Lockiewicz et al., 2018).

Linguistic aptitude also includes phonemic coding ability, grammatical sensitivity, aptitude for inductive language learning, and associative memory (Rogers et al., 2017). Linguistic aptitude can influence language acquisition and play a crucial role in developing linguistic competence.

A multidisciplinary approach combining linguistics, psychology, and neuroscience reveals that certain individuals exhibit an innate aptitude for language learning, granting them the ability to acquire linguistic skills with remarkable agility and effectiveness. This approach deepens the understanding of how linguistic competencies are rooted in brain structure and how individual variations may impact language learning processes and language use. Along this line of thinking, we find scientific evidence suggesting that specific brain areas, such as the Left Inferior Frontal Gyrus, posterior part (LIFGpt), and Left Medial Frontal Gyrus (LMFG), exhibit relationships with the ability to infer grammatical structures, highlighting the potential specificity of neural organization for this aptitude. However, the lack of correlations in other linguistic aptitude subtests suggests that different linguistic skills may be supported by divergent neural substrates within the brain (Nov n et al., 2019).

### 1.2 Metacognitive Psycholinguistic Factors

When individuals contemplate their language usage, comprehension, and strategies for enhancing language skills, they participate in metacognitive processes that have the potential to impact their linguistic proficiency, both in written and oral forms (Sun & Zhang, 2023).

Reflection and self-analysis can be essential in developing students' metacognitive awareness and improving their auditory performance in a foreign language (Pei et al., 2023). Thus, metacognition can manifest in students' ability to evaluate their linguistic progress, identify areas of difficulty, and select the most effective strategies to enhance their competence in the foreign language (Hab k et al., 2022).

Research in this field has evolved to explore how metacognition influences the understanding and production of a foreign language. The measurement of metacognition in EFL has focused on the development of instruments such as self-report questionnaires (Wang et al., 2023).

Evidence shows that students' ability to monitor and regulate their writing process directly influences the quality and sophistication of their written productions in EFL (Sun & Zhang, 2023). Additionally, it can help students become more aware of their learning process, set goals that drive their academic performance effectively, and improve academic success in foreign language learning (Ghanizadeh et al., 2024).

## 2. Method

This study employed multiple linear regression (MLR) as the statistical method to investigate the relationship between psychosocial factors and linguistic competence. MLR is a widely used technique for modeling the linear correlation between multiple independent variables and one dependent variable (Geng et al., 2020).

Firstly, psycholinguistic factors were identified as the independent variables in the study. These factors include cognitive and metacognitive aspects that could influence the development of linguistic competence. Then, linguistic competence was measured and considered the dependent variable in the analysis. This variable represents the level of language skill and proficiency in the foreign language of the participants in the study, which can be operated categorically or ordinal. Accordingly, two linear regression tests were performed for the dependent variable in its categorical and ordinal forms.

The MLR technique facilitated the calculation of measures that quantify the relationship between these variables while also accounting for the influence of other potential factors that could affect linguistic competence (McDonald, 2023). The  $R^2$  McF and  $R^2$  N measures were used, which are more relevant as they evaluate the model fit and its ability to explain variability in the dependent variable in the context of MLR.

In the case of the dependent variable's ordinal form, the General Linear Model algorithm was used as an alternative to MLR, and both of these are included in the statistical software Jamovi. This software facilitated the calculations and examination of the relationship and effect size between psycholinguistic factors and linguistic competence.

### 2.1 Participant Characteristics

The participants ranged from 18 to 38 years old, with occupations mostly being university students 87% and 13% professionals. University students mostly come from the same institution as the Language Center, which belongs to a state-managed university, categorizing students into a medium to low socioeconomic stratum. The Language Center has been providing continuous services for 32 years, primarily in foreign languages such as English, French, Italian, and Portuguese. It has three branches outside and within the university campus, covering social, engineering, and biomedical areas. Classes are conducted from Monday to Saturday at different times.

### 2.2 Sampling Procedures

The sample consisted of 153 students selected through convenience non-probabilistic sampling from a population of 3,867 students enrolled in English as a Foreign Language (EFL) courses, which includes 1,526 males, 2,138 females, and 203 individuals who do not identify as either male or female. The sample comprised students from the pre-intermediate level, with a gender distribution of 36% female (269 students), 57% male (429 students), and 8% non-binary or unspecified (58 students). This level was chosen because students at the pre-intermediate stage have the necessary language proficiency to understand and respond effectively to the English questionnaire developed for the research. The pre-intermediate level represents a critical stage in language acquisition, providing valuable insights into the challenges and progress typical of this phase. Additionally, this level offers homogeneity in language proficiency, facilitating controlled comparisons and reducing variability related to language skills. Students at this level were also more accessible and willing to participate, which supported effective data collection and alignment with the study's objectives.

Inclusion criteria required students to be regular students with grades above 60 points and currently enrolled in an English course. Exclusion criteria included not having been enrolled for the previous three months prior to the cycle, being minors, or older adults. Thus, the gender distribution of the sample reflects the pre-intermediate level population at the Language Center, ensuring that the study's findings are relevant to this specific group.

### 2.3 Measures and Covariates

For data collection, a virtual form was designed and utilized, maintaining the structure of the research instrument. This instrument was developed using a specialized online platform for efficient creation. The digital form included meticulously formulated questions categorized into relevant thematic sections for the study, with response options enabling the collection of detailed quantitative data, as will be detailed later. This virtual form was accessible through links provided to the participants, facilitating access and response from any internet-connected device. The form was shared through the Language Center's teachers, who obtained permission from selected students to participate in the research. Selected students received the form link and were informed about the importance of their participation. The estimated time to complete the form was approximately 15 minutes, allowing agile and comfortable participation. The initial instrument consisted of 10 items and two main components; however, after conducting exploratory and confirmatory factor analyses, the instrument (Questionnaire on Influential Psycholinguistic Factors in the Development of Linguistic Competence [QIPF-9]) was adjusted to 9 items while retaining the two factors. Reliability was obtained through Cronbach's  $\alpha$  and McDonald's  $\omega$ , which yielded values of 0.818 and 0.826 (Table 1). Both values indicate good internal consistency among the set of items.

Table 1. Reliability Statistics of the QIPF-9

	Cronbach's $\alpha$	McDonald's $\omega$
scale	0.818	0.826

*Note.* Cronbach's  $\alpha$  assumes unidimensionality, whereas McDonald's  $\omega$  is more precise in complex data structures.

For the instrument's validity, Bartlett's sphericity test and the Kaiser-Meyer Olkin (KMO) test were conducted to assess whether the data structure is suitable for factorial analysis (López & Gutiérrez, 2019). The obtained values reflect that the sample adequacy measures with p-values of 0.001 (Table 2) and 0.831 (Table 3) are appropriate for factorial analysis.

Table 2. Bartlett's Test of Sphericity

$\chi^2$	gl	p
501	36	< .001

*Nota.* The Bartlett's Test of Sphericity results ( $p < 0.001$ ) confirm the relevance of factor analysis by demonstrating that the correlation matrix is not an identity matrix.

Table 3. Sampling Adequacy Measure KMO

	MSA
Global	0.831
ITEM1	0.856
ITEM2	0.821
ITEM3	0.818
ITEM4	0.893
ITEM5	0.852
ITEM6	0.849
ITEM7	0.859
ITEM8	0.777
ITEM9	0.738

*Note.* The Sampling Adequacy Measure (KMO) assesses the suitability of data for factor analysis.

The overall value of the Kaiser-Meyer Olkin (KMO) Sampling Adequacy Measure is above 0.8, indicating that the sampling is adequate; moreover, each item presents measures above 0.7, so there is no risk of inadequate sampling or need for corrective measures since the sample variables are significantly correlated with each other. Therefore, exploratory factor analysis (EFA) is appropriate.

Through EFA (Table 4), the division of two factors is observed, with item iterations to each factor exceeding 0.3. Additionally, the uniqueness values of each item range between 0.266 and 0.729, indicating that the model's factors explain most of the variance of each variable, which is positive in EFA.

Table 4. Factor Loadings for the QIPF-9

	Factor		Unicidad
	1	2	
ITEM1	0.578		0.619
ITEM2	0.794		0.335
ITEM3	0.820		0.266
ITEM4	0.687		0.470
ITEM5	0.633		0.591
ITEM6		0.484	0.729
ITEM7		0.549	0.667
ITEM8		0.683	0.502
ITEM9		0.653	0.567

Note. The 'Minimum Residual' extraction method was used in combination with a 'Varimax' rotation.

In the Goodness of Fit Test (Table 5), a p-value lower than the predetermined threshold (0.05) indicates that the model may not fit the data well. However, since the p-value (0.065) is slightly above this commonly used threshold, it suggests some uncertainty regarding whether the model fits the data well. Therefore, other model fit indicators provide a more comprehensive view of the model fit and its acceptability.

In this regard, the fit measures (Table 6) demonstrate a notable consistency of the model with the data. The Comparative Fit Index (CFI) shows a high value of 0.976, indicating excellent agreement between the model and the observed data. Similarly, the Tucker-Lewis Index (TLI) also presents a high value of 0.966, suggesting an adequate fit of the model. The values of the Standardized Root Mean Square Residual (SRMR) and the Root Mean Square Error of Approximation (RMSEA) are 0.0433 and 0.0525, respectively; outstanding in the former case and acceptable in the latter as it falls within the confidence interval of 0.00 to 0.0871.

Table 5. Test for Exact Fit

$\chi^2$	gl	p
37.7	26	0.065

Note. The Test for Exact Fit evaluates the goodness of fit of the model.

Table 6. Fit Measures

CFI	TLI	SRMR	RMSEA	90% CI of RMSEA	
				Inferior	Superior
0.976	0.966	0.0433	0.0525	0.00	0.0871

Note. The Fit Measures table displays various indices including CFI, TLI, SRMR, and RMSEA, along with their respective 90% confidence intervals.

### 3. Results

Table 7 shows the high significance of the Model Global Test with a p-value < 0.001 and the R<sup>2</sup> McF measures of 0.183, indicating that 18.3% of the variability in linguistic competence is explained by cognitive and metacognitive psycholinguistic factors, considering the number of variables and the sample size. Additionally, the R<sup>2</sup> N measures of 0.218 suggest that approximately 21.8% of the variability in linguistic competence is explained by the predictor variables without considering adjustment for the number of variables and the sample size. Such a measure is relevant, as it is logical to recognize that other factors influence linguistic competence besides cognitive and metacognitive psycholinguistic factors.

Table 7. Model fit measures

Model	Deviance	AIC	R <sup>2</sup> <sub>McF</sub>	R <sup>2</sup> <sub>N</sub>	Global Model Fit Test		
					χ <sup>2</sup>	gl	p
1	298	322	0.183	0.218	66.8	8	<.001

Note. R<sup>2</sup><sub>McF</sub> adjusts the variability explained by the model for the number of variables and sample size, whereas R<sup>2</sup><sub>N</sub> does not.

The Likelihood Ratio Omnibus Test (Table 8) displays p-values < 0.001 for cognitive factors and 0.053 for metacognitive factors, demonstrating that cognitive psycholinguistic factors are the ones significantly contributing to linguistic competence, unlike metacognitive psycholinguistic factors, which do not show high significance.

Additionally, Table 8 provides the effect size through the ε<sup>2</sup> values for each set of predictor variables (cognitive and metacognitive psycholinguistic factors) in explaining the model's linguistic competence variance. Cognitive psycholinguistic factors appear to have a more substantial effect on linguistic competence (0.161) than metacognitive factors (0.023).

Table 8. Likelihood Ratio Omnibus Test

Predictor	χ <sup>2</sup>	gl	p
CogF	42.78	4	<.001
MetacF	9.35	4	0.053

Note. The Likelihood Ratio Omnibus Test evaluates the combined significance of predictors in the model. "CogF" stands for cognitive factors, while "MetacF" denotes metacognitive factors.

Table 9. ANOVA Omnibus tests

	SS	df	F	p	η <sup>2</sup> <sub>p</sub>	ε <sup>2</sup>
Model	27.50	2	32.66	<.001	0.290	0.281
CogF	15.67	1	37.22	<.001	0.189	0.161
MetacF	2.58	1	6.12	0.014	0.037	0.023
Residuals	67.35	160				
Total	94.85	162				

Note. The table shows the results of the Likelihood Ratio Omnibus Test, which assesses the significance of predictors in the model.

#### 4. Discussion

Our findings showed that psycholinguistic factors explain 21.8% of the variance in linguistic competence and moderately affect predicting such a variable. This result can be considered a good start, especially in psycholinguistic research, where linguistic competence is a complex and multifaceted construct (Little, 2020; Pazilov, 2021).

Our results also demonstrated the significance of cognitive psycholinguistic factors over metacognitive ones concerning linguistic competence, warranting a deep analysis to understand this difference. Studies suggest that learning an L2 impacts students' mental, emotional, and physical development. Psycholinguistics plays a fundamental role in students' success in learning and using a second language, as each individual possesses distinctive personality traits that influence their learning style. Thus, individual differences can indicate success or failure in language learning; cognitive psycholinguistic factors impact L2 learning (Shabitha & Mekala, 2013).

Makarets (2020) in their research points out that the development of psycholinguistics revealed the connection between psychological principles and the execution of spoken language (manifestation of the linguistic system); the varied ways of assimilating and being aware of language rules make it possible to discern between linguistic norms that are explicitly recognized in society and those that are implicitly internalized at a cognitive level. It also notes that psycholinguistic units are linked to creating and comprehending linguistic expressions.

Psycholinguistic and individual factors modify the acquisition of a minority L2, affecting bilingual children's vocabulary and the

receptive-expressive unit in immersion (Chondrogianni & Butcher, 2023).

Klimkina (2019) points out that using the association strategy when learning vocabulary in a foreign language facilitates the activation of memory resources, essential for improving the learning process and enhancing success in acquiring new words. The more associative connections and diverse reference points used when memorizing a new word, the greater the likelihood of successfully retaining it and the more ingrained the acquired knowledge.

Developing linguistic competence then becomes an activity involving social interaction, where the linguistic environment is combined with the individual's internal learning processes, that is, cognitive psycholinguistic factors. In English-medium instruction (EMI), students' and instructors' adequate linguistic competence is crucial for program success (Rahmanova & Ekşi, 2023). In this regard, Al-Wossabi (2024) highlighted the correlation between different types of instructional intervention and mental processes, such as information processing, internalization, knowledge storage, and language production.

On the other hand, the results regarding metacognitive psycholinguistic factors showed a low relationship and no significance with linguistic competence in our study population. In this regard, such a finding contradicts most research on this aspect. It was identified that metacognition relates to the lexical and syntactic complexity of produced texts and writing fluency, meaning that students' ability to monitor and regulate their writing process directly influences the quality and sophistication of their written productions in EFL (Sun & Zhang, 2023). However, alternately, the same study observed a negative effect of metacognitive estimates only on writing accuracy, indicating a tedious calibration process on writing hindering its development.

Similarly, another study highlighting the crucial role of metacognition in language learning examined the effects of online metacognitive listening practice on English as a Foreign Language (EFL) students. The results indicated that this approach significantly improved students' listening comprehension, supporting that increasing metacognitive awareness during listening can enhance performance in a foreign language. Additionally, a positive impact was observed on students' metacognitive awareness, particularly in planning and evaluation, suggesting that online practice provided opportunities for them to reflect on their learning process. However, the authors did not find significant improvements in auditory self-efficacy, suggesting that other factors may influence students' perception of their listening competence (Pei et al., 2023).

A study also evaluated self-regulated learning (SRL) strategies and attitudes toward English in students with different levels of competence. Although they did not specifically use the term metacognition, it plays a crucial role within SRL, allowing students to be aware of their skills, monitor their comprehension and performance, and adjust their study strategies based on their learning goals. In this sense, they found that students with higher levels of competence showed more significant use of metacognitive strategies, such as planning and monitoring (Habæk et al., 2022).

Similar findings highlight the importance of developing metacognitive awareness in students. This variable positively predicted both positive self-critical rumination and personal excellence goals, which were associated with higher linguistic performance (Ghanizadeh et al., 2024).

Similarly, in Iran, mediated metacognitive intervention in EFL students was investigated, whose results showed a significant impact on oral comprehension performance, highlighting the crucial role of metacognition in language learning (Razavi et al., 2023).

However, it is also important to note that the model still has 78.2% unexplained variance. This suggests that other factors not considered in the study may influence linguistic competence. Therefore, it is recommended to integrate other factors into a model that explains linguistic competence more comprehensively and broadly to offer a more complete and accurate understanding of this complex and multidimensional phenomenon.

This study has brought to light new and intriguing insights into the significance and impact of cognitive and metacognitive psycholinguistic factors on linguistic competence. The results, which reveal that these factors can account for 18.3% of the variability in linguistic competence, as indicated by the  $R^2_{McF}$ , are a significant departure from previous understandings. In comparison, the  $R^2_N$  explains 21.8% of the variability without adjusting for the number of variables and sample size. These findings not only underscore the importance of psycholinguistic factors in developing English linguistic competence but also hint at the influence of other factors not considered in this model, sparking further curiosity and exploration.

The Omnibus Likelihood Ratio Test reaffirms the importance of cognitive psycholinguistic factors, showing statistical significance with  $p < 0.001$ , whereas metacognitive factors do not reach a similar significance level ( $p = 0.053$ ). That underscores the crucial role of cognitive factors in linguistic competence. Additionally, the analysis of effect sizes, with  $\epsilon^2$  values of 0.161 for cognitive factors and 0.023 for metacognitive factors, reinforces this conclusion, highlighting that cognitive factors have a more significant influence than metacognitive factors. These findings not only contribute significantly to the field of psycholinguistics but also have practical implications for educators and psychologists, emphasizing the importance of considering cognitive factors in language learning and development.

Despite the significant findings of this study, several limitations should be considered. First, although the sample size is sufficient for the analyses conducted, a larger size could have provided more robust and generalizable results, and the inclusion of probabilistic sampling could also have aided in better generalization and inference to the entire population. Additionally, the model used focused on cognitive and metacognitive psycholinguistic factors. However, other relevant factors, such as socioeconomic context, personal motivation, and educational environment, should have been included, which may limit the complete understanding of the determinants of linguistic

competence. Some variables relied on self-reported measures, which could introduce biases due to subjectivity and social desirability of responses; future research could benefit from more objective and standardized assessments. The cross-sectional design prevents establishing definitive causal relationships between variables, so longitudinal studies could better understand how psycholinguistic factors influence linguistic competence over time. The results obtained may not apply to all populations, so further studies in different cultural and linguistic contexts are needed to validate the generalization of the findings. Finally, although the statistical model used is robust, interpreting the results may be complex due to the interaction between multiple factors, and some effects may be amplified or attenuated by the presence of other variables not considered in this analysis. Considering these limitations, future research can address these challenges, improving the accuracy and applicability of the findings on the determinants of linguistic competence.

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#### **Authors' contributions**

Prof. MJGA and Dr. CCR were responsible for study design and revising. Prof. GZV was responsible for data collection. Prof. MJGA drafted the manuscript and Dr. CCR revised it. All authors read and approved the final manuscript.

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The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

#### **Data sharing statement**

No additional data are available.

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