

Investigating the Cognitive Constraints of Language Perception and Their Impact on Language Interference

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Abstract:

This study investigates the cognitive constraints underlying language perception and their impact on language interference among multilingual learners. Drawing on Psycholinguistics and Second Language Acquisition, it examines how cognitive factors such as attention, working memory, and perceptual processing influence cross-linguistic interference in third language (L3) acquisition. The study focuses on Algerian EFL learners and explores how prior linguistic systems (Arabic as L1 and French as L2) affect both the perception and production of English. A mixed-methods approach was employed with 100 university students, using questionnaires, writing tasks, and teacher interviews. The findings reveal that learners rely heavily on existing linguistic representations, leading to interference in written production. The results suggest that cognitive constraints on language perception play a significant role in multilingual processing and contribute to cross-linguistic influence in L3 learning.

Keywords: Cognitive constraints; language perception; language interference; multilingual learners; Algerian EFL learners.

1- Introduction

The study of multilingual language acquisition has increasingly highlighted the complex role of previously acquired languages in shaping the learning of additional languages. In contexts where learners possess more than one prior language, the acquisition of a new language involves interactions between linguistic systems that may facilitate learning but may also generate interference. Research in second and third language acquisition indicates that cross-linguistic influence is not determined solely by structural similarities between languages, but is also shaped by the cognitive processes involved in language perception and processing. These cognitive processes constrain how learners interpret linguistic input and determine which prior language resources they draw upon during communication and writing.

From a psycholinguistic perspective, language perception encompasses the mental mechanisms through which learners organize and interpret linguistic information. Cognitive constraints such as limitations in working memory, attention, and perceptual

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processing affect how multilingual learners process linguistic forms and structures in a target language. When learners rely on knowledge from previously acquired languages to interpret or produce linguistic structures, interference may occur, particularly when the systems involved differ in form or usage.

As noted by Eric Kellerman, the likelihood of cross-linguistic transfer is closely related to learners' perceptions of linguistic similarity and difference between languages, influencing which language serves as a source of transfer (Kellerman, 1983). This issue is especially relevant in multilingual contexts such as Algeria, where learners are typically exposed to Arabic as a first language and French as a second language before learning English as a foreign language. In such settings, both Arabic and French may function as sources of cross-linguistic influence during English acquisition. The interaction of these languages can generate various forms of language interference, particularly in written production, where learners actively mobilize linguistic knowledge from different systems.

Despite extensive research on cross-linguistic influence, relatively little attention has been given to the role of **cognitive constraints in language perception** as a factor influencing language interference. Most studies have focused on structural transfer and error analysis, while the cognitive mechanisms underlying learners' perception and processing of linguistic input remain underexplored. Therefore, the present study aims to investigate the **cognitive constraints of language perception** and their impact on **language interference** among Algerian multilingual learners of English, with particular focus on written production. Understanding these processes may provide valuable insights into the types of errors produced by learners and the factors shaping their linguistic choices.

2– Literature Review

2.1 Cognitive Constraints in Language Perception

2.1.1 Working Memory

Working memory is a core cognitive system responsible for temporarily holding and manipulating information (Baddeley, 2003). It plays a central role in language perception, allowing learners to process and integrate linguistic input. Limitations in working memory can reduce the ability to hold multiple representations simultaneously, causing learners to rely on familiar structures from L1 or L2 during L3 acquisition (Engel de Abreu, 2011).

Research has shown that learners with higher working memory capacity are better able to manage syntactic complexity and avoid errors caused by interference. For example, Engel de Abreu and colleagues (2011) found that multilingual children with stronger working memory were less prone to syntactic transfer errors when reading and writing in an L3. Similarly, Baddeley (2003) emphasized that the phonological loop allows learners to temporarily store auditory input, supporting correct perception of unfamiliar L3 sounds and structures. Without sufficient capacity, learners often substitute unfamiliar L3 elements with patterns from their previous languages, resulting in interference.

2.1. 2 Attention and Inhibitory Control

Cognitive control in language perception is closely tied to attentional resources and inhibitory control. Bilingual and multilingual learners must continuously select relevant input from the target language while suppressing interference from other languages in their repertoire (Bialystok, 2001; Green, 1998). This requires both focused attention and executive control mechanisms.

Studies indicate that learners with weaker inhibitory control show higher rates of interference. For instance, Costa, Miozzo, and Caramazza (1999) observed that bilingual speakers inadvertently activated words from a non-target language during lexical tasks, demonstrating that without proper inhibition, cross-linguistic activation occurs automatically. In L3 learning, such interference is more pronounced because learners must manage two non-target sources (L1 and L2) simultaneously.

Moreover, attentional load impacts the accuracy of perception. When learners are cognitively overloaded, they may perceive L3 sounds incorrectly or misinterpret grammatical structures. This aligns with the Controlled Attention Hypothesis, which suggests that attentional resources mediate language processing efficiency (Engle, 2002).

2.1. 3 Perceptual Constraints

Language perception is also shaped by phonological and prosodic processing. The Perceptual Assimilation Model (PAM) posits that learners interpret foreign sounds by mapping them onto their existing phonological categories (Best, 1995). When L3 sounds do not correspond closely to L1 or L2 categories, learners misperceive them, resulting in phonological interference.

For example, Arabic-speaking learners often confuse English /p/ and /b/ sounds because Arabic lacks a /p/ phoneme. Similarly, French influences the perception of English vowels

for Algerian learners, as L2 vowel categories may compete with L3 sounds. Studies by Flege (1995) and Best (1995) demonstrate that these perceptual constraints can influence both spoken and written production, since misperceived sounds may be transcribed incorrectly or trigger incorrect spelling patterns.

2.2 Language Interference in Multilingual Contexts

2.2.1 Definition and Sources

Language interference refers to the influence of previously acquired languages on comprehension or production in a target language (Weinreich, 1953). It can occur at multiple levels:

- **Phonological interference:** sound substitutions and accent transfer
- **Lexical interference:** borrowing, false cognates, overgeneralization
- **Syntactic interference:** word order or morphological transfer
- **Semantic interference:** transferring meaning or usage incorrectly

In multilingual learners, interference is often dynamic, with L1 and L2 both potentially influencing L3. Cenoz (2003) notes that L2 often exerts a stronger effect than L1, particularly when L2 is dominant or structurally closer to L3. This is particularly relevant in Algeria, where French (L2) often interacts with English (L3), while Arabic (L1) continues to influence cognitive processing.

2.3 Cognitive Factors Contributing to Interference

Cognitive mechanisms mediate the degree and type of interference. The Inhibitory Control Model suggests that interference occurs when non-target languages are insufficiently suppressed (Green, 1998). Similarly, the Bilingual Interactive Activation Model (BIA+) proposes that lexical items from multiple languages are activated simultaneously during perception and production, requiring cognitive control to select the appropriate target (Dijkstra & Van Heuven, 2002).

Empirical studies confirm the cognitive basis of interference. For example, Abutalebi and Green (2007) found that bilinguals with stronger executive control produced fewer cross-linguistic errors. In L3 learners, the need to monitor two previously acquired languages amplifies cognitive demands, increasing susceptibility to interference (Hancin-Bhatt & Nagy, 1994).

2.4 Third Language Acquisition and Multilingual Contexts

L3 acquisition is uniquely sensitive to cognitive constraints because learners draw upon multiple prior language systems. Cenoz (2003) describes the cumulative enhancement model, in which both L1 and L2 can positively or negatively influence L3 learning. While prior knowledge can facilitate learning through transfer of similar structures, it can also lead to interference when prior systems differ in form or usage.

In Algeria, learners typically acquire Arabic as L1, French as L2, and English as L3. Research shows that French often serves as the dominant source of transfer for English, influencing syntactic choices and lexical selections, whereas Arabic contributes to semantic and phonological patterns (Cenoz, 2003; Ringbom, 2007). Cognitive constraints mediate these effects: learners with stronger working memory and attention control show less interference, whereas those with lower cognitive capacity are more prone to transfer errors (Bialystok, 2001; Engel de Abreu, 2011).

Additionally, written production in L3 requires active mobilization of cognitive resources. Learners must perceive, interpret, and encode linguistic input simultaneously, which increases the likelihood of interference if cognitive constraints are exceeded (Kellerman, 1983)

3– Method and Tools:

3.1 Research Design

This study adopts a mixed-methods research design with a descriptive orientation in order to investigate the cognitive constraints of language perception and their impact on language interference among multilingual learners. The mixed-methods approach was selected because it allows for the integration of quantitative and qualitative data, providing a more comprehensive understanding of multilingual language processing and cross-linguistic influence.

Quantitative data were used to examine learners' linguistic background, language use, and perceived similarity between languages, as well as to identify patterns of language interference in written production. Qualitative data, obtained through teacher interviews, provided deeper insights into learners' writing difficulties, cross-linguistic influence, and psycholinguistic factors affecting language production.

Although cognitive constraints such as working memory, attention, and inhibitory control are central to this study, they were not measured through experimental cognitive tasks. Instead, these constraints were inferred from learners' language perception, self-

reported data, and patterns of language interference observed in written production. The integration of these data sources enabled the study to explore the relationship between language perception, cognitive constraints, and cross-linguistic interference in multilingual learners.

3.2 Participants

The participants in this study consisted of 100 undergraduate students enrolled in the English Department at Chadli Bendjedid University in Algeria. The students were divided into four groups and were all enrolled in the Written Expression module at the time of data collection. The sample included 13 male and 87 female students aged between 18 and 20 years. All participants were multilingual learners who spoke Arabic as their first language (L1), French as their second language (L2), and were learning English as a foreign language (L3). The students attended a weekly Written Expression class lasting one hour and a half, which focuses on developing writing skills in English.

In addition to the student participants, two teachers of Written Expression participated in the study. The teachers had 10 and 36 years of teaching experience, respectively. Their participation was important for providing qualitative insights into students' writing difficulties, common errors, and the influence of Arabic and French on English writing.

3.3 Research Instruments

This study employed three main research instruments to collect both quantitative and qualitative data: a writing task, a questionnaire, and semi-structured interview.

The writing task was designed to examine students' written production in English and identify instances of language interference resulting from the influence of Arabic and French. Students were asked to write a short text in English on a general topic. Their written productions were analyzed to identify lexical, syntactic, and semantic interference patterns.

The questionnaire was administered to collect quantitative data about students' linguistic background, language use, exposure to languages, self-reported proficiency, and their perception of similarity and difference between Arabic, French, and English. The questionnaire also included items related to psycholinguistic factors such as psychotypology, which refers to learners' perception of linguistic distance between languages and its influence on language transfer and interference.

Semi-structured interviews were conducted with two teachers of Written Expression to obtain qualitative data about students' writing difficulties, common errors, and the influence of prior languages on English writing. The interviews also explored teachers'

perspectives on psycholinguistic factors influencing language transfer, language perception, and cross-linguistic interference.

3.4 Data Collection Procedure

Data were collected during the academic year in classroom settings and followed three main stages. First, the questionnaire was administered to students in order to gather information about their language background, language use, and language perception. Second, students completed the writing task under teacher supervision, where they wrote a short essay in English. These texts were later collected and analyzed to identify instances of language interference. Finally, semi-structured interviews were conducted with two teachers to obtain qualitative insights into students' writing difficulties and cross-linguistic influence. All participants were informed about the purpose of the study, and confidentiality and anonymity were ensured throughout the research process.

3.5 Data Analysis

The data were analyzed using both quantitative and qualitative methods. Questionnaire data were analyzed using descriptive statistics such as frequencies and percentages to describe students' language background, language use, and perception of language similarity.

The analysis of students' written production followed the error analysis procedure proposed by Corder (1973) and later developed by Ellis (2002). The procedure involved several stages, including error identification, error classification, error quantification, and error interpretation. First, students' written texts were carefully examined to identify linguistic errors. Second, the identified errors were classified into major categories, including grammatical and syntactical errors, orthographic errors, and lexical errors. Third, errors were further classified according to error types such as addition, omission, misformation, and disordering, based on Corder's (1973) error taxonomy. Finally, the frequency and percentage of each error category and error type were calculated in order to determine the most frequent types of language interference in students' written production.

Interview data were analyzed using thematic analysis to identify themes related to language interference, language perception, writing difficulties, and psycholinguistic factors influencing multilingual language production. The combination of descriptive statistics, error analysis, and thematic analysis allowed for a comprehensive examination of the relationship between cognitive constraints, language perception, and language interference among multilingual learners.

4– Results and Discussion

The analysis of the results focuses on both the types of errors produced by learners and the cognitive and perceptual factors that may account for these errors in multilingual language production.

4.1 Analysis of Students' Written Errors

The written productions of the 100 Algerian English learners were analyzed to identify the types, frequency, and patterns of errors in their English writing. The classification of errors followed the error analysis framework proposed by Corder (1973), who categorized learner errors into omission, addition, misformation, and disordering, and the methodological procedure outlined by Ellis (2002), including error identification, categorization, quantification, and interpretation.

In total, 2285 errors were recorded across the students' written essays. Errors were grouped into three main categories: grammatical and syntactical errors, orthographic errors, and lexical errors (Table 1).

Table 1: Frequencies of Overall Errors Committed by Participants

No.	Categories	Frequencies	Percentage %
1	Grammatical and Syntactical Errors	1257	55%
2	Orthographic Errors	708	31%
3	Lexical Errors	320	14%
Total	3	2285	100%

Source: Author's own Data and Analysis; Error Categorization Based on the Error Analysis Framework Proposed by Corder (1973) and Further Developed by Ellis (2002).

As shown in Table 1, grammatical and syntactical errors were the most frequent, accounting for 55% of all errors. Orthographic errors represented 31%, and lexical errors were the least frequent at 14%. These results suggest that learners face the greatest challenges with grammar and sentence construction, highlighting a cognitive constraint in processing complex linguistic structures in English as a third language (L3).

Table2 : Distribution of Errors by Type

No.	Types of Errors	Numbers of Errors	Percentage (%)
1	Addition	845	37%
2	Disordering	731	32%
3	Omission	503	22%
4	Malformations	206	9%

Source: Author's own Data; Error Types Adapted from Corder (1973).

Table 2 shows that addition errors were the most frequent (37%), followed by disordering errors (32%), omission errors (22%), and misformation errors (9%). The high proportion of addition and disordering errors indicates that learners often impose structural patterns from previously acquired languages onto English, reflecting cognitive interference in sentence planning and syntactic encoding.

These findings align with previous research in second and third language acquisition, which highlights that errors are systematic and reflect underlying cognitive processing difficulties rather than random mistakes (Ellis, 2002; Cenoz, 2003). Specifically, grammatical and syntactical errors demonstrate the impact of cognitive constraints on working memory, attention, and processing capacity, which affect learners' ability to manage multiple linguistic systems simultaneously (Bialystok, 2001; Engel de Abreu, 2011). Orthographic and lexical errors further indicate difficulties in mapping English forms to mental representations shaped by L1 and L2.

Overall, the analysis reveals that cross-linguistic interference is most prominent in grammatical and syntactic domains, suggesting that learners rely heavily on existing linguistic knowledge when processing and producing English. The frequency and types of errors highlight how cognitive constraints in language perception influence L3 writing, emphasizing the importance of instructional strategies that target both grammatical awareness and language processing skills.

4.2 Language Perception and Cross-Linguistic Influence

The questionnaire results indicate that learners' perception of linguistic distance plays a significant role in shaping their written production. Most participants reported that French is closer to English than Arabic, particularly in terms of vocabulary and certain grammatical features. This perception appears to influence learners' writing behavior, as many lexical and syntactic errors reflected the influence of French.

This finding is consistent with earlier research on cross-linguistic influence, which suggests that learners tend to rely on previously acquired languages when producing a new language (Cenoz, 2003; Ringbom, 2007). In multilingual contexts, both the first language

(L1) and the second language (L2) may influence third language (L3) production, but their influence depends on factors such as language similarity, proficiency level, and language exposure.

The results also indicate that learners rely on their previous linguistic knowledge when they encounter difficulties in English writing. When learners lack the appropriate vocabulary or grammatical structures in English, they tend to draw on their knowledge of French or Arabic. This behavior often leads to cross-linguistic interference, particularly in lexical choice and sentence structure.

The findings from the teacher interviews support this interpretation. Teachers reported that students frequently translate directly from French when writing in English and sometimes use Arabic sentence structures, especially when producing complex sentences. This confirms that multilingual learners activate multiple linguistic systems during language production, which may result in interference.

4.3 Cognitive Constraints in Third Language Writing

In addition to language perception, the results suggest that cognitive constraints play a significant role in language interference. Writing in a third language is a cognitively demanding task that requires learners to process multiple linguistic components simultaneously, including grammar, vocabulary, spelling, and content organization.

According to the working memory model proposed by Alan Baddeley (2003), working memory is essential for processing and storing linguistic information during language production. When learners write in a foreign language, they must hold information in memory while constructing sentences, which can overload their cognitive capacity. As a result, learners may rely on previously acquired linguistic structures that are more easily accessible in memory.

Language interference may also be explained by the Inhibitory Control Model proposed by David W. Green (1998), which suggests that multilingual speakers must suppress non-target languages when producing a specific language. If this inhibition is not fully effective, elements from other languages may interfere with the target language.

Furthermore, research by Ellen Bialystok (2001) highlights the role of attentional control in bilingual and multilingual language processing. Learners must selectively attend to the target language while inhibiting competing linguistic systems. When attentional resources are limited, interference from other languages becomes more likely.

These findings suggest that some of the errors observed in students' written production are not only the result of linguistic differences between languages but also the result of cognitive limitations during language processing. Under conditions of cognitive load, learners tend to rely on more familiar linguistic patterns from their previous languages.

5 General Discussion

Overall, the findings of this study indicate that cross-linguistic interference in the written production of Algerian learners of English as a third language is influenced by both language perception and cognitive constraints. The results show that learners draw on their previous linguistic knowledge when writing in English, especially when they encounter difficulties related to grammar and vocabulary. The study also demonstrates that learners' perception of linguistic similarity influences the source of language transfer. French appears to play a significant role in lexical and syntactic transfer, while Arabic influences sentence structure and meaning in certain cases. This suggests that multilingual learners use all available linguistic resources when producing a third language.

In addition, the study highlights the role of cognitive factors such as working memory limitations and attentional control in language production. Writing in a third language requires significant cognitive effort, and when cognitive resources are limited, learners are more likely to rely on previously acquired languages, leading to interference. These findings support the view that third language acquisition is a complex cognitive and multilingual process in which multiple linguistic systems interact. Language interference should therefore be understood not only as a linguistic phenomenon but also as a cognitive process influenced by language perception, memory, and attention.

6- Conclusion

The main objective of this study was to investigate the role of cognitive constraints in language perception and their impact on cross-linguistic interference (CLI) in multilingual learners of English in Algeria. The analysis of 100 students' written productions revealed that cognitive factors particularly limitations in working memory, attentional control, and perceptual processing significantly influence learners' ability to manage and integrate multiple linguistic systems. These constraints were reflected in the frequency and types of errors, with grammatical and syntactic errors being the most prevalent, followed by orthographic and lexical errors.

The findings demonstrate that learners frequently transfer structures from previously acquired languages (Arabic as L1 and French as L2) into English (L3), particularly when cognitive resources are insufficient to support accurate sentence construction. Addition and disordering errors were the most common error types, highlighting learners' reliance on familiar patterns from L1 and L2 to compensate for limitations in processing and organizing L3 input. This confirms that cognitive constraints shape how learners perceive, process, and produce the target language, reinforcing the systematic nature of errors in multilingual contexts.

Furthermore, the study underscores the importance of **language proximity and similarity** in influencing the direction and extent of transfer. Learners tend to draw more heavily on the language they perceive as cognitively or structurally closer to the target language, which amplifies interference in areas such as syntax and vocabulary. These findings are consistent with research on cross-linguistic influence, which highlights that cognitive limitations and prior language experience jointly determine the patterns of transfer observed in L3 learning (Cenoz, 2003; Engel de Abreu, 2011; Ellis, 2002).

In conclusion, **cognitive constraints on language perception are a central factor in the occurrence and nature of language interference** among multilingual learners. Effective L3 instruction should consider these cognitive limitations, providing strategies to enhance working memory, attentional focus, and awareness of structural differences between languages. By addressing these cognitive factors, educators can reduce the impact of interference and support more accurate and fluent language production in multilingual contexts.

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