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L1 P-Chopping and L2 Null-Preposition: the same output, a different nature

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This paper addresses the nature of P-Chopping/Null-Preposition in the grammars of native speakers (N = 30) and Chinese-speaking learners (N = 72) of European Portuguese. This systematic phenomenon, attested in natural languages (Tarallo 1985; Alexandre 2000; Arim et al. 2004; Kato & Nunes 2009; Kato 2010; Santos 2014) and interlanguage grammars (Klein 1993; 1995; Jourdain 1996; Dekydspotter et al. 1998; Klein 2001; Perpiñán 2010; 2015; Perpiñán & Cardinaletti 2024) consists of the omission of the mandatory preposition in *wh*-movement constructions. The results of an oral production and one self-paced reading acceptability judgment task indicate that native speakers produce and accept the omission of the preposition in argument but not in adjunct positions, but L2 speakers produce and accept it in both contexts. The asymmetries shown by native speakers corroborate previous claims that the omission of the preposition tends to occur when an argument of the verb is relativized, rather than when the preposition precedes an adjunct (Baker 1988; Kato 2010; Santos 2014). The results of L2 speakers corroborate previous L2 studies that did not find such an asymmetry in the acquisition of *wh*-questions (Klein & Casco 1999) and relative clauses (Klein 1993; Jourdain 1996). This contrast between the native and the interlanguage grammar indicates that the phenomenon has a different nature: it is grammatical for native speakers, resulting from the availability of inherent Case Marking prepositions (Kato 2010) and it is developmental for L2 learners, who attempt null operator movement and, accordingly, include a null preposition (Klein & Casco 1999).

1 Introduction

The acquisition of prepositional relative clauses (RCs) in European Portuguese (EP) has been investigated both in first (L1) and second language (L2) acquisition research. Studies on EP L1 acquisition of RCs indicate that prepositional RCs are acquired later and develop with schooling. This is applicable to EP, as demonstrated by Vasconcelos (1991; 1996), Valente (2008) and Fontes (2009) as well as other languages such as Italian (Guasti & Cardinaletti 2003), French (Labelle 1990), English (McDaniel et al. 1998), and Spanish (Pérez-Leroux 1995). To the best of our knowledge, there are limited studies that look at the L2 acquisition of prepositional RCs in EP (Espírito Santo 2020; Espírito Santo et. al. 2024). The L2 research on the acquisition of prepositional RCs in other languages focuses mostly on the differences in markedness between Pied Piping (PiP) and Preposition Stranding (PS) strategies, predominantly in L2 English acquisition. Instead, the present study investigates the phenomenon of deleting the mandatory preposition in prepositional RCs, by native and non-native speakers of EP. The study of this systematic phenomenon raises interesting questions about the nature of interlanguage grammar (ILG) or the limits of recoverability of deletion.

In standard EP, prepositional RCs are produced using PiP, which involves fronting the mandatory preposition (1). Resumption (2), where the preposition remains *in situ* and is followed by a resumptive element, it is also attested, but it is not sanctioned by prescriptive grammars and it is considered non-standard (e.g., Alexandre 2000). The strategy that is the focus of the present paper is also non-standard[1] and consists of deleting the mandatory preposition (3).

(1) *Foi   um   debate$_i$ [[$_{OBL}$ a que] valeu a pena   assistir t$_i$]].*
     be-PST.3SG DET.INDF.M.SG debate   to REL be.worth-PST.3SG watch

(2) *Foi   um   debate$_i$ [[$_{OBL}$ que] valeu a pena   assistir a ele]].*
     be-PST.3SG DET.INDF.M.SG debate   REL be.worth-PST.3SG watch to 3SG

(3) *Foi   um   debate$_i$ [[$_{OBL}$ Ø que] valeu a pena   assistir t$_i$]].*
     be-PST.3SG DET.INDF.M.SG debate   REL be.worth-PST.3SG watch
     All: 'It was a debate that was worth watching.'

The strategy described in (3) is known as P-Chopping (P-Chop) or PP-deletion in the literature on Portuguese (Tarallo 1985; Alexandre 2000; Arim et al. 2004; Alexandre 2012; Duarte 2013; among others). The literature that primarily focuses on L2 acquisition uses the Null-Preposition (Null-Prep) designation to refer to the same phenomenon (Klein 1993; Perpiñán 2010; 2020; among others). This non-standard strategy is documented not only in the grammar of native EP

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[1] Although non-standard strategies are attested in the oral and written speech of European Portuguese native speakers, they are considered non-standard because they are not sanctioned by prescriptive grammars of Portuguese and they are not taught to native-EP acquiring children' nor in L2 language lessons.

speakers (Brito 1995; Alexandre 2000; Brito & Duarte 2003; Arim et al. 2004; Antunes & Brito 2008; Alexandre 2012; Duarte 2013; Espírito Santo 2020; Amorim 2021), but also in the ILG of non-native EP speakers (Espírito Santo 2022).

The main research question (RQ) of this paper is whether the omission of the preposition in the ILG has the same nature as the omission of the preposition in an adult L1 grammar, specifically in the grammar of EP.

This paper is structured as follows: Section 2 describes the P-Chop phenomenon in EP. To enable a comparison with the participants' native language and to speculate about potential transfer effects, section 3 briefly presents the main properties of prepositional relative clauses in Chinese. Section 4 discusses some of the explanations for the omission of the preposition in natural languages (i.e., not in L2 acquisition contexts) presented in the literature. Section 5 covers the omission of the preposition in L2 acquisition (Null-Prep). The experimental design adopted in the present study is detailed in section 6, followed by the results, in section 7. Section 8 presents the discussion and section 9 shows the conclusions.

2 P-Chopping in European Portuguese

P-Chop RCs in EP are preferentially introduced by *que*, which works as a neutral element, irrespective of the syntactic function of the relativized element (e.g., Peres & Móia 1995; Espírito Santo 2020). The same was noted for Brazilian Portuguese (BP) (see Kato 2010). This strategy has both diachronic and synchronic attestations. Sentence (4) illustrates an example of the omission of the preposition in the diachrony (example from the 13th century):

(4)   *o   dia Ø que eu   tal   pesar vi*
       DET.M.SG day   REL 1SG such grief see-PST.1SG
       'the day (in) which I saw such grief'

                              (*Cancioneiro da Ajuda* 10224; Huber 1933, from Duarte 2013: 8)

Synchronically, this strategy is present in other varieties of Portuguese, such as Santomean Portuguese (5), Cape Verdean Portuguese (6) and BP (7) (Tarallo 1985; Kato & Nunes 2009; Gonçalves 2010; Alexandre et al. 2011; Alexandre & Hagemeijer 2013; among others).

(5)   *Tenho   uma moça lá   em casa Ø que não chamo   empregada [a uma moça].*
       Have-PRS.1SG one lady there in home   REL not call-PRS.1SG cleaner   (to one lady)
       'I have a girl there at my place that I do not call a waitress.'

(6)   *Faz   umas coisas Ø que eu   não gosto [de umas coisas].*
       Do-PRS.3SG   some things   REL 1SG not like (of some things)
       'He does some things that I don't like.'

                              (both from Alexandre et al. 2011: 22)

(7) *Nova Iorque é   uma cidade Ø que você respira*
New York   be-PRS.3SG one city   REL 2SG breathe
Gershwin [em Nova Iorque].
Gershwin (in New York)
'New York is a city where you breathe Gershwin.'

(Tarallo 1985: 358)

There is increasing evidence of the use of this strategy in EP, showing that P-Chop incorporates speakers' oral discourse, regardless of their level of instruction (Brito & Duarte 2003: 667[2]; Santos 2014; Aßmann & Rinke 2017; among others).

Researchers do not always take the same approach when describing the preferred contexts for P-Chop. Some focus on the syntactic function of the relativized object, like Veloso (2013) and Aßmann & Rinke (2017), while others adopt a lexical approach, underscoring the verbs and prepositions with which P-Chop RCs are more frequent. For example, Arim et al. (2004) highlight the use of certain prepositional combinations such as *gostar de* 'like of', *falar de* 'talk about'*, precisar de* 'need of', *necessitar de* 'need of' and *chamar a* 'call to', as well as the prepositions *em* 'in' and *a* 'to'.

The authors who follow the syntactic approach do not agree on the preferred contexts for P-Chop. Veloso (2013: 2128–2129) claims that P-Chop is more frequent in the relativization of temporal or locative PPs, followed by the cases where the preposition has a purely grammatical function, required by verbs such as *gostar* 'like', *falar* 'talk' and *precisar* 'need'. The prepositions introducing indirect objects and oblique semantic objects are less likely to be dropped, as schematized in (8) (from Aßmann & Rinke 2017: 34).

(8)   temporal/local > grammatical oblique > indirect > semantic oblique

Santos (2014: 38) emphasizes that complements are more frequently the subject of P-Chop than adjuncts, based on a corpus-based approach. These assumptions contradict those made by Veloso (2013) and require further attention. Additionally, Santos (2014: 37–38) notes that nominal complements and adjuncts have a higher percentage of P-Chop than verbal complements and adjuncts, and that *de* is the preposition most frequently chopped among the ones analyzed in her study (*em,* "in," *de,* "of," *a,* "to," and *com,* "with").

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[2] "Embora numa perspetiva purista ambas as estratégias [cortadora e resumptiva] sejam consideradas marginais, o que é certo é que a primeira (estratégia cortadora) faz actualmente parte do registo oral de falantes altamente escolarizados, o que permite supor que estamos perante uma tendência de mudança, mesmo no português europeu." [Although, from a purist perspective, both strategies [P-Chop and resumption] are considered as non-standard, the fact is that the first (P-Chop strategy) integrates the oral speech of highly instructed speakers, which allows us to suppose that we are facing a trend of change, even in European Portuguese."] (Brito & Duarte 2003: 667, the translation is mine).

Aßmann & Rinke (2017: 31) also conduct a corpus-based analysis that confirms P-Chop is more commonly used to relativize arguments than adjuncts. The researchers found that P-Chop occurs most frequently in the relativization of indirect objects (97.4% of the analyzed sentences), followed by verbal complements (93.1%), temporal PPs (76.8%), locative PPs (58.6%), and oblique PPs (51.5%).[3] Considering the prepositions selected by the verb, according to the analysis of *corpora* by Aßmann & Rinke (2017), *de* and *a* are the most frequently omitted prepositions.[4]

Espírito Santo (2020) follows a lexical approach, in an experimental study run with native EP speakers. The study tests the omission of the preposition in simple declarative sentences and RCs with the verbs more commonly associated with P-Chop, as well as with other verbs that select the same prepositions.[5] One of the objectives is to determine if P-Chop in RCs results from a change in the theta-grid of certain verbs, which might be selecting a DP instead of a PP. The findings of this study suggest that some verbs have alternative theta-grids (V + Prep + DP and V + DP).[6] However, native speakers do not accept the deletion of the preposition in declarative clauses with the same verbs that occur in P-Chop RCs, indicating that these verbs are selecting a PP and not a DP, not evidencing changes in their theta-grid. For example, *gostar de* is one of the verbs with which P-Chop RCs are more frequent, but the participants rejected the omission of the preposition with *gostar* in declarative sentences. This finding aligns with Brito's (1995) claim that the presence of P-Chop RCs with certain verbs does not necessarily correlate with a modification in the theta-grid of those verbs.

Other V + Prep pairings that allow P-Chop in RCs are noted in Espírito Santo's (2020) study, including *assistir a* 'watch (to),' *lembrar-se de* 'remember (of),' *recordar-se de* 'remember (of),' *esquecer-se de* 'forget (of)'. Nonetheless, this study does not provide conclusive findings on the conditions that favour P-Chop. Neither the absolute frequency of the sequence V + Prep nor the preposition's poor auditory salience can reliably predict the use of P-Chop in relativization (Espírito Santo 2020: 168). P-Chop seems to be the result of combining an [-animate] head with

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[3] The authors treat oblique and verbal PPs separately without clarifying what criteria they take into consideration, which may have influenced their overall results. Duarte (2003), for instance, includes all syntactic functions that are not central under the designation 'oblique': "Chamam-se oblíquas (abreviadamente OBL) às relações gramaticais que não são centrais. Têm relações gramaticais oblíquas tanto argumentos obrigatórios e opcionais do predicador verbal (i.e., complementos do verbo) como adjuntos (…) os constituintes com relações gramaticais oblíquas são tipicamente de natureza preposicional, adverbial ou frásica. [We call oblique (abbreviated OBL) the grammatical relations that are not central. Mandatory and optional arguments of the verbal predicator (that is, complements of the verb) and adjuncts may have oblique grammatical relations (…) the constituents that have oblique grammatical relations are typically prepositions, adverbs or sentences.] (Duarte 2003: 294) (the translation is mine).

[4] The authors consider verbal chopping cases that are usually classified as complement adjectival clauses, such as *ser/estar habituado* 'be used to,' *estar ligado a* 'be connected to,' *ser curioso por* 'be curious by'.

[5] The verbs tested were: *agradar a* 'please (to),' *assistir a* 'assist to,' *esquecer-se de* 'forget (of),' *falar de* 'talk about,' *gostar de* 'like (of),' *lembrar-se de* 'remember (of),' *necessitar (de)* 'need of,' *precisar de* 'need (of),' *recordar-se de* 'remember (of)'.

[6] This seems to be the case with the verbs *agradar* 'please,' *precisar* 'need,' *necessitar* 'need' and *falar* 'speak' (Espírito Santo 2020).

a less phonetically prominent preposition. Interestingly, the data suggest that native speakers' preference for P-Chop may also be related to specific thematic roles associated with the PP, with native speakers being less likely to accept P-Chop when the relativized element is a locative (Espírito Santo 2020: 169–171).

3 Prepositional relative clauses in Mandarin Chinese

Mandarin Chinese (MC) RCs are head-final, meaning that the RC comes before the head in linear order. This is in contrast to Portuguese RCs, which are head-initial (9):

(9)   [*Xiaoming xihuan DE]   [DEM-CL na-ge ren]   jiao Zhenni.*
       Xiaoming like   REL   DEM-CL person   named Zhenni
       'The person that Xiaoming likes is named Jenny.'

(Xu 2009: 26)

Contrary to Portuguese, MC does not use relative pronouns. Instead, an invariable relativizer (DE) introduces the RC domain. Resumptive elements are mandatory when the object of an overt preposition is relativized. MC behaves exactly like Welsh (Rouveret 1994) or Hausa (Tuller 1986) in this respect. Neither of these languages permits PiP or PS and, as a result, oblique relativization is always done through resumption (10).

(10)   [*Wo dui ta$_j$ hen bucuo   DE] na-weipéngyou$_j$*
       1SG to 3SG very not.bad DE   that-CL-friend
       'The friend to whom I am very kind'

(Pan 2016: 287)

In MC, the omission of the preposition in *in-situ* relativization generates an ungrammatical structure:

(11)   *Zhe jiu   shi [$_{NP}$ [$_{CP}$ta *(cong nar) lai   de] na-ge xiaozhen]*
       this exactly be   3SG from there come DE DEM-CL town
       'This is the town where he came from'

(Ning 1993:96, 134, *apud* Wen 2020: 96)

Due to the properties of prepositional RCs in MC, eventual cases of omission of the preposition in prepositional RCs in the L2 acquisition of EP by MC native speakers cannot be transferred from the L1, where resumption is the only available strategy.[7]

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[7] Ning (1993) identified gapped adjunct RCs in Mandarin Chinese, but, contrary to what is observed in EP, these are not a consequence of the relativization process. They occur with verbs that show the same behavior in matrix clauses. For this reason, we consider that non-native P-Chop cannot be explained as L1 transfer from these structures.

If cases of omission of the preposition are found, they can be explained in one of two ways: learners are using/accepting the non-standard strategy of EP (P-Chop), provided by the input, or learners are on a developmental path towards the acquisition of lexical properties. These two possibilities are addressed further, in the discussion.

4 Possible explanations for the omission of the preposition in natural languages

Various explanations have been proposed for the absence of prepositions in RCs in natural languages, including Baker (1988) and Kato (2010). In this paper, we adopt Kato's proposal, which is further developed in the following paragraphs. Kato & Nunes (2009) explain the omission of the preposition in BP by native adult speakers as a lexical idiosyncratic matter, associated with particular theta-roles. Following Kato (2010), a preposition may be optional in the numeration when the displaced element is discourse-linked and the preposition is licensed by the verb (in line with Bouchard 1981, for French). Kato (2010) notes that the absence of the preposition involves only A'-movement positions, where the DP can have a default Case. If the preposition is absent in the numeration, the relevant DP remains with its Case unvalued and the derivation crashes (Chomsky 2001), unless the DP is moved to a 'default' Case position (nominative, in BP):

(12) a. *A   Maria precisa   Ø esse   dinheiro amanhã.
         DET.F.SG Maria need-PRS.3SG   DET.3SF money   tomorrow

      b. Esse dinheiro   a   Maria precisa   para amanhã.
         DET.3SF money DET.F.SG Maria need-PRS.3SG for   tomorrow

(Kato 2010: 178)

Additionally, Kato proposes that prepositions selected by the verb assigning inherent Case, with verbs like *precisar* 'need,' *gostar* 'like,' etc., may be Inherent Case Marking Prepositions (ICP). ICP do not occur with adjuncts (i.e., when the PPs are not selected by the verb), but they appear with arguments. Nevertheless, ICP do not occur with all argument PPs, but relate to specific theta-roles (Kato 2010: 176). According to the hierarchy of theta roles proposed by the author (13), the prediction is that PPs playing the role of theme are more likely to have prepositions absent in the numeration than benefactives:

(13)   Theme > Goal > Locative > Instrumental > Benefactive

Additionally, the author admits that "inherent case splits the hierarchy according to speaker or dialect" (Kato 2010, footnote 6: 177).

Following Kato, in BP, verbs selecting ICP can display three types of RCs: PiP, resumption, and P-Chop. PiP and resumption emerge when the preposition is selected in the Numeration. The

preposition is merged inside IP, and it is dragged along with the extracted *wh*-element (14a). Resumption presupposes a resumptive pronoun in the Numeration. The preposition merges with it and a co-referent DP is merged at Left Dislocation (LD), from where extraction occurs (14b). When the verb does not select the preposition, the DP complement moves to TopP and receives the default nominative Case. Extraction occurs from this position (14c).

(14) a. $[_{DP}$ o   autor] $[_{CP}$ com quem$_i$ $[_{IP}$eu falei t_i]]
DET.M.SG author   with REL   1SG talk-PST.3SG

b. $[_{DP}$ o   autor] $[_{CP}$ que$_i$ $[_{LD}$ $t_{i.default\ nom}$] [eu falei   **com ele**$_i$]]
DET.M.SG author   REL   1SG talk-PST.3SG with 3SG

c. $[_{DP}$ o   autor] $[_{CP}$ que$_i$ $[_{TopP}$ $t_{i.default\ nom}$] [eu falei $[_{DP}t_i$]]]
DET.M.SG author   REL   1SG talk-PST.3SG

(adapted from Kato 2010: 181)

5 The omission of the preposition in second language acquisition (Null-Preposition)

In the context of L2 acquisition, Mazurkewich (1985) and Bardovi-Harlig (1987) conducted the first studies indicating that L2 learners omit the preposition from *wh*-questions and RCs that select PPs. However, the authors did not provide a detailed analysis of this aspect. For instance, Bardovi-Harlig did not explore the possible reasons behind the "no-prep" findings and instead interpreted them as a grammatical developmental stage.

The deletability of the preposition in RCs and *wh*-questions by L2 learners who were aware of the subcategorization properties of the verbs was first addressed by Klein (1993). Klein analysed the acquisition of prepositional RCs in English by speakers of different L1s. She found that participants who do not accept the omission of the preposition in declarative sentences (15a) often admit its deletion in interrogatives (15b) or RCs (15c):

(15) a. The children are waiting for the bus.
      b. *Which bus are the children waiting?
      c. *This is the bus that the children are waiting.

(Klein 2001: 37)

While some of Klein's participants' L1s allowed for the omission of the preposition in RCs, this was not the case for all of them. Therefore, it was concluded that Null-Prep in RCs and *wh*-questions is not dependent on the L1, but specific to the acquisition of L2 English.

Furthermore, Klein (1995) conducted a cross-linguistic study and concluded that in some languages (such as Haitian Creole, Northern Greece dialects, colloquial Brazilian Portuguese, colloquial Puerto Rican, Venezuelan Spanish, colloquial Italian, Catalan, Montreal French and

Québecois) the subcategorized verb can omit its preposition in RCs, but not in questions. The examples from Haitian Creole, in (16), illustrate this asymmetry. The declarative sentence requires the preposition 'de' (16a), while the RC does not (16b). However, the corresponding interrogative is not allowed without the preposition (16c). Thus, the author assumed that the permissibility of Null-Prep in questions was unattested in natural languages.

(16)   a.   *Twa   zanmi-yo   ap pale   **de** sinema   sa   a*
              Three friends-(PL) are talking about movie this (top)
              'The three friends are talking about this movie.'

         b.   *Men   sinema (que) twa   zanmi-yo   ap pale*
              Here-is movie (that) three friend-(PL) are talking (top)

         c.   *De/*Ø ki   sinema twa   zanmi-yo   ap pale?*
              About what movie three friends-(PL) are talking
              'What movie are the three friends talking about?'

<div align="right">(adapted from Klein 2001: 39)</div>

Faced with the evidence that L2 learners (L2ers) of English accept and omit the preposition in questions (15b), the author concludes that the use of null prepositions could potentially violate Universal Grammar's (UG) rules related to identification, licensing, and recoverability, particularly the Empty Category Principle. The proposal is that Null-Prep in ILG is evidence of a wild grammar, which does not conform with UG.

To determine if the absence of the preposition is unique to English, as claimed by Klein (1993), Jourdain (1996) analysed the omission of the preposition in French L2ers. She found that the deletion of the preposition may be constrained by the thematic role associated with the PP. Prepositions such as *à* 'to' and *de* 'from,' in argument positions, are more easily omitted than *pour* 'to, for' and *avec* 'with,' which introduce adjuncts. The omission of the preposition occurs in both RCs and questions (Jourdain 1996: 179). However, the asymmetry between PP arguments introduced by *à* and *de* and PP adjuncts introduced by *avec* is only statistically significant in questions. Jourdain speculates that the omission of the preposition results from a misconfiguration of parameters. Nevertheless, she disagrees with Klein and argues that some parts of UG are available when the preposition is omitted (Jourdain 1996: 240–244). The participants in her study showed sensitivity to the nature of the prepositions involved, revealing an asymmetry between weak and strong prepositions. This suggests that the faculty of language plays a role in the deletion of the preposition as well.

Dekydtspotter et al. (1998) propose that Null-Prep results from two related phenomena: interpretation of movement constructions as construals, not involving movement, and incorporation of the preposition within the verb. In particular, it is argued that L2 learners interpret interrogative and cleft sentences, such as those shown in (17) and (18), respectively, as

construals where the null element is an A-bar bound pro (19a), rather than the trace of a moved element (19b).

(17)   *De quel homme es-ce   que tu   as vu   une   peinture*
       of which man   be-PRS.3SG-it that 2SG voir-PST.2SG DET.INDF.F.SG painting
       par/?de ce   peintre?
       by/of   DEM painter?
       'Of which man is it that you have seen a painting by/of this painter?'

(18)   *C'est   d'Aristotle   que tu   as vu   une   peinture*
       It-be-PRS.3SG of Aristotle that 2SG voir-PST.2SG DET.INDF.F.SG painting
       par/?de Rembrandt.
       by/of Rembrandt.
       'It is of Aristotle that you have seen a painting by/of Rembrandt.'

                                                    (adapted from Dekydtspotter et al. 1998: 343)

(19)   a.   [$_{CP}$ *Op*$_i$ [$_{IP}$......... [$_{PP}$ *pro*$_i$] .....]]
       b.   [$_{CP}$ *Op*$_i$ [$_{IP}$......... [$_{PP}$ *t*$_i$] .....]]

                                                    (adapted from Dekydtspotter et al. 1998: 348)

Since categorical uniformity is a UG requirement on chain formation, the authors resort to Baker's (1988) concept of Preposition Incorporation (PI) to explain the categorical mismatch between the moved *wh*-word (DP) and the PP gap. Dekydtspotter et al. note that an empty category like *pro* must be governed by a lexical category. However, a preposition cannot license a *pro* complement because it interferes with and blocks the government from the lexical V head. The authors adopt Baker's proposal that the preposition moves out of the PP and incorporates into V', enabling the head-licensing condition on object *pro* to be satisfied. The reason for this is that the VP complex resulting from the inclusion of the preposition takes a DP as its complement, not a PP. This proposal bans Null-Prep from sentence adjunct constructions since incorporating a preposition into a verb should not be possible across a CP, as required in sentence adjuncts.

Klein & Casco (1999) contrasted prepositional arguments and adjuncts in the L2 acquisition of *wh*-questions in English L2. The participants in their study completed a grammaticality judgment task (GJT) including questions with PiP, PS and Null-Prep. They found that, contrary to Dekydspotter et al. (1998), L2ers accepted the omission of the preposition with adjuncts.

Their analysis is as follows: a *wh*-element is base-generated in top, being "an *in situ* element that learners misanalyse from *wh*-constructions in the input which they are not secure enough to generate in a lower position and consistently move overtly" (Klein & Casco 1999: 357). Furthermore, the authors claim that in Null-Prep the object of the preposition is a null resumptive pronoun which takes the form of an operator, a big PRO. The preposition before the big PRO is also null:

(20) $[_{top}$ wh] $[_{CP}$ . . . . . $[_{PP}$ P$_{\emptyset}$ OP]]

<div align="right">(adapted from Klein & Casco 1999: 357)</div>

The *wh*-features of the operator need to be checked and trigger covert movement, pied-piping the empty PP into Spec/CP, as proposed in Den Dikken's (1995) analysis of dative prepositions in English:

(21) $[_{top}$ wh] $[_{CP}$ $[_{PP}$ P$_{\emptyset}$ OP]$_i$ [IP   VP $[_{PP}$t]
        Who   did she listen?

<div align="right">(adapted from Klein & Casco 1999: 357)</div>

This explanation accounts for the existence of Null-Prep with both adjuncts and arguments (Klein & Casco 1999).

Klein later argues that L2ers exhibit incomplete acquisition of *wh*-movement due to a bias against PS in English, "particularly because prepositions are generally very weak and clitic-like in most languages and are prohibited from separating from their objects" (Klein 2001: 59).

Perpiñán (2010) examined the acquisition of prepositional RCs in L2 Spanish by Arabic and English native speakers. The study employed an experimental design with various tasks. In the oral production task (which inspired the one presented in this paper, see section 6), PiP was the strategy most produced by all groups (including a control group of Spanish native speakers). However, instances of Null-Prep were also recorded. Although the omission of the preposition was residual among native speakers (4.2%), it reached 19.8% among English learners and 16.7% among Arabic L2ers. Since Arabic does not display PS, Arabic participants' results are not compatible with Klein's hypothesis (2001), according to which the omission of the preposition is a consequence of the incomplete acquisition of *wh*-movement combined with a bias of the English speakers against PS. The results of Perpinán's online GJT indicated that PiP was appropriately processed by all groups, against the idea that the deletion of the preposition resulted from economy principles in the derivation, as suggested by Dekydtspotter et al. (1998). Finally, a self-paced reading comprehension task was conducted to test whether L2ers violated the universal principle of recoverability of deletion with Null-Prep RCs. The overall results indicate that L2ers have comprehension accuracy results quite close to those of native speakers, suggesting that "convergence at the comprehension level is possible" between native and non-native speakers (Perpiñán 2010: 196). Furthermore, L2ers did not present problems in interpreting RCs with the omission of the preposition. However, in sentences with PiP, native speakers had better scores, indicating that the preposition contributes to the overall meaning of the sentence among them, but makes no semantic contribution for L2ers. In other words, L2ers' interpretation of RCs is not affected by the strategy used. To sum up, Perpiñán (2010) argues that the omission of the preposition does not indicate a "wild grammar" but is a "systematical developmental stage" of

the ILG that L2ers (and L1 learners) go through during the acquisition of oblique RCs (Perpiñán 2010: 183). The omission of the preposition results from the optionality of the preposition, which happens when the DP is in an A-bar position and the preposition is not necessary to the overall meaning of the sentence (as proposed by Kato 2010 for natural languages). Therefore, the preposition does not assign the Case of the DP, which is instead assigned by default. As a result, the P-Chop structure is found in the ILG and conforms to UG constraints.

More recently, Perpiñán & Cardinaletti (2024) analysed the omission of the preposition in *wh*-questions, prepositional RCs and sluicing constructions in L1 and L2 Spanish speakers (native English and Arabic speakers). They conclude that the omission of the preposition is a scalar phenomenon, occurring more frequently in RCs, followed by *wh*-questions and finally by sluicing constructions. The authors claim that this phenomenon applies to both native speakers and L2ers, but acknowledge that it is more prevalent in ILG. They attribute this to various factors: "The complexity of pied-piping, together with the weak L2 knowledge of functional prepositions and their relatively easy semantic recoverability makes perfect ground for missing the obligatory preposition along the way in the (complex) movement derivation" (Perpiñán & Cardinaletti 2024: 165).

To summarize, scholars have suggested that the omission of the preposition in L2 may be a result of impaired access to UG (Klein 1993; Jourdain 1996), a strategy to avoid movement constructions (Dekydspotter et al. 1998; Klein 2001), or a developmental stage (Perpiñán 2010; Perpiñán & Cardinaletti 2024). The omission of the preposition in the ILG of L2ers has been explained as a phenomenon of PI (Dekydspotter et al. 1998), building on Baker, or as an instance of inherent case marking (Perpiñán 2010), in line with Kato's (2010) analysis of the same phenomenon in BP.

The authors agree that L2ers omit and accept the omission of the preposition in questions and RCs (Klein 1993; Jourdain 1996; Dekydtspotter et al. 1998; Klein & Casco 1999; Perpiñán & Cardinaletti 2024). Empirically, these proposals differ in the predicted contexts for the omission of the preposition: while some scholars expect it to occur with arguments and adjuncts (Klein & Casco 1999), others predict that the preposition is omitted more often with arguments than adjuncts (Jourdain 1996; Dekydtspotter et al. 1998).

6 The study

6.1 Research questions and hypotheses

We are examining a situation where the L2 (the target grammar) allows for the omission of the preposition (P-Chop) as a non-standard strategy to relativize prepositional PPs. In the learners' native language, when the preposition is overt, prepositional RCs are produced with one single strategy, i.e., with resumptive elements. Although L2ers are exposed to P-Chop in the naturalistic input, it is not explicitly taught in the classroom.

The researchers noted that, in natural languages, the preposition is often omitted when the PP selects for an argument (contrasting with adjuncts), due to A-bar movement of the object of the preposition (Baker 1988; Kato 2010). Jourdain (1996) found similar results for the acquisition of *wh*-questions in the L2, but not for RCs; however, there is no general agreement on these findings. Klein & Casco (1999), for instance, provide evidence of Null-Prep in the L2 acquisition of *wh*-questions with both adjuncts and arguments. Given the differences between the omission of the preposition in natural languages and L2 acquisition, and the fact that non-native speakers are exposed to P-Chop in the naturalistic input, the aim of this study is to investigate whether L2ers are acquiring this property from the native EP input or if they are exhibiting instances of Null-Prep, found in L2 acquisition. In other words, we aim at understanding if the grammatical knowledge of second language learners differs from that of native speakers. Differences in P-Chop productions and acceptability rates between L2ers and native speakers may provide clues regarding L2ers' access to UG, feeding the debate on whether adult L2ers have full access (Flynn & Martohardjono 1994; Schwartz & Sprouse 1994; 1996; Lardiere 2000), partial access (Eubank 1994; 1996; Hawkins & Chan 1997), or no access (Clahsen & Muysken 1986; Bley-Vroman 1990; Meisel 1997; Bley-Vroman 2009) to UG. Considering this, we formulate our first research question and related hypothesis below:

> **RQ1:** Does native P-Chop have the same nature as the Null-Prep structure found in L2 acquisition?

> **Hypothesis 1:** Native speakers show regularities in the omission of the preposition that are not necessarily reflected in the ILG of non-native speakers. More specifically, native speakers omit the preposition preferentially when it is selected by the verb (specifically with the combinations *gostar de* 'like (of)', *precisar de* 'need (of)', *pensar em* 'think (about)' and *participar em* 'participate (in)'). Non-native speakers omit the preposition in all contexts (including when it introduces an adjunct). The omission of the preposition has a different nature in native production (P-Chop) and L2 acquisition (Null-Prep).

Several studies have suggested that the omission of the preposition in the context of L2 acquisition is a developmental phenomenon (Bardovi-Harlig 1987; Perpiñán 2010; Perpiñán & Cardinaletti 2024). Therefore, our second RQ and related hypothesis address the potential effect of proficiency on the manifestation of this phenomenon:

> **RQ2:** Do advanced and intermediate speakers show differences in the production and acceptance of prepositional RCs omitting the preposition?

> **Hypothesis 2:** A proficiency effect is expected, with intermediate speakers showing more evidence of Null-Prep (developmental). Advanced speakers are closer to the target grammar and show more instances of P-Chop.

6.2 Participants

A total of 102 participants (N = 102) successfully completed the experiment, including a control group of 30 native EP speakers and 72 MC learners of EP. All non-native participants were exposed to MC through school at a very young age, regardless of their native dialect.[8] In addition, non-native participants (61 female, 11 male; mean age = 19.32 years, SD = 3.79) were attending or had attended a course in Portuguese as a Foreign Language (PFL), and they were divided into two groups based on the level of the language course they were taking or that they had completed: 36 intermediate learners (B1–B2 levels of the Common European Framework of Reference for Languages; CEFR) and 36 advanced learners (C1–C2 levels; CEFR). Most participants had also been exposed to or instructed in English. However, EP is here considered an L2 since the L2 concept is understood broadly, as one of the main non-native languages acquired by the speakers outside the family context.

The native control group of EP speakers (28 females and 2 males) attended Lisbon University's School of Arts and Humanities (mean age = 24.71, SD = 18.15), except for one participant (already graduated).

To ensure that participants were familiar with the argument grid of the verbs tested, they took a pre-test consisting of a cloze test with the 8 experimental verbs and 14 fillers (Learnclick platform), where they had to select one of four options, including an option without a preposition. Failure to recognize that the experimental items required a preposition resulted in exclusion from the study. Out of the initial group of 118 non-native speakers who took the pre-test, only 74 (63%) met the inclusion criteria for the study. However, two of these were later excluded as they did not complete all of the experimental tasks. All participants answered a linguistic questionnaire based on Carrol & Conklin (2017) and Slabakova (2015), including questions on how frequently they spoke, wrote, listened to, and read in Portuguese.

6.3 Experimental Items

Only verb + preposition (V + Prep) pairings compatible with the prepositions *em* and *de* were selected. These were chosen based on their frequency in EP (see Santos 2014: 35) and in the manuals and syllabus of PFL. The experimental combinations of V + Prep were also controlled for the type of PP: prepositional arguments of the verb and adjuncts introduced by a preposition were tested.

The prepositions introducing a PP argument do not assign the same theta roles to the 4 arguments analysed. The PPs selected by *gostar* 'like,' *precisar* 'need,' and *pensar* 'think' bear

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[8] Thirty-nine of the participants were native speakers of Mandarin Chinese, 18 could speak Cantonese as their first language, 11 could speak both Mandarin and Cantonese, and 4 could speak other Chinese dialects as their first language. Cantonese native speakers were included in the study due to the structural similarities between prepositional RCs in Mandarin Chinese and Cantonese.

the theta role of theme, while the PP selected by *participar* 'participate' may be interpreted as a theme or an abstract locative. With adjunct PPs, the preposition expresses a locative origin meaning (*gritar de* 'scream from' and *telefonar de* 'call from') or a locative stative value (*trabalhar em* 'work in' and *estudar em* 'study in').

Pied-Piping (standard) with the invariable relativizer *que* 'that' or with the variable relativizer *o (a) qual* (*literally: 'the which'*), also available in EP, is expected in the 8 scenarios considered. In the cases where the PP has a locative value, a subtype of PiP with the relativizer *onde* 'where' (instead of the standard combination Prep + relativizer) is also possible, in particular with the combinations *participar em* (*este é o concerto onde a cantora participou* 'this is the show where the singer participated')*, estudar em* (*esta é a biblioteca onde a Tatiana estuda* 'this is the library where Tatiana studies')*, trabalhar em* (*este é o aeroporto onde o piloto trabalha* 'this is the airport where the pilot works')*, telefonar de* (*este é o escritório onde a Joana telefona todos os dias* 'this is the office where Joana calls every day')*, gritar de* (*este é o jardim onde a Nádia gritou* 'this is the garden where Nadia screamed'). **Table 1** provides a schematic representation of the possible combinations of relativizer and preposition.

Relativizer(s)		*Que* 'that' *o (a) qual ('the which')*		*onde* 'where'	
Prepositions		de (from)	em (in)	de	Ø
Verb selecting an argument PP	*gostar* 'like'	yes	–	–	–
	precisar 'need'	yes	–	–	–
	pensar 'think'	–	yes	–	–
	participar 'participate'	–	yes	–	yes
Verb preceding an adjunct PP	*gritar* 'scream'	yes	–	yes	yes
	telefonar 'call'	yes	–	yes	yes
	trabalhar 'work'	–	yes	–	yes
	estudar 'study'	–	yes	–	yes

Table 1: Experimental verbs and possible combinations of relativizer and preposition.

6.4 Tasks

6.4.1 Oral Production Task

The goal of this task was to identify the preferred strategy for producing RCs: the standard PiP or non-standard P-Chop or Resumption. On a computer screen, participants saw a scenario (two sets of pictures) together with information about each image. The researcher read aloud the information that was written on the screen using the procedure adopted in Perpiñán's (2010)

study. Participants had to reply to a question on the following slide, which featured a portion of the preceding image. To make sure that the extracted component for each sentence was the intended one, the initial words of each response were given. The material was presented both verbally and in writing to guarantee that the non-native participants had no trouble remembering the details they needed to build the RC. The participants were instructed to say the sentence as quickly as they could, using the information given, to elicit a more implicit response. Eight target items for prepositional RCs (four arguments and four adjuncts) were included in the experimental items. As control items, eight target items elicited direct object RCs, to confirm that participants could produce RCs. Additionally, 18 pure fillers with unrelated structures were added to the task. There were 34 items in total (16 RCs items, 18 non-RCs items), in 68 slides (see Supplementary Files Instrumentation, A2).

Scenarios were randomly divided into two lists, each with identical items but in a different sequence. To prevent skewed results, half of the participants performed the task in order A and the other half in order B. **Figure 1** illustrates an example of an experimental item from the oral production task.

Figure 1: Example of an experimental item of the oral production task.

6.4.2 Self-Paced Reading Acceptability Judgment Task

The purpose of the Self-Paced Reading Acceptability Judgment Task (SPR-AJT) was to tap into the implicit ILG, assessing if participants accepted prepositional RCs with the standard and non-standard relativization strategies. It contained 100 sentences pseudorandomized into 10 blocks, ensuring that two items from the same condition or containing the same verb would not follow one another (see Supplementary Files, Instrumentation, A1). If necessary, breaks could be taken in between each block. On a computer screen, participants read each sentence in a non-cumulative, word-by-word format. The participants were asked to rate the

sentence as soon as the final word disappeared and a sliding bar appeared on the screen. The sliding bar's left edge had a 0 with the words "very bad" beneath it, while the extreme right had a number 1 with the words "very good." Participants were informed that this line went on continuously and that they could rate the sentence using the computer's trackpad at any point along the scale. The utilisation of a sliding bar instead of a Likert scale was intended to facilitate a more intuitive response and circumvent the issue of uneven gaps. The SPR-AJT included a time constraint; participants had to press the space bar on their keyboard to reveal the next word in each segment, which showed as a row of dashes. The word would, however, automatically disappear after 300 milliseconds and be replaced with the following section if the participants had not moved on to the subsequent word. Time pressure, which is thought to be important to tap into the implicit knowledge of these structures, is present in this method while still permitting the participants to choose their own reading path (allowing for varying reading speeds for native and non-native speakers). Before the experiment began, participants read the instructions and completed four practice trials. Non-native participants received instructions in Portuguese and Mandarin Chinese. The experiment was programmed using PsychoPy 3.2.3.[9]

6.4.3 Selection of Items for the SPR- Acceptability Judgment Task

The experimental items included only prepositional RCs; as in the oral production task, direct object RCs were included as baseline/control items, making sure that the participants had no problem with RCs. Prepositional RCs were tested for the three relativization strategies (PiP, P-Chop, and resumption) and the same V + Prep combinations were included as in the oral production task. As a result, there were a total of 24 experimental prepositional RCs: 12 with arguments (4 verbs × 3 strategies) and 12 with adjuncts (4 verbs × 3 strategies). The task also included 60 fillers, 20 of which were grammatical and 40 of which were not (in sum, 16 direct object RCs, 24 prepositional RCs, and 60 filler sentences, 100 sentences in total, see Supplementary Files, Instrumentation, A1).

Argument (22) and adjunct (23) RCs are illustrated below. The standard strategy presents the preposition; in the non-standard P-Chop the preposition is not pronounced.

(22) *O   filme (em)* **que** *a   aluna   pensou   é   interessante*
      DET.M.SG movie in   REL DET.F.SG student think-PST.3.SG be-PRS.3.SG interesting.
      'The movie about which the student thought is interesting.'

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[9] The participants in this study completed two SPR-AJTs, one designed to assess the participants' ratings of each relativization strategy, which is described in this section, and a second one, which was focused on the ratings given to RCs formed with constituents extracted from syntactic islands. The second SPR-AJT focused on the acceptability of movement constraints that are beyond the present paper.

(23)	*O*	*café*	*(em) que/ onde*		*a*	*rapariga*	*trabalha*
	DET.M.SG	coffee-shop	in	REL /REL-where	DET.F.SG	girl	work-PRS.3.SG
	tem		*muitos clientes.*				
	has-PRS.3.SG		many customers				

'The coffee-shop that the girl works in *it* has a lot of costumers.'

6.5 Procedure

The tasks involved in this study were performed in a single session of around 45–60 minutes. First, the participants completed the oral production task and then the SPR-AJT.

Before the Covid-19 epidemic, the tasks were administered to 47 participants in person. Every face-to-face meeting took place in a quiet setting. However, during the pandemic, the experiment had to be modified to accommodate the lockdown restrictions. The process remained the same, but Zoom sessions took the place of face-to-face meetings; the self-paced reading task was conducted on PsychoPy, but it was accessed remotely. 54 Chinese-speaking participants and one Portuguese-speaking participant had remote access to the author's computer. The reaction times were not taken into consideration since it was not possible to ensure that the remote access had not materially affected the results.

7 Results

7.1 Oral Production Task

Table 2 presents the global results of the oral production task.

		Arguments					Adjuncts				
		PiP	Loc.	P-Chop	Others	Total	PiP	Loc.	P-Chop	Others	Total
Native EP	n	54	2	53	11	**120**	42	58	7	13	**120**
(n = 30)	%	45%	2%	44%	9%	**100%**	35%	48%	6%	11%	**100%**
Adv. L2ers	n	103	2	33	6	**144**	81	34	21	8	**144**
(n = 36)	%	72%	1%	23%	4%	**100%**	56%	24%	15%	6%	**100%**
Int. L2ers	n	75	2	46	21	**144**	63	29	44	8	**144**
(n = 36)	%	52%	1%	32%	15%	**100%**	44%	20%	31%	6%	**100%**

Table 2: Strategies produced by the three groups in the relativization of arguments and adjuncts.

The sentences (24)–(27) illustrate each one of the strategies with arguments (a.) and adjuncts (b.):

[Pied-Piping]

(24) a. *Este*   *é*   *o*   *espetáculo* *em que* *a*   *cantora*
          DEM.M.SG be-PRS.3SG DET.M.SG show   in REL   DET.F.SG Singer
          participou.
          participate-PST.3SG

     b. *Este*   *é*   *o*   *aeroporto* *em que* *o*   *piloto* *trabalha*
          DEM.M.SG be-PRS.3SG DET.M.SG airport   in REL   DET.M.SG pilot work-PRS.3SG

[Locative][10]

(25) a. *Este*   *é*   *o*   *espetáculo* *onde* *a*   *cantora*
          DEM.M.SG. be-PRS.3SG DET.M.SG show   where DET.F.SG singer
          participou.
          participate-PST.3SG

     b. *Este*   *é*   *o*   *aeroporto* *onde* *o*   *piloto* *trabalha.*
          DEM.M.SG. be-PRS.3SG. DET.M.SG airport   where DET.M.SG pilot work-PRS.3SG

[P-Chopping]

(26) a. *Este*   *é*   *o*   *espetáculo* ∅ *que* *a*   *cantora*
          DEM.MSG be-PRS.3SG DET.M.SG show   REL DET.F.SG singer
          participou.
          participate-PST.3SG

     b. *Este*   *é*   *o*   *aeroporto* ∅ *que* *o*   *piloto* *trabalha.*
          DEM.F.SG be-PRS.3SG DET.M.SG airport   REL DET.M.SG pilot work-PRS.3SG

[Resumption]

(27) a. *Este*   *é*   *o*   *espetáculo* *que* *a*   *cantora*
          DEM.MSG be-PRS.3SG DET.M.SG show   REL DET.F.SG singer
          participou   *nele.*
          participate-PST.3SG in-it

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[10] The relativizer 'onde', which has a [+locative] feature, cannot be combined with different prepositions in a linear way. The combination '*em onde' ('in where') is ungrammatical because the preposition and the relativizer incorporate the same locative value. Additionally, native speakers exhibit inconsistency when combining 'onde' with other prepositions. For instance, they may omit the prepositions *a* 'to' and *de* 'from' when they are mandatory due to the lack of social prestige of the conflated forms *aonde* and *donde* (see Veloso 2013). Therefore, I argue that the omission of the preposition in relativization with 'onde' is not equivalent to other cases of P-Chop, as it seems to be motivated by social and historical factors. Instances of relativization with 'onde' have been classified as 'locative', regardless of the presence of the preposition.

b. *Este   é   o   aeroporto que o   piloto*
   DEM.F.SG be-PRS.3SG DET.M.SG airport   REL DET.M.SG pilot
   trabalha   nele.
   work-PRS.3SG at-it

Both in relativizing arguments and adjuncts, L2ers deviated from native EP by producing a wider variety of sentences, including grammatical and non-grammatical ones.[11] Notably, resumption was not produced by any participant, native or non-native.

PS, which has been identified as the most productive strategy in English (see, for example, Klein 1993 and Salles 1997), was produced residually with the two types of PPs (arguments or adjuncts). As stated in section 6.2., the non-native participants had prior exposure to or instruction in English. Although English may have facilitated the acquisition of *wh*-movement, it is not possible to draw any conclusions regarding the role of English in this process, given that the knowledge of English RCs was not controlled. Evidence of the influence of English would be the use of PS in the oral production task. Nevertheless, the study identified only a small number of sentences with PS, predominantly from the same participant and categorised as "others." This indicates that the influence of English on non-native production was relatively limited.

7.1.1 Arguments

Looking at the general data (**Table 2**), the first noteworthy aspect is that advanced L2 speakers, as opposed to native speakers, were more likely to use PiP (72% vs. 45%) showing lower rates of P-Chop (23%). A chi-square test of independence was performed using Jamovi (version 2.3) to evaluate the relationship between the strategies and the groups. The relationship between these variables was significant (χ^2 (6), N = 408, 26.6, p = <0.001, Cramer's V = 0.180). Native speakers used P-Chop (44%) and PiP (45%) as their preferred strategies to relativize arguments.[12] The three groups diverge significantly in their use of PiP to relativize arguments (χ^2 (2) = 8.858, p = <0.012, Cramer's V = 0.2), and also in the production of P-Chop (χ^2 (2) = 9.299, p = <0.010, Cramer's V = 0.27). The locative strategy was not manipulated as a dominant variable in an identical χ^2 test with arguments, because there was only one verb subcategorizing an argument admitting the locative strategy (*participar*, 'participate').

Table 3 shows the results of the oral production task considering the relativization of arguments by verb.

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[11] These include the use of possessive structures, adjectives, descriptive expressions in place of the RC, the deletion of the relativizer, and cleft constructions. All these sentences were grouped under "others".

[12] Another unexpected result was the absence of resumption in oral production data. However, this result is not discussed in this article. See Espírito Santo et al. (2024) for a detailed analysis of resumption.

Verb + Prep	Group	Strategy								Total	
		PiP		Loc.		P-Chop		Others			
		n	%	n	%	n	%	n	%	n	%
gostar de 'like (of)'	Native EP	10	33%	N/A		17	57%	3	10%	30	100%
	Adv.L2ers	30	83%			4	11%	2	6%	36	100%
	Int. L2ers	23	64%			7	19%	6	17%	36	100%
precisar de 'need (of)'	Natives	8	27%	N/A		19	63%	3	10%	30	100%
	Adv.L2ers	25	69%			9	25%	2	6%	36	100%
	Int. L2ers	23	64%			8	22%	5	14%	36	100%
pensar em 'think (about)'	Native EP	17	57%	N/A		12	40%	1	3%	30	100%
	Adv.L2ers	21	58%			13	36%	2	6%	36	100%
	Int. L2ers	13	36%			20	56%	3	8%	36	100%
participar em 'participate (in)'	Native EP	19	63%	2	7%	5	17%	4	13%	30	100%
	Adv.L2ers	27	75%	2	6%	7	19%	0	0%	36	100%
	Int. L2ers	16	44%	2	6%	11	31%	7	19%	36	100%

Table 3: Strategies produced by the three groups in the relativization of arguments (by verb).

The analysis by verb (**Table 3**) indicates that native speakers show a preference for P-Chop with the verbs selecting *de* (*gostar de* 'like' (of) and *precisar de* 'need' (of)), using more PiP with the verbs selecting *em* (*pensar em* 'think' (about)), especially with *participar em* 'participate' (in)). On the contrary, the learners have higher rates of P-Chop with *pensar em* 'think' than with the other verbs, showing that learners and the control group do not necessarily converge in the relativization strategies chosen for each combination of V + Prep.

7.1.2 Adjuncts

With adjuncts, a chi-square test of independence was conducted using Jamovi (version 2.3) to evaluate the relationship between the strategies and the groups. The relationship between these variables was significant (χ^2 (6), N = 408, 54.1, p = <0.001, Cramer's V = 0.258). The locative strategy was preferred by native speakers – a χ^2 test shows that the difference between groups in the production of locative with adjuncts is statistically relevant (χ^2 (2) = 20.287, p = <0.001, Cramer's V = 0.41). The differences in the production of P-Chop are also significant: intermediate speakers have higher rates of P-Chop, followed by advanced speakers and native speakers. A χ^2 test taking the P-Chop strategy as the dominant variable, and comparing its production in the three groups, indicates a significant difference (χ^2 (2) = 23.853, p = <0.001, Cramer's V = 0.58).

Advanced Chinese learners prefer PiP (56%), followed by the locative strategy (24%) and then P-Chop (15%). A χ^2 test shows that these differences are significant for advanced learners (χ^2 (3) = 84.389, p = <0.001). Native speakers alternate between PiP (35%) and the locative strategy (48%), and these differences are statistically relevant (χ^2 (3) = 58.200, p = <0.001). Intermediate Chinese participants are divided between PiP (44%), locative (20%), and P-Chop (31%), showing relevant differences (χ^2 (3) = 45.167, p = <0.001).

The results obtained in the relativization of adjuncts by verb are presented in **Table 4**.

Verb + Prep	Group	Strategy								Total	
		PiP		Loc.		P-Chop		Others			
		n	%	n	%	n	%	n	%	n	%
gritar de 'scream (of)'	Native EP	10	33%	16	53%	2	7%	2	7%	30	100%
	Adv. L2ers	28	78%	1	3%	5	14%	2	6%	36	100%
	Int. L2ers	20	56%	6	17%	7	19%	3	8%	36	100%
telefonar de 'call (from)'	Natives	9	30%	12	40%	1	3%	8	27%	30	100%
	Adv. L2ers	18	50%	7	19%	7	19%	4	11%	36	100%
	Int. L2ers	17	47%	2	6%	15	42%	2	6%	36	100%
trabalhar em 'work (at)'	Native EP	13	43%	13	43%	2	7%	2	7%	30	100%
	Adv. L2ers	15	42%	15	42%	5	14%	1	3%	36	100%
	Int. L2ers	12	33%	7	19%	15	42%	2	6%	36	100%
estudar em 'study (in)'	Native EP	10	33%	17	57%	2	7%	1	3%	30	100%
	Adv. L2ers	20	56%	11	31%	4	11%	1	3%	36	100%
	Int. L2ers	14	39%	14	39%	7	19%	1	3%	36	100%

Table 4: Strategies produced by the three groups in the relativization of adjuncts (by verb).

In the analysis of adjuncts, the first aspect to highlight is that, for native speakers, the use of the locative strategy does not depend on the preposition since they produce it with *em* and *de*. The two groups of learners show more expressive rates of the locative strategy with the verbs that precede the preposition *em,* perhaps indicating that they associate this preposition with a semantic locative feature. Finally, intermediate speakers stand out by showing higher percentages of P-Chop with all verbs. The preposition does not seem to be the factor motivating this choice, since they have equal rates of P-Chop with *telefonar de* 'call (from)' and *trabalhar em* 'work (at)' (42% in each case), and with *gritar de* 'scream (of)' and *estudar em* 'study (in)' (19% in each case).

7.1.3 Production of P-Chop in the relativization of arguments and adjuncts

The data described above seem to indicate that native and non-native speakers omit the preposition in different contexts. Our first hypothesis (see 6.1.) is that the omission of the preposition has a different nature for native and non-native speakers. To verify this conjecture, a logistic mixed-effects regression model[13] was fit, predicting the oral production of P-Chop against any other strategy, by group. A model with random intercepts for participant and item, as well as group and type, with the interaction, was included. Then, a model without that interaction was also fit. The model with the interaction had a significantly improved model fit as evidenced by the likelihood ratio test.[14] The results are shown in **Figure 2**.
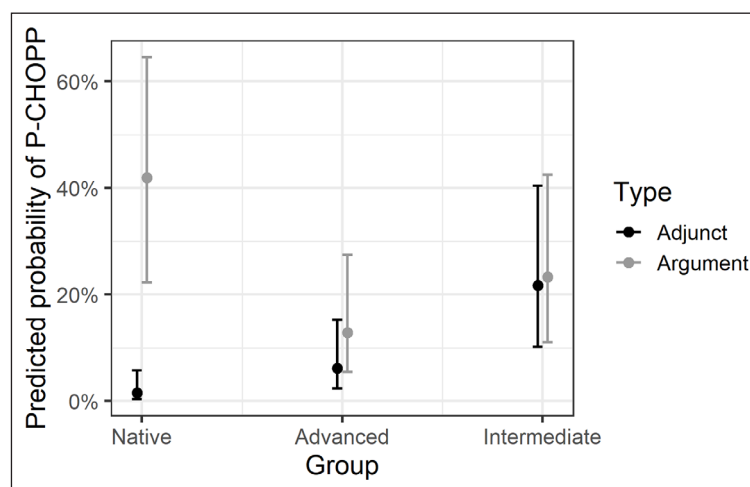
Figure 2: Predicted probability of P-Chop, by group.

The model confirms that, on the one hand, native speakers tend not to omit the preposition when an adjunct is relativized, diverging significantly from Intermediate L2ers in this respect ($p = 0.0004$). On the other hand, native EP speakers use P-Chop and PiP in the relativization of arguments, diverging significantly from Advanced L2ers ($p = 0.0181$), who choose mainly PiP in this context. The results from the native speakers' group confirm that P-Chop is significantly more productive with arguments ($p = 0.0001$) than with adjuncts. However, the difference between these types of sentences was not significant for advanced ($p = 0.1066$) nor for intermediate learners ($p = 0.8425$) (see Supplementary Files, Results, A3, Table 3).

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[13] See Supplementary Files Analysis, Oral_production_analysis.R and A6_GLMM_OPT.

[14] The random slope for Type by participant was abandoned because of a singular fit, but the results did not change significantly when the random slope was included.

7.2 Self-paced reading acceptability judgment task

In the SPR-AJT, the data were analyzed using a mixed-effect logistic regression fit using the *lme4* package in R (Bates et al. 2015; R Core Team 2021).[15] As the nature of the percentage rating data could not be analyzed as continuous data,[16] it was binarized to be either 0 or 1, with the cutoff being based on the distribution of the data. The models included random intercepts for participant and item, as well as random slopes for both Argument/Adjunct contrast and Strategy (PiP or Resumption), by participant.[17] A model containing these two predictors and language background was fit. As it was pertinent to our research questions whether or not the effects of each predictor would vary, based on the levels of other predictors, all potential interactions were tested. The contribution of these interactions was tested by comparing nested models with the likelihood ratio test. The final models reported here all provided significantly improved fits over reduced models. In keeping with recommended statistical practices, all experimental conditions were kept in all models regardless of their contribution to model fit.

Figures 3–5 display the mean acceptability rates (before binarization) given to RCs formed with PiP (**Figure 3**) and P-Chop (**Figure 4**) by the three groups of speakers, where 0 meant "very bad" and 1 meant "very good"; recall that participants could choose any intermediate point in the scale (see Supplementary Files, Results, A4). All participants gave higher ratings to RCs formed by PiP. In the overall results (that include arguments and adjuncts), P-Chop was rated at chance level by the three groups.
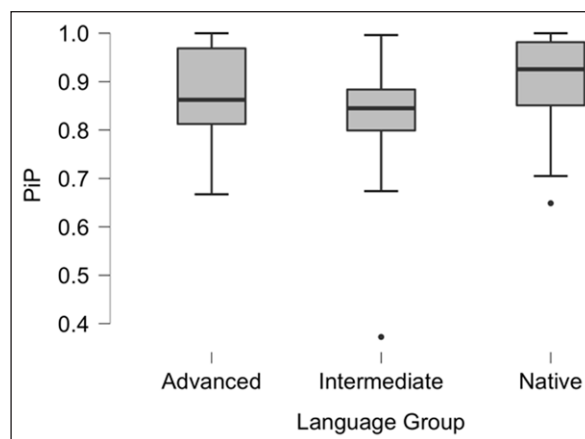

Figure 3: Mean SPR-AJT ratings for oblique RCs formed with PiP (0.4–1.0).

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[15] See Supplementary Files, A5_GLMM_AJT1.

[16] The data collected for this task could not be modelled as continuous nor as proportion data, as fitting a linear model leads to heteroskedastic patterns in the model residuals due to the bounded nature of the data. It also does not meet the requirement to be analysed as proportion data, as the ratings from participants are not a proportion of a binary outcome in a series of trials.

[17] The distribution of the data showed a minimum in the density distribution at 0.61. Anything equal to or below 0.61 was treated as 0, and anything above it was treated as 1.
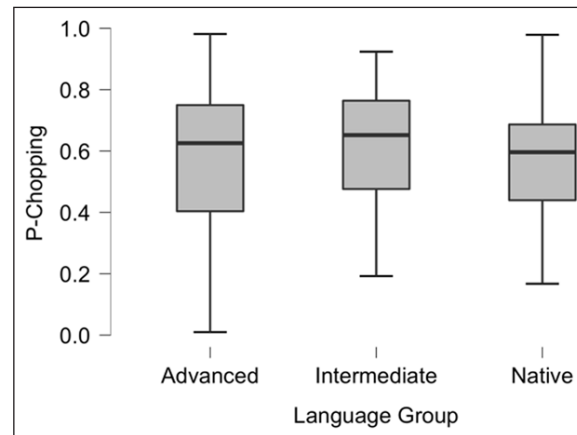
Figure 4: Mean SPR-AJT ratings for oblique RCs formed with P-Chop (0.0–1.0).
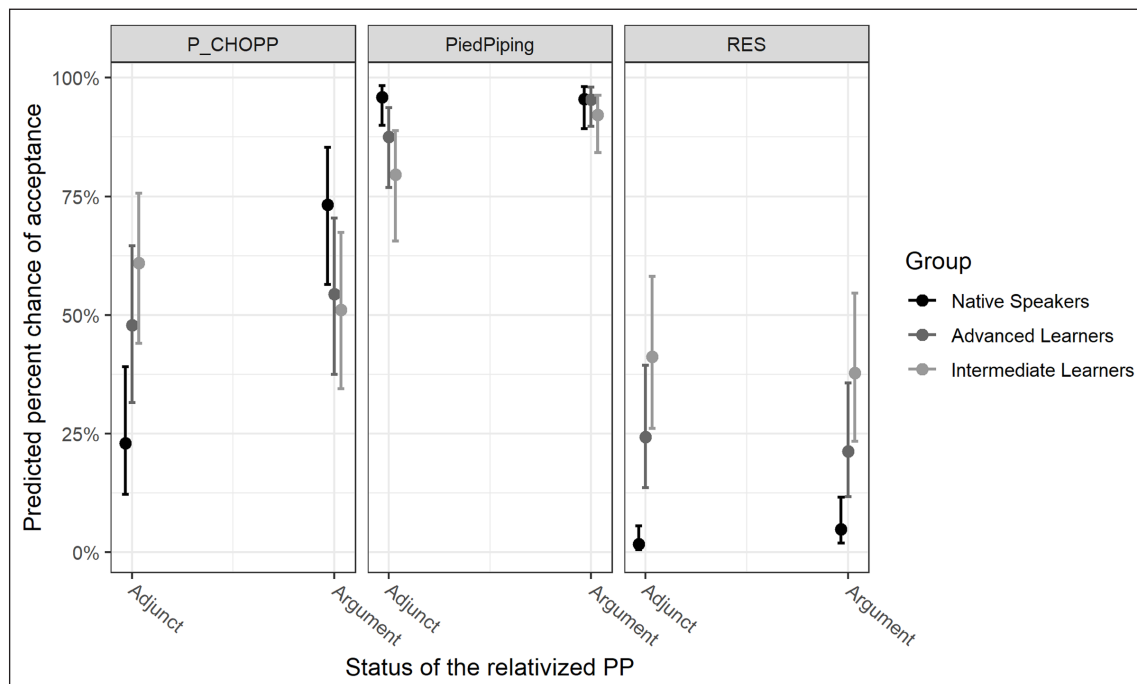

Figure 5: Predicted rates of acceptance of each strategy with arguments and adjuncts by group.

The full statistical model was the one adopted in this task. The reported model had an improved fit over the reduced model as evidenced by the likelihood ratio test χ^2 (4) = 27.193, p = 1.817e-05.[18] Following the application of the statistical model, **Figure 5** shows the projected likelihood of acceptance of each strategy by group while examining the distinctions between arguments and adjuncts.

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[18] See Supplementary Files (Analysis, AJT_analysis.R and Generalized Linear Mixed Models, A5).

This plot already gives us an idea that the status of the relativized PP is more relevant with P-Chop, especially for native speakers. Whether the relativized element is an adjunct or an argument does not seem relevant with PiP. Resumption is rejected more strongly by native speakers and advanced learners than by intermediate learners, regardless of the status of the relativized PP.

7.2.1 Between Groups differences[19]

After running the statistical model, the interaction between groups and relativization strategies reveals that the differences between native speakers and advanced learners are not relevant in the acceptance of PiP in the relativization of adjuncts ($p = 0.0697$) or arguments ($p = 0.9998$). Similarly, the two groups of learners do not diverge significantly in the acceptance of PiP with adjuncts ($p = 0.3776$) and arguments ($p = 0.5274$). Native speakers differ from intermediate learners in the acceptance of PiP with adjuncts ($p = 0.023$), but not with arguments ($p = 0.5518$) (see **Figure 5**, in section 7.2., and Tables 4 and 5, Supplementary Files, A3). The difference between intermediate learners and native EP in the acceptance of PiP with adjuncts indicates that intermediate learners' intuitions of the standard PiP strategy are not as robust as those of native speakers' and advanced learners'.

The interaction between groups and relativization strategies also indicates that native speakers diverge significantly from advanced L2ers ($p = 0.0304$) and intermediate L2ers ($p = 0.0005$) in the rating of P-Chop with adjuncts (see Supplementary Files, A3, Table 8). Native speakers and the two groups of L2ers do not diverge significantly in the acceptance rates of P-Chop with arguments (advanced, $p = 0.1363$; intermediate, ($p = 0.0676$) (see Supplementary Files, A3, Table 9). Intermediate and advanced learners do not differ significantly in the acceptance of P-Chop with adjuncts ($p = 0.3915$) (see Supplementary Files, A3, Table 8).

7.2.2 Within Groups Differences

The comparison of the 3 options in the context of the interactions predicts that, for native speakers, the difference between strategies (P-Chop vs. PiP; P-Chop vs. Resumption and PiP vs. Resumption) is statistically relevant within arguments and within adjuncts (all with $p = <0.001$) (see Supplementary Files, A3, Tables 10 and 11). Furthermore, the model shows that the differences in the acceptance of P-Chop with arguments vs. adjuncts for native speakers is statistically significant ($p = <0.001$), but this does not occur with the other strategies (see Supplementary Files, A3, Table 12).

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[19] All results provided are given on the log odds ratio (not the response) scale; P value adjustment: Tukey method for comparing a family of 3 estimates.

Advanced learners also distinguish the three relativization strategies. The difference of the predicted ratings assigned to PiP and P-Chop, and PiP and Resumption are statistically significant ($p < 0.0001$) with arguments and adjuncts. These results show that advanced learners recognize PiP as the standard strategy with confidence. The expected ratings given by advanced learners to P-Chop and Resumption are also statistically significant with arguments ($p = 0.0008$) and adjuncts ($p = 0.0247$) (see Supplementary Files, A3, Tables 13 and 14). Advanced learners do not differ significantly in the acceptance of P-Chop with arguments vs. adjuncts ($p = 0.5026$), nor in the acceptance of resumption with arguments vs. adjuncts ($p = 0.6828$), but the difference in the acceptance of PiP with arguments vs. adjuncts is significant ($p = 0.0262$) (see Supplementary Files, A3, Table 15).

Finally, intermediate speakers show a less stabilized grammar. The only relevant differences are between P-Chop and PiP with arguments ($p = <0.0001$), and PiP and Resumption with arguments ($p = <0.0001$) and adjuncts ($p = 0.0001$). The other contrasts are not statistically significant, showing that intermediate learners do not distinguish P-Chop from Resumption with arguments ($p = 0.3446$) nor with adjuncts ($p = 0.1010$). The differences between the standard strategy (PiP) and the non-standard P-Chop are also not relevant when adjuncts are relativized ($p = 0.0624$) (see Supplementary Files, A3, Tables 16 and 17). When the rates attributed to each strategy with arguments and adjuncts are compared, the data show that the acceptance of P-Chop with arguments vs. adjuncts is not statistically significant for intermediate learners ($p = 0.3031$). Intermediate learners do not rate resumption as significantly different with arguments and adjuncts either ($p = 0.7139$). Like advanced learners, the ratings attributed by intermediate learners to PiP with arguments and adjuncts differ statistically ($p = 0.0141$) (see Supplementary Files, A3, Tables 18).

8 Discussion

Although the outcome of P-Chop and Null-Prep is superficially the same – the absence of the preposition –, these two mechanisms seem to have a different nature: P-Chop is part of the grammar of native speakers, while Null-Prep is developmental for L2ers. The claim that P-Chop is grammatical seems radical since it is not described in prescriptive Portuguese grammars. However, different experimental studies (Antunes & Brito 2007; Espírito Santo 2020; Amorim 2022) and corpus-based research (Alexandre 2000; Santos 2014; Aßmann & Rinke 2017; a.o.), as well as the present work, have shown evidence that the P-Chop strategy exists in complementary distribution with the PiP strategy in the grammar of native speakers. Therefore, even though it is not sanctioned by prescriptive grammars or manuals, it can be said to be grammatical.

The regularities demonstrated by native speakers, who preferentially produce and accept P-Chop with arguments, confirm the findings of studies on EP (e.g. Santos 2014; Aßmann &

Rinke 2017; Espírito Santo 2020). This calls into question the claims made by Veloso (2013), who suggests that P-Chop is more commonly used with adjuncts (e.g. the relativization of temporal or locative PPs). However, native speakers do not accept the omission of the preposition with the same verbs if the sentence is declarative (i.e., not involving *wh*-movement) (Brito 1995; Espírito Santo 2020). So, there is no evidence of changes in the argument grid that would explain the omission of the preposition in relative clauses. The question is, if there are regularities, what is the reason underlying native P-Chop and in what contexts may it occur?

Following Kato (2010), we assume that the omission of the preposition in EP is determined by a set of formal and semantic features, occurring preferentially when the Prep is selected by the verb and assigns inherent Case (with arguments). According to Kato (2010) and Espírito Santo (2020), we believe that the theta roles connected to the relativized elements might also be playing an important part in determining the absence of the Prep. Indeed, native EP speakers seem to consistently accept the omission of the preposition with other verbs not tested in the present study that also select an object playing the theta role of theme, such as *lembrar-se de, recordar-se de* 'remember of', *esquecer-se de* 'forget about', *assistir a* 'watch to', *chamar a* 'call to', *falar de* 'talk about' (Espírito Santo 2020: 169–170).

However, native speakers judge as ungrammatical P-Chop RCs with verbs that combine with a locative or goal, such as *viver em* 'live in' or *chegar a* 'arrive to' (Espírito Santo 2020: 170). Possibly it is not a coincidence that native speakers did not produce P-Chop as frequently with *participar em* 'participate in' (see **Table 3**) as with the other 3 verbs that select for an argument, given that the complement of *participar* 'participate' may be interpreted as a locative (the word *espetáculo* 'show' may refer to the physical surroundings at the moment of the show, see earlier Figure 1 and Supplementary Files, Instrumentation, A2). In addition, unlike the verb *participar* 'participate', the verbs *gostar* 'like', *precisar* 'need', and *pensar* 'think' can take a complement clause without a preposition (e.g. *gosto que…*'I like that...', *preciso que* 'I need that...', 'I think that...'), which may lead to the omission of the preposition.[20]

In the relativization of adjuncts, native speakers alternated between the locative and PiP strategies. In other words, given that the adjuncts tested hold a [+] locative semantic feature, the locative strategy replaced P-Chop and is in complementary distribution with PiP. This strategy may explain the absence of P-Chop when the object of the relativization has a [+] locative semantic feature.

The present paper adopts Kato's proposal that an argument P-Chop RC involves an ICP that is not present in the Numeration. ICPs can only be absent when the argument is in an A' position. If an ICP occurs in an A position, the resulting sentence will not be acceptable, as shown previously, in sentence (12a). This explains why P-Chop occurs in RCs involving movement, and

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[20] I thank to one of the reviewers for pointing this out.

not in declarative clauses (Brito 1995; Espírito Santo 2020). However, we propose a different derivation. While Kato assumes that the DP complement moves to TopP inside CP, adopting a raising analysis (Bianchi 1999; 2000; de Vries 2002; Kayne 1994; Kenedy 2007; Kato & Nunes 2009), we follow Rinke & Aβmann's head external analysis for RCs in EP (Rinke & Aβmann 2017: 19 and following). Their proposal accounts for all RCs in EP and avoids some of the theoretical and empirical issues that the raising analysis poses in EP (see Rinke & Aβmann 2017, who provide a deeper discussion of this issue, which is out of the scope of the present paper). Since, according to Kato 2010, the preposition is not selected in the Numeration, I assume that the element introducing P-Chop RCs is the same as in subject/direct object relative clauses (a transitive determiner, following Rinke & Aβmann 2017) and that the derivation is equivalent. Accordingly, *que* is generated in the argument base position, holding an empty NP as its complement. The empty NP relates with the external head NP through coindexation. C^o holds an unvalued *u*Wh feature and probes for an *i*Wh value feature, targeting the DP_{REL}, which moves to Spec, CP. **Figure 6** illustrates the derivation starting from Stage 2, as Stage 1 consists of the Numeration, where the preposition is not selected.
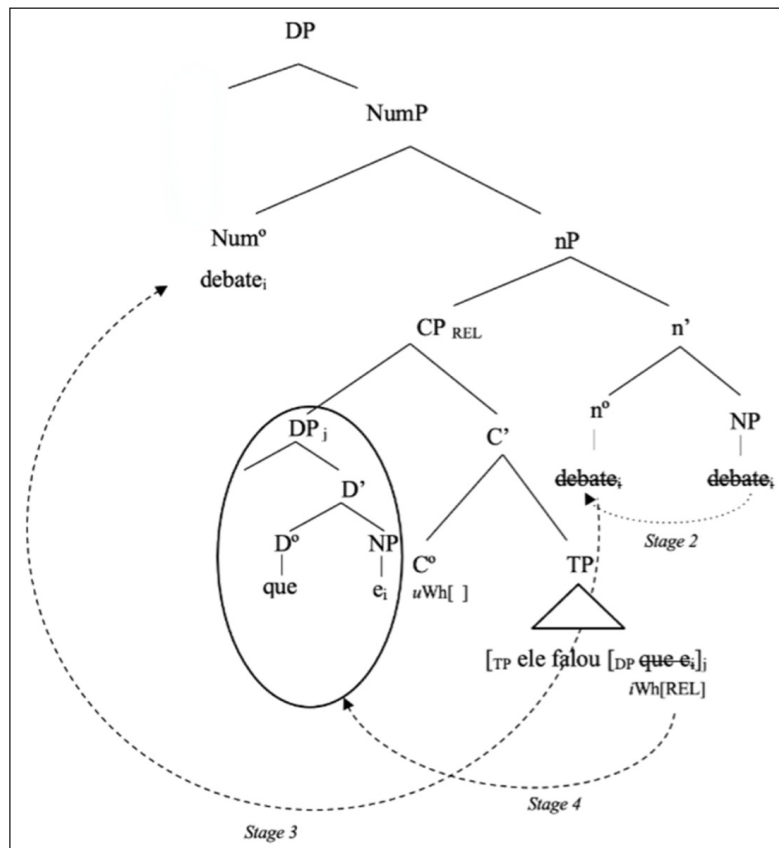

Figure 6: Proposed structure for P-Chop RCs.

The L2 data collected in our study do not point towards the same regularity. Intermediate learners omit/accept the omission of the preposition regardless of the status of the relativized PP (arguments/adjuncts) and regardless of the theta role at stake (theme or locative). Advanced learners produce and choose PiP in contexts where native speakers are divided between PiP and the omission of the preposition (with arguments playing the theta role of theme).

It seems that L2ers are not necessarily acquiring the Null-Prep mechanism from the native input, given that they produce it in different contexts (also in adjunct relativization). Indeed, the L2ers' results do not reflect the regularities of native P-Chop, which confirms our first hypothesis: native speakers show regularities that are not visible in L2 production, corroborating previous findings, namely, that the omission of the preposition is more likely to happen when an argument of the verb is relativized than when the preposition precedes an adjunct.

Our findings reveal a proficiency/formal learning effect: advanced learners prefer the standard PiP, differing from the behavior of native speakers, who alternate PiP and P-Chop with arguments/themes. Intermediate learners show instances of Null-Prep with arguments and adjuncts. A similar proficiency effect was found in Klein & Casco's (1999) data. Thus, our second hypothesis is partially confirmed: intermediate speakers exhibit a less stable grammar, with more evidence of developmental Null-Prep. However, advanced speakers are not closer to the target grammar, given that they do not exhibit the same regularities that native speakers do. This outcome is possibly an effect of explicit classroom learning, since advanced L2ers prefer the standard language target strategy.

So, why do Chinese L2ers of EP omit the prepositions with adjuncts? It is true that the lack of knowledge of the verb's selectional properties may provide an explanation for the omission of the preposition in the relativization of arguments (Perpiñán 2010; Perpiñán & Cardinaletti 2024), even more so under time-pressure. Nevertheless, as adjuncts are not selected by the verb, the lack of knowledge of the selectional characteristics of the verb does not explain the entire phenomenon.[21]

The lack of an asymmetry between arguments and adjuncts has been found in other studies on the L2 acquisition of RCs (Klein 1993; Jourdain 1996) and *wh*-questions (Klein & Casco 1999). In particular, Klein & Casco (1999) argue that L2ers are pied-piping a null resumptive which takes the form of a big PRO (Klein & Casco 1999: 357). Following the PRO theorem, PRO must be ungoverned (Chomsky 1981; Kayne 1991), and this rules out an overt preposition: "PRO may function as an empty operator, requiring null case which can be assigned by the null preposition". The null preposition is pied-piped with the null operator, in null operator movement. This analysis accounts for the occurrence of Null-Prep instances with adjuncts and

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[21] I am grateful to Ana Lúcia Santos for bringing this to my attention during the oral presentation of an earlier version of this paper.

explains the contrast with the data from native speakers. It also fits within the limits of UG, since L2ers drop the preposition when they are doing covert movement, as predicted by the PRO theorem. Nevertheless, contrary to what Klein & Casco (1999) and Klein (2001) claim for L2 English, this cannot be due to a bias against PS, given that PS practically does not exist in EP. We believe that this incomplete acquisition of *wh*-movement is a developmental stage that may be overcome with exposure to the language, as proficiency advances, as our results also indicate.

Finally, this study demonstrates that native and non-native representations of P-Chop structures are not entirely equivalent. The data indicate that while native grammars may exclude the preposition in the numeration for certain types of arguments, non-native speakers consistently include a null preposition in all P-Chop cases. This explains why non-native speakers overextend P-Chop to the relativization of adjuncts. As proposed by Klein and Casco (1999), this does not imply that L2 learners are not accessing Universal Grammar (UG). Instead, it appears to indicate that L2 learners are accessing UG to restructure their ILGs in a developmental path towards the acquisition of this structure.

9 Conclusion

To conclude, we have argued that the omission of the preposition in prepositional RCs is a grammatical phenomenon in EP that does not relate to changes in the argument grid of the verb. It depends on the type of PP that is being relativized (argument or adjunct) and on the thematic role of the relativized element (the preposition seems to be more easily omitted with themes than with locatives). These findings are in line with the studies of Baker (1988) and Kato (2010), according to which the omission of the preposition is less likely to occur with adjuncts. To draw a hierarchy of thematic roles for EP, more experimental data need to be collected, controlling the thematic roles of the relativized PPs.

In L2 acquisition, the omission of the preposition seems to occur more randomly, and it is not determined by the same factors as in native grammars. Possibly the L2ers pied-pipe a covert operator and, following UG constraints, move a null preposition along with it. This explanation is supported by the high rates of overt PiP that L2ers produce, in comparison to native speakers. This explanation also accounts for the lack of contrast between arguments and adjuncts, showing, at the same time, that the L2 grammar is constrained by UG, even at developmental stages.

Abbreviations

1	First person
2	Second person
3	Third person
BP	Brazilian Portuguese
CEFR	Common European framework of reference for languages
CL	Classifier
DEM	Demonstrative
DET	Determiner
EP	European Portuguese
F	Feminine
GJT	Grammaticality judgment task
ICP	Inherent case marking prepositions
ILG	Interlanguage grammar
INDF	Indefinite
L1	First language
L2	Second language
LD	Left dislocation
M	Masculine
MC	Mandarin chinese
Null-Prep	Null-preposition
P-Chop	Preposition-Chopping
PFL	Portuguese as a foreign language
PI	Preposition incorporation
PiP	Pied-piping
PL	Plural
Prep	Preposition
PS	Preposition stranding
PRS	Present
PST	Past
RCs	Relative clauses

REL	Relativizer
RQ	Research question
SG	Singular
SPR-AJT	Self-paced reading acceptability judgment task
UG	Universal grammar
V + Prep	Verb + preposition

Data availability

https://osf.io/v3ng4/?view_only=45458ba612f84509a4847faf5e8afc95.

Ethics and consent

The study was approved by the Ethics Committee of the School of Arts and Humanities of Lisbon University.

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Competing interests

The author has no competing interests to declare.

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