Are heritage speakers one step ahead in ongoing processes of diachronic change?

Comparing heritage speakers with speakers of two varieties of Portuguese in their comprehension of null object constructions

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This study investigates whether heritage speakers of European Portuguese (EP) show a diachronically advanced behaviour in their comprehension of null object constructions. Based on a comprehension experiment, we compared heritage speakers to homeland speakers of EP, on the one hand and homeland speakers of Brazilian Portuguese (BP) on the other, the latter representing a variety in which null objects have diachronically spread. Our results confirm significant differences between EP homeland speakers and the two other groups but not between heritage speakers and BP homeland speakers, indicating an acceleration of diachronic change in the heritage speaker group. In addition, our study confirms that null objects in islands are available to homeland speakers of EP, challenging earlier analyses of null objects in this variety.

Keywords: heritage speakers, diachronic change, Portuguese, null objects, comprehension

1. Introduction

Heritage speakers (HS) are bilingual speakers who acquired their heritage language as their first native language (L1) within the family context and a second, environmental language as their second L1 or early L2 in early childhood (see definitions in Rinke & Flores, 2014; Rothmann, 2009; Valdés, 2001). Studies on

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adult HS show that they may differ in some linguistic respects from monolingually raised speakers within the country of origin of their families (homeland speakers; Montrul, 2008; Polinsky, 2018). HS vary individually from those who are indistinguishable from homeland speakers to those who show high degrees of variation and divergence. This individual variation is attributed to different factors, including the amount and type of input they received in their heritage language over time (see Daskalaki et al., 2019; Flores et al., 2017; Sopata et al., 2023; Torregrossa et al., 2023). Current use of the heritage language in their daily life (see Chondrogianni & Daskalaki, 2023), their motivation to speak the language, and their attitude towards the heritage language (Cuartero Marco, 2024) and language attrition (Flores & Snape, 2025) may also play a role. The importance of individual factors and individual variation among HS have sometimes masked another important observation, namely that divergence from homeland speakers and variation found in the linguistic outcome of HS typically follows specific patterns, which generalize across individual variation and across the specific linguistic properties of the languages involved.

One example of a general tendency observed in null subject languages as heritage languages is the often-reported overuse of subject pronouns (see Kaltsa et al., 2015; Keating et al., 2011; Montrul, 2004; Paradis & Navarro, 2003; Serratrice et al., 2004; Sorace et al., 2009, among many others). Laleko and Polinsky (2017) account for this observed overuse of overt pronouns by referring to the 'Silent Problem', which reflects a "difficulty in producing and interpreting linguistic segments that contain null, unpronounced elements" (Polinsky & Scontras, 2020, p. 15, see also Polinsky, 2018). According to the authors, the 'Silent Problem' can lead to an overrealization of pronouns in spontaneous speech to avoid silence. HS may also reanalyse the interpretative possibilities of null and overt subjects, leading, for example, to higher rates of topic continuity interpretations with overt subject pronouns, even in bilingual speakers who speak two null subject languages (de Prada Pérez, 2009; Rinke & Flores, 2018; Sorace et al., 2009).

Interestingly, the opposite effect has been observed with respect to null *objects*: bilingual HS of European Portuguese (EP) tend to overuse null objects (Rinke et al., 2018; Rinke et al., 2019). Based on a corpus study, Rinke et al. (2018) argue that the overuse of null objects follows a diachronic development that has previously been described for Brazilian Portuguese (BP) — a variety of Portuguese which is less restrictive and shows a more frequent use of null objects.

A diachronically advanced behaviour was also observed by Rinke and Flores (2014) with respect to EP heritage speakers' knowledge of clitics. The authors claim that the linguistic knowledge of the heritage bilinguals investigated in their study is "innovative, because it promotes linguistic changes which are inherent

in the speech of native monolinguals" (Rinke & Flores, 2014, p. 681). This means that particularities in the grammars of HS may reflect accelerated and extended diachronic changes also found in the homeland varieties (see also Flores & Rinke, 2021; Kupisch & Polinsky, 2021). One explanation for this is HS' reliance on colloquial input sources. In addition, quantitatively reduced input may also impact language development in heritage languages in ways also observed in processes of diachronic change. For example, heritage languages may reflect processes of grammaticalization (Rinke & Flores, 2021; see Kupisch & Polinsky, 2021 for an illustration based on the grammaticalization of articles in heritage languages).

In this paper, we investigate whether the increase of null objects in HS' production found in earlier studies is reflected in their comprehension. In particular, we ask whether HS of EP are comparable to speakers of the diachronically more advanced variety of BP in their comprehension of null objects.

2. Null objects in EP and BP: A diachronic tale

EP and BP are null object languages, which allow for the occurrence of a definite direct null object. For example, speaking about a certain book and the attempts to find it, a speaker may utter the following sentence including a null object (Example 1, see Kato & Raposo, 2001, p. 673).

(1) Eu só encontrei ____ na FNAC.
I only found ____ in.the FNAC
'I only found it at FNAC.'

It is uncontroversial that both varieties of Portuguese license null objects in main clauses like (1), when the object referent is given in the context. However, the two varieties also differ in some respects. The first difference consists in the frequency of using a null object. Concerning written language, Kato and Raposo (2001) find an abundant use of null objects in the original BP version of Paulo Coelho's *O Alquimista* ('The Alchemist'). In the EP translation, however, all null objects have been translated as clitics. Cyrino (2001) compares newspaper articles from Brazil and Portugal and comes to a similar conclusion: while in the Brazilian texts 76% of all objects occur as null objects, there are only 3% of null objects in the EP texts. For spoken language, the numbers are slightly different, but the contrast between BP and EP holds as well: As shown by Sainzmaza-Lecanda and Schwenter (2017, p. 100), null objects are much more frequently realized in spoken BP (72.5% of 3rd person anaphoric direct object variants) than in spoken EP (40.6%).

According to Cyrino (1993), the more frequent use of null objects in BP is the result of diachronic development. Starting with 14.2% of null objects in texts of the

XVIIth century, the proportion of null objects in all direct objects increased up to 81.1% in the second half of the 20th century. The author attributes this change to the loss of 3rd person clitics in BP, which have been replaced in the spoken language by either strong pronouns or null objects (see also Tarallo, 1983; Kato et al. 2006).

The second difference between EP and BP regarding null objects is more controversial, and it concerns the occurrence of null objects in syntactic islands. According to Raposo (1986), EP null objects are variables bound by an A'-topic operator (2a.), and cannot occur in syntactic islands like (2b.), because of a locality restriction: the trace in the canonical object position (*ec*) cannot be properly syntactically bound.

(2) a. $[_{Top}\ e_i]\ [_{S'}\ OP_j\ [_S$ a Joana viu ec_j na TV ontem]]
the Jane saw in.the TV yesterday
'Jane saw it/him/them on TV yesterday.' (Raposo, 1986, p. 379)

b. *O rapaz [que trouxe ec_i mesmo agora da pastelaria] era o teu
the boy that brought right now from.the pastry.shop was the your
afilhado.
godson
(Raposo, 1986, p. 382)
Intended meaning:
'The boy who brought it right now from the pastry shop was your godson.'

Farrell (1990) shows that BP licenses null objects in island constructions (3). According to Cyrino (1993), null objects in islands are attested in BP from the XIX century onwards.

(3) Aquela casa nunca foi pintada pelo cara que ec_1 comprou ec_2 de mim.
that house never was painted by.the guy hat bought from me
'That house$_i$ was never painted by the guy$_j$ that ec$_j$ bought ec$_i$ from me.' [1]
(Farrell, 1990, p. 333)

In later work, Raposo admits that his original acceptability judgments were too strict and that some of the sentences showing null objects in islands might be acceptable in EP (see Raposo, 2004). The corpus study by Rinke et al. (2018) reports some cases of null objects in clefts and in adverbial adjunct clauses like (4), confirming that speakers of EP do produce null objects in island constructions to some extent.[2]

1. We adopt the example in its original form from Farrell (1990). 'ec_1' refers to the subject, 'ec_2' to the object.

2. That (4) is indeed an island is illustrated by the impossibility of wh-extraction out of it (see Rinke et al., 2018, p. 18).

(4) Porque isto era uma freguesia muito rural. Desde que eu comecei a
because this was a village very rural since that I started to
conhecer Ø, apenas havia uma tasca na freguesia.
know only had.there one tavern in.the village
'Because this was a very rural village. Ever since I first got to know it, there has only been one tavern in the village.'
(Ø = a freguesia /'the village') (Rinke et al., 2018, p. 18)

Admittedly, null objects occurred quite rarely in island constructions in the corpus data: out of 208 occurrences of null objects in the monolingual sub-corpus, only 14 (6.7%) appeared in island contexts, 5 in the older and 8 in the younger generation of monolingual speakers. Based on these results, it is unclear whether the occurrence of null objects in island contexts represents a (diachronic and grammatical) difference between BP and EP or whether islands are a grammatical option in EP as well. To address this issue, the current study included null objects in island contexts and compared them with null objects in main clause contexts.

In addition to grammatical constraints, the use of null objects also relates to pragmatic factors (e.g., accessibility, Ariel, 1990) and referential features (e.g., animacy, Rinke, 2025). Concretely, null objects refer to highly accessible antecedents in the context (Kerezova, 2024) and show a tendency to refer to inanimate referents. We will not go into further details here as our study will not focus on these aspects.

Because the heritage speakers in this study grew up and live in Germany, it is important to distinguish the null object phenomenon from German topic drop, referring to the omission of a subject or object topic in the sentence initial position (see Example (5) from Bayer et al., 2001, p. 490).

(5) a. Ich hab' ihn schon gesehen.
I have him already seen
'I saw him already'
b. [] hab' ihn schon gesehen []=NOM
have him already seen
c. [] hab' ich schon gesehen []=ACC
have I already seen

German topic-drop contrasts with the null object structure in Portuguese in several ways: null objects are not restricted to the sentence-initial position (see

*[O que]$_i$ é que desde que eu comecei a conhecer ø$_i$, apenas havia uma tasca na
the what is.it that since that I started to know, only there.was one tavern in.the
freguesia?
village

Examples (1) and (2)). In Portuguese, subject and object may be omitted simultaneously, but not in German. Most of the examples used to illustrate the null object property (including the stimuli used in the experimental task) are ungrammatical in German.

To summarize this section: Both EP and BP allow for null objects. But as a result of diachronic development, BP speakers use null objects more frequently than EP speakers. It has also been argued that BP and EP speakers differ with respect to the licensing of null objects in islands. This difference is more controversial as null objects in islands have been attested in corpus data of colloquial EP as well.

3. Null objects in EP as heritage language: Previous findings

Rinke et al. (2019) compare the production of objects in six- to ten-year old children acquiring EP and Polish as heritage languages in Germany. Both target languages — unlike German — display null object constructions. The results of an elicited production task demonstrate that children overuse null objects in their heritage languages, although they also show, at the same time, a certain sensitivity to pragmatic and referential features.

A corpus investigation by Flores et al. (2017) focusing on object realization in adult HS of EP living in Germany confirms the tendency of HS to use high amounts of null objects. The study compares first- to second-generation speakers (HS to their parents' generation) and age-matched (younger and older) monolinguals, showing that HS produce higher amounts of null objects than first-generation migrant speakers and (older) monolingual speakers. However, younger monolinguals also show higher rates of null objects than older monolinguals, although they do not fully reach the number of null objects produced by HS. If we take the comparison between the younger and the older monolingual generations to reflect *change in apparent time* (Labov, 1963, 1994, p. 43ff.), it seems that there is a development towards an increase of null objects in the homeland variety and — in a more pronounced way — in EP as heritage language.

The assumption that the extended use of null objects in HS reflects diachronic development is discussed in Rinke et al. (2018). A closer inspection of the higher production of null objects in adult EP HS living in Germany revealed that they also produced significantly more *animate* null objects than the other speaker groups. The authors interpret the higher rate of animate null objects in the bilingual group as reflecting an extension of null objects to more referential antecedents. Following a proposal by Cyrino et al. (2000), this development is interpreted in terms of a universal diachronic advancement in the extension

of null elements along a referential scale from [–referential] (=propositional, nonspecific, inanimate, 3rd person) to [+referential] (=animate, specific, human, 1st and 2nd person) entities. Although Brazilian Portuguese does not generally license specific animate null objects, the diachronic development of null objects in BP follows the mentioned universal referential scale.

To date, there is no study investigating the comprehension of null objects by HS of EP. Focussing on monolingual children of EP, Costa and Lobo (2009) conducted a truth value judgment task using verbs that allowed transitive or intransitive interpretations (e.g., *mergulhar*, 'submerge oneself/something'). In main clauses in which the verbs appeared without a clitic, adult EP speakers preferred a transitive interpretation, but in island contexts they opted for an intransitive reading (92% vs. 8% acceptance of transitive interpretations). Children aged between 3;2 and 5;10, however, accepted a transitive interpretation also in islands (80% transitive interpretations in main and 70% in island clauses), showing that they had not yet acquired a restriction on null objects in island contexts. If the behaviour of younger children at earlier stages of acquisition is taken as a potential outcome of heritage language development (as argued in Rinke & Flores, 2018; see also Rinke et al., 2019), then adult HS may show the same behaviour in island constructions as the children in Costa and Lobo's (2009) study (but see the discussion in Section 2 concerning the occurrence of null objects in island constructions in the homeland variety). The next section presents a study testing the comprehension of null objects in adult heritage speakers, focusing on the acceptance of null object interpretations in main clauses and island constructions.

4. The present study

4.1 Research questions

In the present study, we investigate the comprehension of null objects in Portuguese, comparing EP and BP homeland speakers to HS of EP living in Germany. Summing up the discussion in Sections 2 and 3, we base our study on the following assumptions. As a result of diachronic development, the homeland variety of BP differs from EP in two respects: BP homeland speakers use null objects more frequently and license them in island constructions. By contrast, EP homeland speakers use quantitatively fewer null objects and only marginally produce null objects in islands. HS use overall more null objects than homeland speakers, which has been interpreted as showing a diachronic advancement.

Our study focuses on the comprehension of null object constructions. Specifically, we present participants with sentences featuring gaps (null objects) and

investigate whether they interpret those gaps as null objects, thus providing a transitive interpretation. We compare three groups of speakers: EP homeland speakers, BP homeland speakers, and HS of EP. We address the following research questions:

1. Do HS of EP differ from EP homeland speakers in their interpretation of null objects? If so, do HS pattern similarly to BP homeland speakers?
   If HS show a diachronically advanced behaviour, we expect them to differ from EP homeland speakers and to pattern with BP homeland speakers.
2. Concerning the licensing of null objects in islands in EP:
   Do homeland speakers of EP accept null objects to the same extent in main clauses and island constructions? Do we find differences between the groups depending on clause type?
   We expect that BP homeland speakers will accept null objects in main and island constructions. Whether EP homeland and HS show the same behaviour is an open question.

4.2 Participants

We tested 122 participants belonging to three speaker groups: 41 homeland speakers of EP (age range = 19–54 years, $M = 22$, $SD = 5.6$), 41 homeland speakers of BP (age range 21–61, $M = 35.7$, $SD = 9.4$) and 40 HS of EP living in Germany (age range 18–37, $M = 25.8$, $SD = 5$). The study complied with the guidelines of the Helsinki Declaration of 1975, as revised in 2024, and it was approved by the Ethics Committee of the German Linguistic Society (DGfS ethics vote #2021–01–210315).

To make sure that speakers met our selection criteria, we used a detailed background questionnaire. The questionnaire differed between the homeland and heritage groups. We asked homeland speakers for their place of birth and additional languages acquired before school age. Additionally, homeland speakers provided self-assessed proficiency in any additional language acquired before school age. If they were born outside of Portugal and reported being bilingual, having high knowledge of the other language, they were excluded. Three EP homeland speakers were born outside of Portugal but were raised monolingually. Four EP homeland speakers had been in contact with an additional language. However, three of them assessed their knowledge in their additional language low or intermediate. Therefore, they were not excluded from the study. We excluded one participant who reported being bilingual and having high language knowledge in another language. We also excluded one participant from the EP heritage group who reported having dyslexia. All BP homeland speakers were born in Brazil. Three reported being bilingual but assessed their language knowledge in the sec-

ond language as low. Similarly to the three EP cases, they were not excluded from the dataset.

Of the 39 heritage participants, 36 reported being born in Germany and 3 in northern Portugal (Table 1). The three participants born in Portugal arrived in Germany at the age of 2, 3 and 4 years. 31 HS participants visited a heritage language class at some point in their life. The mean attendance duration of Portuguese class was 9 years ($SD = 2.3$). 22 participants reported German as their dominant language, 14 reported being balanced bilinguals and 2 reported Portuguese as their dominant language. The mean self-assessed proficiency was at 3.5 ($SD = 0.6$) on a 0 to 5 scale. We did not include a proficiency measure in addition to the self-rating, as we relied on previous research showing a strong correlation between self-rated proficiency and other proficiency measures (see Flores et al., 2022, and references therein). Proficiency was not included in our statistical analysis as our heritage group was relatively homogeneous, as indicated by the relatively low standard deviation.

Table 1. Language profiles of HS

Factors on Bilingualism	European Heritage Speakers
Country of birth	3 (7.7%) Portugal
	36 (92.3%) Germany
Age of arrival in Germany (in years)	1 (2.6%) 2 years
	1 (2.6%) 3 years
	1 (2.6%) 4 years
Portuguese heritage language class	31 (79.5%) yes
	8 (20.5%) no
Years of Portuguese heritage language class	9 (2.3)
	1 ≤ 10 ≤ 12
Self-assessed dominance	2 (5.1%) Portuguese
	22 (56.4%) German
	14 (35.9%) balanced
	1 (2.6%) no answer
Self-rated proficiency in Portuguese	3.5 (0.6)
	2 ≤ 4 ≤ 5

Note. In 'Country of birth', 'Portuguese heritage language class' and 'Self-assessed dominance rows', numbers represent the frequency and the percentage of the total amount of heritage speakers included in this study. In the row 'Age of arrival in Germany', numbers represent the frequency and percentage of the total amount of heritage speakers included in this study and their age of arrival in years. In the row 'Years of Portuguese heritage language class', numbers represent the mean number of years of Portuguese language education (and their standard deviation) and the minimum, median and maximum number of years. In the row 'Self-rated proficiency in Portuguese', numbers represent the mean ratings on a scale from 0 to 5 (and their standard deviation) and the minimum, median and maximum number of that rating.

4.3 Materials

The experimental items included verbs that could either be interpreted as transitive or intransitive, following a methodology similar to Costa and Lobo (2009). For example, the verb *subir* can either mean 'to lift something' (transitive) or 'to go upstairs' (intransitive).

The target sentence included either an overt clitic pronoun or a gap (null pronoun) occurring either in a main or an island clause. This resulted in a 2×2 design that yielded 4 experimental conditions: overt main, null main, overt island, null island. These conditions were realized in 6 items per condition (including the six verbs mentioned in the next paragraph), leading to 24 experimental items. Note that this number of items might seem low given recent calls that suggest increasing the number of items in order to maximize experimental power (Brysbaert & Stevens, 2018). However, 24 was the maximum number of items that we were able to construct given the specific requirements of our materials, i.e., they needed to have verbs that allowed for both a transitive and intransitive reading, and they also needed to elicit these readings in both EP and BP. Furthermore, given the nature of the covered box task, the dependent variable was less variable than in a reaction time paradigm — i.e., participants could either choose the shown or the covered image, meaning that there were only two response outcomes. We expected this to increase power by reducing between-trial variability. Finally, the number of items in our task was on the upper end compared to previous covered box tasks, which typically use 6–18 items (Feng, 2022; Huang et al., 2013; Romoli & Schwarz, 2015; Zehr et al., 2016).

In the "overt" conditions, the verb was followed by a clitic. This configuration should support a transitive interpretation (e.g., *subir+cl* = 'to lift something', see Example (6a.). By contrast, in the "null pronoun" conditions, both an intransitive and a transitive interpretation were possible (e.g., *subir* __ = 'to go upstairs' or 'to lift something', see Example (6b.). We applied this methodology in order to make sure that the stimuli in the null conditions were still grammatical even if a transitive interpretation was not available. We used the following six verbs: *subir* ('to go upstairs' / 'to lift something'), *descer* ('to go downstairs' / 'to lower something'), *parar* ('to stop' / 'to stop something'), *virar* ('to turn around' / 'to turn around something'), *aquecer* ('to warm up' / 'to heat something'), *arrefecer* ('to cool down' / 'to cool something').

The target sentences were preceded by a context that set up a situation that could allow for both a transitive and an intransitive reading of the target sentence. For example, the context in Example (6) sets up a situation in which it is plausible that the subject (*Carlos*) either moves upstairs to the gatekeeper (intransitive reading) or lifts the parking lot barrier (transitive reading). The context sentences

were followed by a question asking what the subject did (i.e., 'What did Carlos do?')

(6) **Example of an experimental item (European Portuguese)**
Context:
O Carlos chegou ao parque de estacionamento. O porteiro estava em cima no primeiro andar. A barreira do parque de estacionamento estava fechada.
'Carlos arrived at the parking lot. The gatekeeper was upstairs on the first floor. The parking lot barrier was closed.'
Question:
Então, o que é que o Carlos fez?
'So, what did Carlos do?'
Target sentence:
Condition main, overt
a. Saiu do carro e [subiu-a] rapidamente.
left of.the car and lifted it$_{CL}$ quickly
'He left the car and lifted it quickly.'
Condition main, null
b. Saiu do carro e [subiu ø] rapidamente.
left of.the car and lifted it$_{null}$/went upstairs quickly
'He left the car and lifted it/went upstairs quickly.'
Condition island, overt
c. Ligou ao porteiro, enquanto [a subia] rapidamente.
called to.the gatekeeper while it$_{CL}$ lifted quickly
'He called the gatekeeper, while he lifted it quickly.'
Condition island, null
d. Ligou ao porteiro, enquanto [ø subia] rapidamente.
called to.the gatekeeper, while it$_{null}$ lifted/went upstairs quickly
'He called the gatekeeper, while he lifted it/went upstairs quickly.'

In Example (6a.), the target verb *subir* occurs in a main clause and is followed by a clitic (*subiu-a*) allowing for a transitive reading only, meaning 'he lifted it'. In (6b.), the verb also occurs in a main clause and is followed by a gap. If the gap is understood as a null object, the transitive reading follows. If a null object is not available for the speaker, an intransitive reading as 'he went upstairs' would follow. The same holds true for the two island conditions (6c.–d.): *a subia* (6c.) only allows for the transitive reading whereas *subia* __ (6d.) can in principle be read either transitively or intransitively.

We used an EP version (with stimuli recorded by a native speaker of EP) for EP homeland and HS. For BP homeland speakers, we used a BP version (with stimuli recorded by a native speaker of BP). The BP version differed from the EP version in the lexical choice of the verbs *esfriar* ('to cool down' / 'to cool some-

thing' instead of *arrefecer*), the use of full 3rd person strong pronouns instead of clitics and the overt realization of the subject in the target sentences instead of a null subject. Some smaller changes included the occasional use of the Brazilian gerund form and some changes in the order of sentences in some of the contexts (see Supplemental Materials 1–4 for a complete list of the items).

The test included 36 filler items and 12 items from a separate experiment. The fillers featured transitive verbs with full noun phrase objects (e.g., *desligou a luz* 'he turned off the light').

4.4 Procedure

We used a covered box task (Huang et al., 2013), a special form of a picture selection task in which participants see one picture displaying an action and a black or covered picture. In the experimental conditions, the visible picture always showed a transitive action in order to test the availability of a transitive interpretation of the conditions, including a gap (thus avoiding that participants always chose the intransitive picture, since this interpretation is available for all three groups). We intended with this design to make the transitive interpretation of the ambiguous verbs more likely, because participants had to actively reject a null object interpretation.

12 of the 36 fillers were accompanied by images depicting the transitive action ("matching fillers", 33.34% choice of the shown picture) and 24 fillers by images depicting intransitive actions ("mismatching fillers", 66.67% choice of the covered picture). This was done to counterbalance the experimental items, since 12 experimental conditions featured overt pronouns, which were also consistent with the transitive images (shown picture). The remaining 12 items from a separate experiment had an expected 1–1 shown-to-covered image response ratio.

Participants were tested individually either in a classroom or at home in a silent environment in the presence of an experimenter. EP homeland speakers were recruited and tested at the University of Minho, HS were recruited and tested in their homes, and BP homeland speakers were recruited using social media and tested online. They used a computer or laptop screen. In the first step, participants completed the linguistic background questionnaire. Afterwards, they received instructions on how a trial worked, what their task was and completed 4 practice trials.

Each trial started with a context image, which was displayed while the participant was listening to the context sentences and the context question (see Figure 1). Afterwards, participants heard the recording of the target sentence. While listening, participants also saw the target sentence printed on the screen. After hearing the target sentence, participants saw two images: a black (covered) image

with a question mark and a picture representing an action. The participants were instructed to select the uncovered image if the sentence matched the action represented in the picture. In case the uncovered image did not represent the described situation, they had to select the covered picture. They were asked to click on 'F' on the keyboard if they wanted to select the picture on the left side of the screen or 'J' to select the picture on the right side of the screen. The sides on which the covered picture and the picture displaying the transitive action appeared were randomized. BP participants were tested online using PCIbex (Zehr & Schwarz, 2018).



Figure 1. Example of an experimental display

The experimental items were presented in four lists following a Latin-square design so that each participant saw only one of the experimental target sentences of condition 1–4 with each verb.

The position of the images was counterbalanced such that half of the time the uncovered image appeared on the right and half of the time on the left. Each trial

timed out after 10 seconds, and participants were asked to choose an image following their intuition. Except for the practice trials and the first item (which was set to be a filler item), all items appeared in randomized order. An experimental session lasted about 30 minutes.

4.5 Analysis

Raw data was preprocessed manually to correct for typos and to translate demographic responses from Portuguese to English. The preprocessed data were exported to R for analysis (version 4.5.1; R Core Team, 2025). Participants' responses were analyzed with generalized mixed-effects logistic regression models using the lmerTest package (Kuznetsova et al., 2017). Trials exceeding 10,000 ms were excluded from the analysis, because pilot testing showed that the majority of responses were below this number. Data loss affected 1.04% in the homeland European, 0.75% in the European heritage, and 0.89% in the homeland Brazilian group.[3]

The responses from the covered box task were analyzed with mixed effects binomial (logistic) regression (Jaeger, 2008). To address our research questions, we ran a model that directly compared the three groups. The model included picture choice as the binary dependent variable. Responses were coded as 1 if the image depicting a transitive action was chosen, and as 0 if the covered image was chosen. Group (European homeland / Heritage / Brazilian homeland), Pronoun type (null / overt), and Clause type (main / island), as well as their interaction, were included as predictors. The variable Clause type was treatment coded (0 island / 1 main), such that the intercept represented the mean across island clauses. The variable Pronoun type was treatment-coded (0 null / 1 overt), such that the intercept represented the mean in the null pronoun conditions. The variable Group was treatment-coded, such that heritage and Brazilian homeland speakers were compared against the European homeland group (the reference level). Therefore, the effects of Pronoun type and Clause type (and their interaction) in the model were estimated for the European homeland group.

With regard to the comparison between groups (research question 1), a positive coefficient for heritage (or Brazilian homeland) speakers would show that they accepted a transitive interpretation with null pronouns in island clauses more often than European homeland speakers. This would be consistent with an affirmative answer to the research question. To directly compare heritage and Brazilian homeland speakers, we used the *emmeans* package (Lenth, 2024). The

3. Two experimental items of the Brazilian homeland dataset were not recorded due to programming error and therefore they could not be analyzed.

use of the European homeland group as a reference level allowed addressing research question 2, i.e., whether homeland speakers of European Portuguese accepted null objects to the same extent in main and island clauses. A positive effect of Clause type would support a higher acceptance of a transitive interpretation with null pronouns in main than in island clauses. This would be consistent with an affirmative answer to the research question.

Following current guidelines in psycholinguistics, the random effects structure of the model included by-participant and by-item intercepts and slopes for all fixed effects (Barr et al., 2013). Because of convergence issues, the model was simplified following the recommendations in Barr (2013). The final structure of the model is reported in the Results section. We report effect sizes with model coefficients in log odds (β), standard errors (SE), and the z-statistic. Data, analysis, code, a full list of materials and supplemental materials are available at: https://doi.org/10.17605/OSF.IO/WBNY8.

5. Results

All groups performed as expected in the filler items, suggesting that they were attentive during the task and could accurately reject the shown image when it did not match the interpretation of the sentence (Supplemental Material 1). Experimental trials with responses exceeding 10 seconds were excluded from the analysis, which affected on average 1.04% of experimental trials in the European homeland group, 0.75% of trials in the European heritage group, and 0.89% of trials in the Brazilian homeland group. Figure 2 shows a descriptive summary of the acceptance of a transitive interpretation in the three groups. Table 2 shows the full output of the statistical model, while the text focuses on the statistically significant results and reports the results of follow-up comparisons.

To address research question 1, i.e., whether heritage speakers showed diachronically advanced behavior, we inspected the coefficients regarding the group comparisons in the island condition (reference level): European vs. Heritage, and European vs. Brazilian. These results show that heritage and Brazilian homeland speakers accepted a transitive interpretation with null objects more often than the European homeland group. A follow-up comparison did not find evidence that heritage and Brazilian homeland speakers differed in the acceptance of transitive interpretation with null objects in island clauses ($\beta = 0.05$, $SE = 0.20$, z-value = 0.28; $p = .999$). Thus, these results support our hypothesis that heritage speakers of European Portuguese mirror patterns of diachronic change, such that both heritage and Brazilian homeland speakers accepted null objects more often

in island clauses than the European homeland group — but did not differ from each other.

To address research question 2, i.e., whether there was an asymmetry in the licensing of null objects depending on the clause type for European homeland speakers, we inspected the coefficients specific to this group: the model intercept, the effects of Clause type, Pronoun type, and their interaction. The model intercept showed no evidence that the European homeland group accepted a transitive interpretation with null objects in island clauses higher than chance level—50% in this case. Crucially, there was also no evidence of an effect of Clause type, suggesting that European homeland speakers accepted transitive interpretations with null pronouns to similar extents in main and island clauses. Instead, the only effect that reached significance was an effect of Pronoun type, showing that transitive interpretations in island clauses were accepted more often with overt than null pronouns. Overall, these results suggest that European Portuguese speakers disprefer null objects in comparison to the other groups, but that they do so to similar extents in main and island clauses. This is an interesting result because a significant effect of clause type would have been expected for European homeland speakers if null objects in island clauses were ungrammatical for them — as compared to null objects in main clauses.

We found a significant interaction between Pronoun type and Group (European homeland vs. heritage speakers), showing that the acceptance of a transitive interpretation with overt vs. null pronouns in island clauses was larger for European homeland than for heritage speakers. Figure 2 suggests that this was due to European homeland speakers accepting transitive interpretations in island clauses more often with overt than null pronouns, while acceptance was similar across both pronoun types in the heritage group. This result further supports the hypothesis that heritage speakers show a diachronically advanced behavior by extending the use of null pronouns to island clauses.

Finally, it is important to note that the acceptance rate in the overt pronoun conditions was very high, but it did not reach 100% (Figure 2). This was surprising, as we had expected transitive readings to be fully licensed in sentences with overt pronouns. To explore whether this result might be due to differences between items, we carried out a post-hoc analysis exploring the potential role of between-item differences. The results indeed suggested that the likelihood of a transitive interpretation differed across items. These results are reported and discussed in Supplemental Material 2.

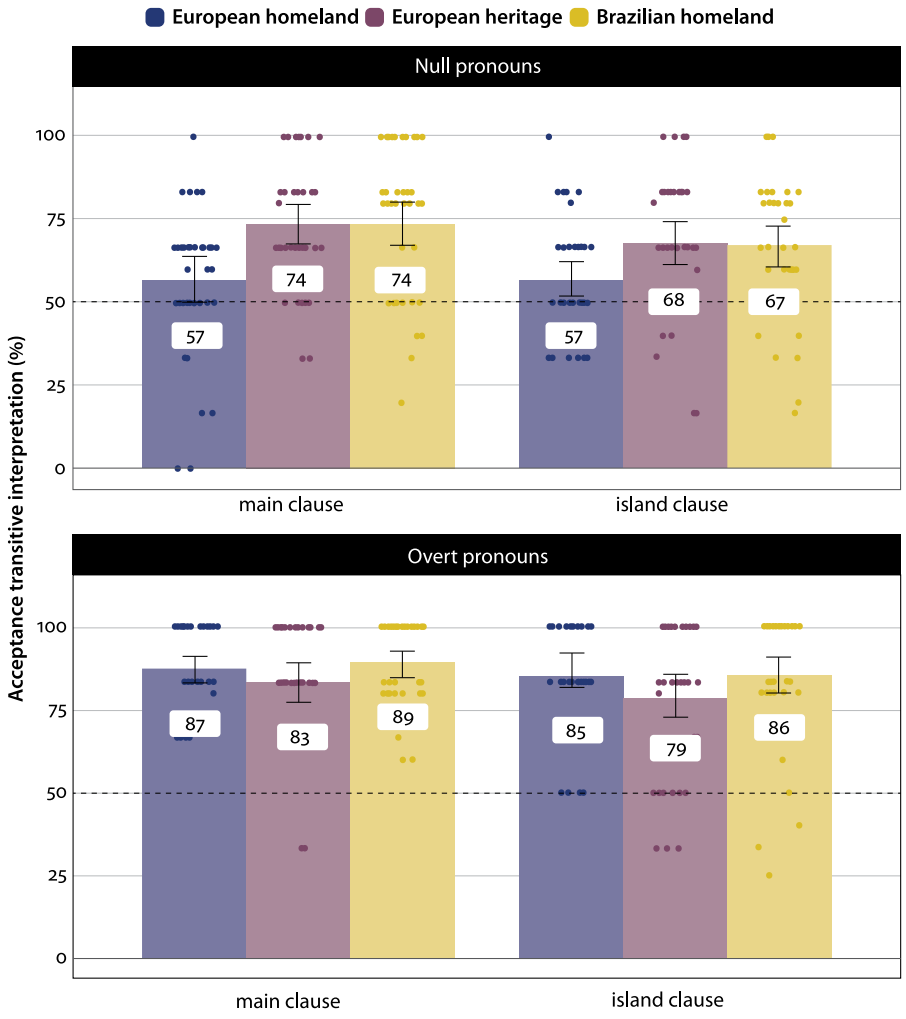


Figure 2. Acceptance of the transitive interpretation (shown image) in the experimental items

Note. Empirical mean acceptance of the transitive interpretation averaged across items and participants. Bars show by-condition averages across participants. Error bars show bootstrapped 95% confidence intervals. Each point corresponds to one participant.

Table 2. Output of the statistical model

Coefficient	Estimate	Standard Error	*z*-value	*p*-value
Intercept (European)	0.31	0.22	1.44	.151
Clause type (European)	0.08	0.25	0.33	.740
Pronoun type (European)	**1.94**	**0.32**	**6.12**	**<.001**
European vs. Heritage	**0.57**	**0.23**	**2.50**	**.013**
European vs. Brazilian	**0.49**	**0.23**	**2.12**	**.033**
Pronoun type × Clause type (European)	−0.10	0.40	−0.25	.802
Clause type × Group (European vs. Heritage)	0.36	0.31	1.15	.248
Clause type × Group (European vs. Brazilian)	0.41	0.31	1.30	.192
Pronoun type × Group (European vs. Heritage)	**−1.10**	**0.39**	**−2.87**	**<.001**
Pronoun type × Group (European vs. Brazilian)	−0.49	0.40	−1.00	.316
Clause type × Pronoun type × Group (European vs. Heritage)	−0.18	0.54	−0−33	.744
Clause type × Pronoun type × Group (European vs. Brazilian)	−0.26	0.57	−0.47	.640

Note. Model formula: Response ~ Clause type * Pronoun type * Group + (1 + Clause type * Pronoun type | Participant) + (1 + Clause type + Pronoun type | Item). The intercept reflects the mean acceptance of the shown transitive image for the European homeland group with null pronouns in island clauses. Significant results at the $\alpha = 0.05$ level are bolded. European = European homeland speakers. Brazilian = Brazilian homeland speakers. Heritage = heritage speakers of European Portuguese.

6. General discussion

We investigated the comprehension of null objects by heritage speakers of EP living in Germany by comparing them to European and Brazilian homeland speakers.

HS have been described as showing acceleration of diachronic changes (Kupisch & Polinsky, 2021; Rinke & Flores, 2014, 2021),[4] due to reduced input quantity in their heritage language and less standardization (mostly colloquial input and less literacy, Rothman, 2007). With respect to null objects, previous research has shown that EP HS show a significant increase in their production as

4. But see Flores et al. 2020 for a case of syntactic stability over several generations of speakers in a German language island in Brazil.

compared to the homeland counterpart, which has been interpreted as diachronic advancement in Rinke et al. (2018).

In the present study, we ask whether this diachronically advanced behavior could be confirmed in a comprehension study. In addition, we investigate the availability of null objects in island constructions, in particular in speakers of EP.

The results of our study showed that all groups of speakers accepted transitive interpretations with null objects. Concerning our first question of a diachronically advanced behaviour by HS, our study showed that the European homeland speakers exhibited the lowest rate of transitive readings with null objects. They differed from Brazilian homeland speakers and heritage speakers, who showed a significantly higher acceptance of transitive readings in main and island clauses. There was no evidence that heritage and Brazilian homeland speakers differed. This may be interpreted as a parallel behavior of Brazilian homeland and heritage speakers, which provides a positive answer to the question whether EP HS can extend patterns of diachronic change.

Concerning the licensing of null objects in islands in EP, our analysis showed that EP homeland speakers accept transitive readings with null objects to similar extents in main and island clauses. Although the overall rate of transitive reading was lower than in the other two groups, we can conclude that null object interpretations were available for them around half of the time (i.e., at a 50% rate). For BP homeland speakers and HS, the results show that null objects are more available, and to similar extents in main and in island clauses.

In the remainder of this section, we relate our findings to previous research. Our main finding, namely that EP heritage speakers more often access null object readings as compared to EP homeland speakers, informs discussions about the factors that shape heritage languages. For example, our results confirm that cross-linguistic influence is not necessarily a key factor influencing the acquisition of null objects in heritage EP, because a transitive interpretation would be generally unavailable in a corresponding German construction.

Our results show that HS do not seem to have a "silent problem" (Laleko & Polinsky, 2017) in the case of empty objects — as opposed to null subjects. The overuse of subjects and the higher omission rate of objects can be seen as two sides of the same coin. Subjects and objects show opposed patterns with respect to discourse pragmatics and referentiality: from a discourse-pragmatic perspective, subjects tend to be topics (and null), whereas objects tend to be the focus or part of the focus domain (and overt). From a referential perspective, subjects tend to be animate and definite (and overt), and objects inanimate or indefinite (and null). From this perspective, heritage bilinguals' behavior reflects a sensitivity to universal referential hierarchies, while simultaneously exhibiting a relaxation of discourse-pragmatic constraints that typically regulate the distribution of

subjects and objects in null subject and null object languages (see Flores & Rinke, submitted).

Based on the view that the difference between Brazilian and European homeland speakers reflects a diachronic amplification of null object constructions, we conclude that the higher acceptance rate of the HS also corresponds to a diachronically more advanced behaviour. The question arises whether the observed pattern corresponds to a structural innovation or to an amplification of an already existing development in the homeland variety (e.g., Nagy, 2016; Rinke & Flores, 2014; Rothman, 2007). We think that we are not facing a restructuring of the grammatical system in this case (or grammatical competition in the sense of Kroch, 1989), because null objects were accepted by all speaker groups in all structural contexts, albeit to different extents. Rather, we witness a more gradual change in terms of an extension of null objects in language use in many contexts in which clitics have been preferred so far. In addition, we know that heritage speakers extend the use of null objects to more referential (+animate) contexts (Rinke et al., 2018). But this has not been tested in this study.

Based on the corpus findings in Rinke et al. (2018), which show that younger homeland speakers of EP produce higher rates of null object constructions than older homeland speakers, we conclude that there may be an ongoing development towards an increase of null objects in the European homeland variety as well. Of course, this ongoing development only concerns the spoken language and especially the colloquial register, because clitics in the written language are used at the expense of null objects, as already shown in the corpus studies by Kato and Raposo (2001) and Cyrino (2001). Because HS generally have less formal education in their heritage language than homeland speakers, and they are less experienced with the written and formal register, their linguistic competence may be indicative of ongoing diachronic changes in the colloquial register (Rinke & Flores, 2014, 2021).

Concerning our second research question, the occurrence of null objects in island clauses in EP, our study suggests that null objects can sometimes be licensed in these environments: European homeland speakers accepted transitive interpretations about 50% of the time. This does not align well with previous findings based on introspection (Raposo, 1986) and truth-value judgment tasks (Costa & Lobo, 2007). The question arises as to what could cause the differences between Costa and Lobo's (2007) truth value judgment task and our covered box task. Costa and Lobo (2007) showed pictures of transitive and intransitive actions to children and adults and asked them whether the sentences including null and clitic objects matched the action in the picture. While children widely accepted transitive interpretations in island clauses as (7), adult controls rejected them to 92%.

(7) *O cão ladrou quando o Rui acordou Ø
the dog barked when the Rui woke up Ø
(intended meaning: 'The dog barked when Rui woke him up.'

The example shows that the stimuli used by Costa and Lobo (2007) differ from our stimuli in the following respect: In our stimuli, the null object in the island clause did not refer to the subject of the main clause as in (7), but to an object previously mentioned in the context (see Example (6)). We think that this difference crucially influences the acceptability of the sentences, as pointed out by Raposo (2004), who states the following generalization (8b.) based on the example in (8a.):

(8) a. *O João pensa que eu recomendei __ ao professor.
the John thinks that I recommended __ to.the professor
intended meaning: 'John$_i$ thinks that I recommended him$_i$ to the professor.'
b. O antecedente de um objeto nulo não pode ser um sujeito em [spec, TP].
'The antecedent of a null object cannot be a subject in SpecTP.'
(Raposo, 2004: 69)

If the generalization in (8b.) holds true, the problem with examples like (7) may be that the matrix subject is the antecedent of the null object in the island clause. In addition, the antecedent is an animate referent in (7), which is in general less felicitous for null objects (see Rinke, 2025).

Our results confirm previous corpus findings by Rinke et al. (2018) and Kerezova (2024), showing that null objects are indeed possible in islands in the European homeland variety, at least in adverbial adjunct clauses. This confirmation based on a comprehension study is important, because judgments about these clauses are controversial (Raposo, 2004) and null objects in islands are not frequently found in the spontaneous speech corpora. Our finding also has consequences for the syntactic analysis of null objects in EP. The availability of null objects in islands in EP speaks against Raposo's (1986) initial analysis of the EP null object in terms of a syntactic variable bound by an A'-topic operator (see Section 2). It confirms that there is no locality restriction. This increases the plausibility of alternative analyses in terms of an empty determiner (Kato & Raposo, 2005; Raposo, 2004) or in terms of a reduced noun phrase (Barbosa, 2019, 2024; Kerezova, 2024).

These results also mean that the general availability of null objects in islands cannot be regarded as a key syntactic difference between EP and BP, in contrast to the overall higher rates of null objects in BP vs. EP which have been confirmed in our study. A limitation of the present study is that our inference that heritage speakers behaved similarly to Brazilian homeland speakers was based on the lack

of statistically significant differences between them (i.e., a null effect). As the number of items and participants in our study was restricted due to the specific nature of the verbs necessary to construct our materials and given the practical limitations associated with recruiting heritage speakers, we acknowledge that future replications with more items and participants may detect more subtle differences between groups.

Because our HS group was fairly proficient and homogeneous (they self-rated on average as 3.5 out of 5, with a low standard deviation of 0.6), we need to leave the question for future research whether heritage speakers of lower proficiencies (and/or without access to formal education) would perform similarly, and more broadly whether language proficiency predicts heritage speakers' sensitivity to diachronically progressive behaviour.

Overall, our study confirms the view that some properties of heritage languages can be due to patterns of ongoing diachronic developments, as previously suggested in the literature of heritage bilingualism (Kupisch & Polinsky, 2021; Rinke & Flores, 2014, 2021). Because diachronic change often follows predictable pathways (e.g., in processes of grammaticalization), further investigations focusing on the relation between diachronic change and heritage languages will enable us to make predictions about properties of heritage grammars based on existing diachronic changes and, conversely, predictions about possible diachronic changes based on heritage grammars.

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Data availability statement

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