

# Heritage Portuguese learners' performance with derivational morphology

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## ABSTRACT

There are very few studies on derivational morphology with heritage speakers. This paper intends to narrow this gap in heritage Portuguese studies. This work focuses on testing the performance of adult Portuguese heritage learners in a college setting with derivational words. I used a multiple-choice fill-in-the-blank task, and the results show that heritage learners significantly perform better when words can be transferred from English and are colloquial in Portuguese. They perform significantly worse when derivational words cannot be transferred from English and are non-colloquial in Portuguese. One suggestion to increase greater performance with derivational words is to explicitly teach morphological awareness to heritage learners of Portuguese in heritage Portuguese language courses to increase vocabulary.

**Keywords:** heritage language, morphological awareness, transferability, familiarity

## Introduction

Heritage Language learners acquire their heritage language in a naturalistic setting and during the critical period of language acquisition development, just as typical native speakers do for an L1 (Valdés, 2005; Montrul, 2010). These speakers usually learn the heritage language at home

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from parents and/or relatives who live with them in the same household. Some authors argue that heritage speakers acquire the language variety their family presents, and they may have limited access to input and language schooling from other native dialects. The heritage language learner forms a heterogeneous group, which ranges from passive-receptive comprehension speakers to native-like speakers of the heritage language, making it difficult to compare them within a single category (Montrul, 2010). According to Valdés (1997, 2001), language use of the heritage language, bilingual education, socioeconomic status of speakers, and the native language dialect all affect the language of this broad range of speakers.

Heritage speakers tend to diminish their language competence across generations in the country of the dominant language. Silva-Corvalan (1994) and others noticed that morphosyntactic and lexical properties of Spanish heritage speakers vary from generation to generation in the United States. Children of immigrants considered first-generation heritage Spanish speakers use some English words and expressions in their heritage Spanish. However, the grandchildren of immigrants or second-generation Spanish heritage speakers show a higher usage of borrowing language from English than first-generation speakers. Furthermore, second-generation heritage speakers of Spanish also display certain characteristics such as a simplification of the verb system, especially in terms of mood and aspect, an overextension of *estar* in detriment of *ser*, the constant use of codeswitching to communicate, and a preference of periphrastic future constructions such as *voy a dormir* vs. verbs with full inflectional morphology such as *dormiré*. Conversely, second language learners acquire a second language mainly in a classroom setting or in an immigrant country after the critical period of L1 acquisition. These speakers usually have limited access to naturalistic input in the second language. They can also be more easily categorized as early or late second language learners. Furthermore, placing second-language learners in different language proficiency levels is more straightforward than heritage speakers. From a cognitive perspective, second language learners acquire a transitional

linguistic system in the brain known as interlanguage (Selinker, 1972), and some authors claim that these speakers fully transfer linguistic knowledge from the L1 and have full access to the same (Sprouse & Schwartz, 1996). From an interactionist perspective, social and affective variables also play a significant role in acquiring a second language (Schumman, 1986; Larsen-Freeman, 2011). Motivation, aptitude, personality, interaction, and age can cause delays in acquisition, creating the perception that learning a second language is neither worthwhile nor attainable. Finally, the positive interaction of cognitive and interactionist factors may not generate uniform outcomes. Some second language learners become near-native speakers of the second language, while others may present a deficit in the second language (Licerias et al., 1999; Gregg, 2010).

There are few studies on derivational morphology in a second language and even fewer studies on this topic with heritage languages (See Zysik, 2020 for derivational morphology in heritage Spanish) compared to L2 studies in inflectional morphology. This paper aims to narrow this gap in two ways: first, we focus on derivational morphology rather than inflectional morphology as the language phenomenon to be investigated in this study. Second, our population comprises of adult heritage speakers of Portuguese in a college setting rather than L2 Portuguese speakers. This paper intends to narrow a gap in the literature by studying a language phenomenon and a population that has not been studied. The following section briefly provides the overall acquisition path of derivational morphology.

## **1. Acquisition of derivational morphology**

In first language acquisition, the linguistic development of inflectional morphology happens mostly prior to literacy years (Berko, 1958; Berman, 1981; Marcus et al., 1992), whereas the linguistic development of derivational morphology occurs mainly throughout elementary grades and even later up into adulthood (Kuo & Anderson, 2006; Anglin, 1993; Carlisle, 2000; Tyler &

Nagy, 1989). The development of derivational morphology takes longer than inflectional morphology because bound derivational morphemes are much greater in number and much less frequent than inflectional morphemes. Moreover, some derivational morphemes suffer phonological and semantic alterations when attached to the stem of words, making the word formation process less transparent and longer to develop (Kuo & Anderson, 2006)

Gordon (1989) developed the level-ordering model, claiming that neutral morphemes (kind-kindness) are acquired before non-neutral morphemes (include-inclusion) in L1 English since they are more productive and have fewer constraints on productivity. Moreover, Tyler and Nagy (1989) investigated the development of relational, syntactic, and distributional knowledge of neutral and non-neutral derived words among fourth-, sixth-, and eighth-grade L1 English students. These children start with relational knowledge, moving slowly to syntactic knowledge and never hitting a complete ceiling on distributional knowledge. Early on, the tested children can distinguish different morphemes related to a common lexeme, such as *art-artist-artistic*. Then, children go through a period when they use syntactic morphemes without knowing their syntactic category, but eventually, in the latter years of childhood, they become aware of word class. The authors observed that a child may know the words *communicate* and *communication* at first without being aware that the latter word is a noun, relying mainly on the meaning of the stem and morpheme rather than the part of speech. Finally, the last stage, which happens to be the most difficult, is distributional knowledge. This knowledge entails knowing the constraints on merging morphemes with lexemes (beautifully vs. \*beautylly), which happen later in adolescence or into early adulthood.

The L1 acquisition of derivational morphology relies on the productivity of word formation rules, the transparency in the meaning of complex words, and the phonological alterations they go through. Typical L1 speakers have access to extensive amounts of naturalistic input and language schooling effects, which work in bidirectional ways through the school years

into adulthood (Kuo & Anderson, 2006), eventually leading to competence in derivational morphology. Conversely, the heritage language scenario is usually characterized by limited access to input and language schooling in the heritage language compared to typical L1 speakers and one in which heritage speakers have an additional dominant language with greater access to naturalistic input and language schooling. In this study, we test the performance of heritage speakers with derivational morphology to measure how well these speakers can perform with derivational words. We introduce morphological awareness next since this construct is the explicit mechanism in which speakers reflect upon the combination of stems and derivational morphemes to obtain meaning from complex words.

## 2. Morphological awareness

The construct of Morphological awareness (Carlisle, 1995 & Kuo and Anderson, 2006) is the ability to reflect on meaning from the small units of complex words. These small, indivisible units which make up words are known as morphemes. They are unique pairings of meaning and sound in language. According to Kuo and Anderson (2006), morphological awareness offers a path to a learner's comprehension. It is essential to distinguish between acquiring morphological knowledge and morphological awareness. The former happens tacitly and through naturalistic contexts involving comprehension and production. In contrast, the latter is the ability to explicitly identify morphemes and

combine them with lexemes to form and decode words. This ability is enhanced over a lifespan, and it reciprocally relates to literacy, primarily through reading comprehension (Kuo & Anderson, 2006; Carlisle, 1995; Nagy et al., 2003) as well as vocabulary expansion as studies from Guo, Roehrig, and Williams (2011) and Kiefer & Box (2013) have shown. Thus, morphological awareness is a construct within the broader domain of morphological knowledge.

Awareness of derivational morphology is the most studied aspect of morphological awareness compared to inflectional and compound morphology since its decoding is highly important for the reading ability of intermediate and advanced texts in a language. Anglin (1993) and Nagy & Anderson (1994) have assessed that 60% to 80% of new vocabulary words in academic texts that English learners must decode are formed via derivational processes. Carlisle (2000), Carlisle and Stone (2003), Mann and Singson (2003), and Nagy et al. (2003) have all shown that the ability to decode complex words well for reading comprehension comes with the latter years of elementary school. This ability, however, does not guarantee automatic or complete reading comprehension since these types of words have more infrequent stems than frequent words in oral language. As a result, morphological awareness becomes an essential ability beyond the first years of language schooling since it is an avenue for reading comprehension of texts with infrequent words in oral language.

Most of the research on morphological awareness has been conducted with L1 monolingual English children (See Goodwin & Ann, 2013 for a review) or English-speaking adults (Guo et al., 2011; Tighe & Schatschneider, 2014, 2015, 2016). Fewer studies have been conducted with second language learners and bilingual children (Kieffer et al., 2013; Kieffer & Box, 2013; Zhang & Koda, 2013; Zhang et al., 2014). There are studies with L1 Brazilian Portuguese children (da Mota et al., 2010; Mota, M. M. P. E., Annibal, L., 2008; Mota, M., Lisboa, R., Dias, J, et al., 2009) but none that I know of with heritage Portuguese young learners inserted at the college level.

This study intends to fill the gap in the absence of studies on morphological awareness in derivational morphology with adult heritage speakers of Portuguese by investigating their language performance with complex words in a multiple-choice fill-in-the-blank task. Participants in the study have been exposed to many years of language schooling and naturalistic input in English and have had limited language schooling in Portuguese. They can shed light on performance with derivational words in conditions different from L1 speakers.

In section 3, we briefly describe derivational morphology in Portuguese. In section 4, we present the study's methodology and research questions. In section 5, we provide the study's results and analysis. Then, we present our final considerations.

### 3. Derivational Morphology in Portuguese

In Portuguese, suffixes are nominal, adjectival, verbal, and adverbial. The closed class of lexical suffixes is comprised of 154 morphemes in Portuguese. 107 derivational suffixes are nominal, and 38 are adjectival (Bechara, 2009). This study focuses on nominal and adjectival complex words via suffixation since these two types are the most frequent in Portuguese. Moreover, I focus solely on these derivational patterns since I want to see word formation by adding suffixes rather than word formation processes without changing the word's stem, i.e., conversive or zero derivations.

It is known that certain derived words are the result of regular, rule-based, productive processes in Portuguese. These processes are clear, and a new word with a new word class is formed when there is an annexation of an immediate suffix in the language. The order of suffix annexation matters in forming the next derived word, and a word can be decomposed into its component parts. (Bybee & McClelland, 2005, Margotti & Margotti, 2011) This productivity allows a great number of stems to be combined with a very small subset of frequent suffixes like

-ção, and -mento, -or, -nte, ista, -eiro, in Portuguese, forming many high-frequency words in the language (Basílio, 1999).

In Portuguese, we can see a regular, rule-based, progressive word formation process with legal, legal, formal, and formal. Suffixes are always annexed on the stem's right, forming the syntactic category of the derived word. Suffixes such as—izar or—ção seen in 1 only have grammatical meaning. They must be annexed to stems to create complex words with appropriate morphosyntactic features and meanings.

1)

[[[Legal A]+-izarV] + -ção N]

[[[Formal A]+-izar V]+ -ção N]

(Margotti &amp; Margotti, 2011)

Regular and productive suffixes in Portuguese appear with many other stems in the language. For instance, the suffixes *-eiro*, *-ista*, *-or*, and *-nte* combine quite productively with many different stems, showing regular formation processes. Moreover, *-eiro* and *-ista* have the same syntactic function and meaning. They form agentive nouns from nouns. They are cases of competing suffixes, and for phonetic reasons, only one will coin a new word in the language. The suffixes *-or* and *-nte* also compete to coin new words in the language. They both form nouns from verbs and have an agentive meaning.

*-eiro*: *pedreiro*, *bombeiro*, *jardineiro*, *cachaceiro* - meaning: agent bricklayer, fireman, gardener, drunkard

*-ista*: *dentista*, *artista*, *balconista*, *jornalista* - meaning: agent dentist, artist, clerk, journalist

*-or*: *ator*, *cantor*, *diretor*, *tradutor* - meaning: agent actor, singer, director, translator

*-nte*: *estudante*, *ajudante*, *comandante*, *militante* - meaning: agent student, helper, commander, militant

However, some word formation processes in Portuguese are opaque due to idiosyncrasies of the lexicon or historical language reasons, making the suffix segmentation more challenging to observe. Hence, the annexation of the suffix to the stem is not, at times, so transparent. In Portuguese, these non-transparent affixes form words with lexemes that are also bound, e.g.,



*coraj-corajoso*, *espac-espacial*, *carn-carnívoro*. These affixes also change the morphophonology of the word, making changes to word stress and its vowel quality. It is only possible to know that *coraj*-is a stem in Portuguese from the meaning the suffix *-oso* provides to the word *corajoso*. The detachment of the suffix from opaque words such as *corajoso* shows that these stems cannot stand on their own as words of the Portuguese language.

Portuguese exhibits derivational morphology in writing via mostly transparent orthographic graphemes, which consider morphological rules that help readers and writers understand the stems and derivational morphemes of non-neutral words. The word *paisagismo*, landscaping, is spelled with the grapheme *g* rather than *j* because of the noun *paisagem*; *landscape* is also spelled with the grapheme *g*. Moreover, the meaning of *paisagismo* can be inferred as the act or state of *paisagem*. This orthographic semi-transparency in the language gives Portuguese speakers better chances of learning a stem's form and meaning with its new suffix in writing (Luft, 2000).

I present the methodology section next, which leads us to the research questions/hypotheses and the experiment for this study.

## 4. Methodology

This study investigates the performance of adult heritage Portuguese learners in a college setting with derivational words in a multiple-choice fill-in-the-blank task. The participants are all English-dominant speakers with more language schooling in the dominant language than in Portuguese. The study aims to test this adult heritage learner population to see what factors affect their ability to perform the task.

In this study, I considered three covariates: parts of speech, transferability, and familiarity. First, part of speech is chosen as an independent variable because derivational processes with suffixes change the syntactic category of words, and sentences comprise syntactic phrases and lexical items with syntactic categories. Second, crosslinguistic transfer plays a major role in

heritage languages (Scontras et al., 2015; Polinsky, 2018; Montrul, 2008), and I want to know if participants transfer knowledge of stems and derivational morphemes that are similar in form from the dominant language to the heritage language. Moreover, I also want to know if they can form complex words with stems and derivational morphemes that are not similar in form to the dominant language. Third, it is known that heritage language speakers have smaller vocabularies in the heritage language compared to baseline L1 speakers (Montrul, Mason, 2020). Thus, I also want to know if words used more in colloquial contexts and are frequent in everyday life, which we call familiar words, also affect heritage speakers' performance with derivational words.

#### 4.1 Participants

All heritage Portuguese participants in the study are undergraduate students at a public university in Massachusetts, USA, where there is a significant heritage European and Brazilian Portuguese community. There are 10 adult heritage speakers of Portuguese in the experimental group and 10 L1 speakers of Portuguese in the control group. In the experimental group, 7 were women, and 3 were men. 8 participants were heritage speakers of Brazilian Portuguese, and 2 were heritage speakers of European Portuguese. Their average age is (20.6) years. Their average age of onset to English is (3.2) years, and they averaged (5.1) years of schooling in the heritage language. Eight participants had parents from a Portuguese-speaking country, and 2 had only one parent, the mother, from a Lusophone country. All participants are second-generation speakers of heritage Portuguese. Half of the participants are considered simultaneous bilinguals, and the other half are sequential. The control group comprises nine native speakers of Brazilian Portuguese and 1 native speaker of European Portuguese. There are 6 women and 4 men in the control group. They are all graduates from Portuguese-speaking higher education institutions; 9 live in Brazil, and 1 in the US.

The derivational processes tested in this study, namely, part of speech, transferability, and familiarity, behave similarly in Brazilian and European Portuguese. Thus, there is no need to form two distinct experimental groups based on their Portuguese heritage language.

## 4.2 Independent variables

### 4.2.1 Parts of speech

There are 24 nouns tested in this study. 4 nouns are derived from 4 nouns + an agentive nominal morpheme (-ista), and 4 nouns are derived from 4 nouns + an agentive nominal morpheme (-eiro). Moreover, 4 nouns are derived from 4 verbs + an agentive nominal morpheme (-or), and 4 nouns are derived from 4 verbs + an agentive nominal morpheme (-nte). 16 agentive nouns make up the set of nouns.

2)

noun	agentive morpheme	agentive noun	Noun	agentive noun
arquivo	-ista	arquivista	Archive	archivist
prisão	-eiro	prisioneiro	Prison	prisoner

3)

verb	agentive morpheme	agentive noun	Verb	agentive noun
escrever	-or	escritor	Write	Writer
estudar	-nte	estudante	Study	Student

4 nouns are derived from 4 nouns + a nominal morpheme which is not agentive but rather expresses a doctrine, set of beliefs, or predisposition (-ismo), and 4 nouns are derived from 4 verbs + a nominal derivational morpheme indicates a result in action or state (-ção), as shown in 4 and 5, respectively.

4)

Noun	Morpheme	Noun	Noun	Noun
capital	-ismo	Capitalism	Capital	Capitalism

5)

Verb	Morpheme	Noun	Verb	Noun
comunicar	-ção	Comunicação	Communicate	Communication

There are 24 adjectives in this study divided into 6 groups of adjectival derivational morphemes with 4 adjectives in each group. The adjectival morphemes which compose the 6 groups are *-ado*, *-oso*, *-vel*, *-estre*, *-al*, *-nte*. A sample of these adjectives is presented in 6.

6)

Noun	Morpheme	Adjective	Noun
Abuso	-ado	Abusado	abuse
Coragem	-oso	Corajoso	bravery
Solução	-vel	Solúvel	solution
Campo	-estre	Campestre	country
Educação	-al	Educacional	education
Abundância	-nte	Abundante	abundance

### 4.2.1 Transferability

Second, I focus on the category transferability construed in this study as both the stem and the suffix in English being similar in form to Portuguese. Transferability in our research has a binary value, as we can see below:

7)

a. **dentist**-**dentista** +Transferb. **baker**- **padeiro** -Transfer

In 7. a, both the stem *dent* and the suffix *-ist* in English are similar in form to Portuguese. We manipulated these instances as words with +transfer capacity, whereas in 7. b, the stem *bak* and the suffix *-er* are very different in form compared to the stem *pad* and the suffix *-eiro* in Portuguese. The instances in 7.b are words we manipulated as having a -transfer capacity.

There are 12 transferable nouns and 12 transferable adjectives from English to Portuguese since they are all Latinate words, 12 untransferable nouns, and 12 untransferable adjectives. In section 5, I show some examples from the study that fit into these subcategories.

8)

	+transfer	-transfer
Noun	prisioneiro (prisoner)	contratação (hiring)
Adjective	abundante (abundant)	amável (lovable)

### 4.2.3 Familiarity

Finally, I looked at familiarity, which is construed in this study as words used in more colloquial contexts and are more frequent in everyday life. I call these words +familiar. We also named words that are not colloquial and are more infrequent in everyday life as -familiar words. Two test items from the study can be seen below.

9)

escritor- (colloquial word) +familiar	writer
promotor- (non-colloquial word) -familiar	prosecutor

There are 12 colloquial nouns and 12 colloquial adjectives. Colloquial words were checked on the compilation of Portuguese corpora *Linguatca*. This compiled corpus includes oral and written texts from Brazilian and European Portuguese varieties with 1,261,058,299 non-repetitive words. The

criterion for ranking is word frequency in a representative corpus, which agglomerates written, oral, and web texts from various genres. All colloquial nouns and adjectives were present in the corpora. Overall, colloquial nouns ranked higher in word frequency than colloquial adjectives. The average frequency ranking for colloquial nouns is 17,103, whereas for adjectives, it is 21,956. One colloquial noun and one colloquial adjective from the study are presented in 10.

10)

Noun	padeiro	baker
Adjective	Leal	loyal

Moreover, there are 12 non-colloquial nouns and 12 non-colloquial adjectives. Non-colloquial nouns and adjectives were overwhelmingly more infrequent than colloquial nouns and adjectives. The average ranking for non-colloquial nouns is 40,342, whereas for adjectives, it is 82,931. We can see an overwhelming distance between colloquial nouns and adjectives compared to non-colloquial nouns and adjectives regarding word ranking in the corpus. Thus, the chosen test items are warranted under the classification of familiarity. One non-colloquial noun and a non-colloquial adjective from the study are presented below.

11)

Noun	requerente	petitioner
Adjective	majestoso	majestic

### 4.3 Research questions and hypotheses

The study is designed to answer the following research questions. The general research question and hypothesis are presented in A:

A. Do heritage speakers of Portuguese choose more incorrect derivational words than L1 Portuguese speakers in a derivational morphology multiple-choice fill-in-the-blank task?

I predict they will choose more incorrect derivational words in a multiple-choice fill-in-the-blank task than L1 Portuguese speakers.

The specific research questions and hypotheses are presented in B, C, and D:

B. Can knowledge of *Parts of Speech* affect heritage speakers' performance?

I predict heritage speakers will perform better when the word is a noun rather than an adjective.

C. Does *transferability* affect the performance of heritage speakers in a derivational morphology task?

Heritage speakers are more likely to choose the correct answer when the word is transferable.

D. Does *familiarity* affect the performance of heritage speakers in a derivational morphology task?

When the derivational word is colloquial, more frequent, heritage speakers are more likely to choose the correct answer.

#### 4.4 Experiment

To test derivational words with a subset of noun and adjectival derivational suffixes shown in section 3.2, I elaborated a multiple-choice fill-in-the-blank task like the one presented in Tyler and Nagy, 1989. A test item comprises a declarative sentence with a blank space and four answer options to fill the empty space. Every answer option includes words with the same stem, but the answer options vary in terms of attached suffixes to the

same stem. Every available answer has a unique suffix. Thus, every answer for a test item comprises the targeted derivational word, pseudowords, and other possible derivational words that do not answer the question correctly. This experiment was chosen due to its simplicity in performing the task and its ability to avoid irrelevant, external task demands. Furthermore, cues for word class through constituent structure and through suffixes may assist participants in choosing an answer without knowing the root of -familiar and -transfer words in the task. This task was given to 10 heritage speakers and 10 L1 speakers of Portuguese who completed the assignment on a laptop computer equipped with the software PsychoPy Builder (v2022.1.3). The test items were randomized, and there was no time limit to complete the task, nor were there any distractors.

A noun test item from the study and an adjectival test item are presented in 12 and 13, respectively.

12)

A televisão entrevistou o \_\_\_\_\_ George Manson.

The Television station interviewed the \_\_\_\_\_ George Manson

1) Prisionista, 2) prisionático, 3) prisioneiro, 4) prisional<sup>1</sup>

Correct answer 3

13)

A previsão para a próxima semana é de chuva \_\_\_\_\_.

The forecast for next week is \_\_\_\_\_ rain.

1) abundista, 2) abundária, 3) abundante, 4) abundátil<sup>2</sup>

Correct answer 3

- 
- 1 Options 1,2, and 4 are pseudowords in Portuguese created by combining the root *pris* with existing derivational morphemes in the Portuguese language.
  - 2 Options 1,2,4 are pseudowords in Portuguese created by combining the root *abund* with existing suffixes



We now present prototypical examples from the conditions in the same section.

Category	Example	Translation
N+T+F	Estudante	Student
N-T+F	Escritor	Writer
N-T-F	Requerente	Petitioner
N+T-F	Arquivista	Archivist
A+T+F	Curioso	Curious
A-T+F	Cansado	Tired
A-T-F	Silvestre	Wild
A+T-F	Aberrante	Aberrant

Table 1- Prototypical Examples

N- Noun

A-Adjective

T- Transferability

F-Familiarity

#### 4.4.1 Coding

Participants were divided into two groups: heritage speakers and L1 Portuguese speakers. Moreover, the category word class was subdivided into N for nouns and A for Adjectives. The category transferability was subdivided into +transfer and -transfer, and the category familiarity was subdivided into +familiar and -familiar. There are 8 possible conditions. We have already presented the conditions in section 3.5.

## 5. Results and analysis

I calculated the impact for all eight conditions with the six subdivided categories. The respective percentages of correct responses for the heritage and control group are as follows:

	Conditions	Percentage HeritageGroup	Percentage ControlGroup
1.	N+T+F	88	98
2.	N-T+F	56	95
3.	N-T-F	50	87
4.	N+T-F	58	93
5.	A+T+F	82	98
6.	A-T+F	62	93
7.	A-T-F	48	97
8.	A+T-F	47	83

Table 2- Percentages (%) of correct responses for all conditions

N-Noun

A-Adjective

T- Transferability

F-Familiarity

The highest percentage of correct responses for the heritage group is condition one with 88%, followed by condition five with 82%. The heritage group performs well when words are +transfer and +familiar. Conversely, the heritage group performs poorly with words that are - transfer and -familiar. Participants perform at 50% in condition three and 48% in condition seven. There is a 38%-point difference between nouns that are +transfer and +familiar compared to - transfer and -familiar nouns. There is a 34%-point difference between +transfer and +familiar adjectives compared to -transfer and -familiar adjectives.

The control group performed almost at the ceiling in six tested conditions. They achieved 98% of correct responses with nouns and adjectives, which are +transfer and +familiar, as shown in conditions one and five. L1 participants had the lowest percentage scores with -familiar nouns and adjectives. Participants achieved 87% of correct responses in condition three and 83% in condition eight. There is an 11%-point difference between condition one and condition three. There is also a 16 %-point difference between conditions five and eight.

The average percentage of correct answers for the heritage group is 61%, and the average percentage of correct responses for the control group is 93%.

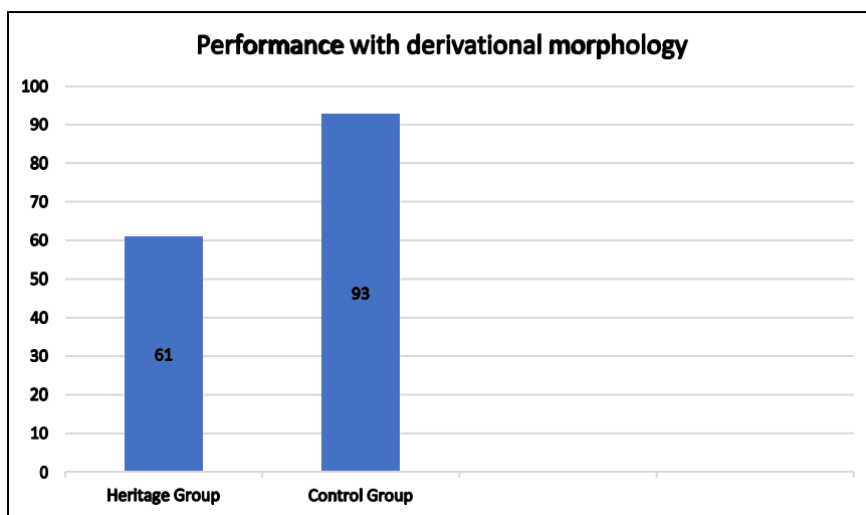


Figure 1-Average percentage of correct responses

The hierarchical logistic regression model for both groups generated the following results.

Correct Response	Coefficient	Standard Error	Z	P>  Z	95% Confidence Interval
Part of Speech	.1316242	.1633544	0.81	0.420	-.1885445 .4517929
Familiarity	.9380526	.1698122	5.52	0.000	.6052268 1.270878
Transferability	.5391104	.1454863	3.71	0.000	.2539624 .8242583
Heritage vs. Control Group	2.240214	.2902679	7.72	0.000	1.671299 2.809128

Table 3- Hierarchical logistic regression model for both groups

The results show that part of speech is not statistically significant ( $p > .05$ ) for both groups. However, familiarity is statistically significant for both groups ( $p < .001$ ). Moreover, transferability is also statistically significant for both groups ( $p < .001$ ). Finally, the performance of both groups is also statistically significant ( $p < .001$ ).

The hierarchical logistic regression confirmed our hypothesis that heritage speakers of Portuguese perform significantly worse with complex words in a multiple-choice fill-in-the-blank task than Portuguese L1 speakers. The heritage group had difficulties forming words with stems that cannot be transferred from English and are non-colloquial in their quotidian vocabulary. The two test items below show words with untransferable and infrequent stems. The results demonstrated that the heritage group performed the task poorly with test items compared to the control group.

14)

Noun/-transfer/-familiar

O \_\_\_\_\_ sugeriu uma pena alta para o criminoso.

The \_\_\_\_\_ suggested a strong sentence for the criminal.

1) Promotista 2) promotor 3) promotoso 4) promotonho<sup>3</sup>

Answer 2

---

3 Answers 1,3, and 4 are pseudowords

15)

Adjective/-transfer-/-familiar

Os alunos reclamaram do ensino\_\_\_\_\_da nova escola.

The students complained about the\_\_\_\_teaching of the new school. 1)defasamento  
2) defasação 3) defasadouro 4) defasado<sup>4</sup>

Answer 4

The heritage group cannot decode stems and suffix of complex words for meaning of -transfer and -familiar words. They struggle to find meaning from word parts from complex words of these types, which affects their performance in the multiple-choice fill-in-the-blank task.

The hierarchical logistic regression model for the heritage group generated the following results:

Correct Response	Coefficient	Standard Error	Z	P>  Z	95% Confidence Interval	
Part of Speech	.1510561	.1793352	0.84	0.400	-.2004345	.5025467
Familiarity	.9193172	.2044254	4.50	0.000	.5186508	1.319984
Transferability	.6709037	.1381047	4.86	0.000	.4002235	.941584

Table 4- Hierarchical logistic regression results for the heritage group

For the heritage group, part of speech is not statistically significant ( $p>.05$ ). Heritage speakers struggled with noun and adjective derivational words. However, familiarity is statistically significant ( $p<.001$ ), meaning they performed statistically better with +familiar words than -familiar words. Moreover, transferability is also statistically significant ( $p<.001$ ). The heritage group performed significantly better with words that are +transfer than words that are -transfer.

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4 Answers 1,2, and 3 are pseudowords

Heritage speakers of Portuguese performed poorly in the derivational morphology task with both noun and adjectival complex words alike. This result answers our first specific research question and refutes our working hypothesis. This result comes as a surprise since, in terms of frequency, nouns are more frequent than adjectives in the Portuguese language. Hence, it was expected that the heritage group would significantly know more complex nouns than complex adjectives. Moreover, the fill-in-the-blank task is a good experiment to predict via suffix knowledge the syntactic category of a word in a sentence (Tyler & Nagy, 1989). Therefore, participants were also expected to choose many correct answers via part of speech, but this was not the case. Part of speech knowledge does not positively affect performance with derivational words for the experimental group. Participants chose many incorrect noun and adjective derivational words throughout the task. Since all the options on a given test item had the same stem and changed only in terms of suffixes, their performance with these suffixes was not enough to positively affect their choice for nouns or adjective derivational words. In 16 and 17, we show a test item with noun derivational and adjective derivational words. The results indicate that heritage speakers had difficulties with both test items.

16) Noun derivational word

A professora tem uma \_\_\_\_\_ em sua turma.

The teacher has a \_\_\_ in her classroom.

1) ajudenta 2) ajudante 3) ajudátil 4) ajudista<sup>5</sup>

Answer: 2

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5 Answers 1,3,4 are pseudowords

17) Adjective derivational word

Ela falou com o policial\_\_\_\_\_depois que prenderam o bandido.

She spoke with the \_police officer after they arrested the criminal.

1) corajoso 2) corajeiro 3) corajista 4) corajáceo<sup>6</sup>

Answer: 1

Our hypothesis that transferability and familiarity affect heritage speakers' performance was confirmed. The effect of +transfer with +familiar words combined created the highest percentage of correct responses, with nouns at 88% and adjectives at 82%. The heritage speaker group performed well when words were similar in stem and suffix to English and were of colloquial use. These test items may be present in the oral language of heritage speakers. The heritage group had many correct responses to test items such as 18 and 19.

18)

O casal não se entende e reclamam da falta de\_\_\_.

The couple does not get along and complains about the lack of\_\_\_\_\_.

1) comunicacionalidade, 2) comunicação, 3) comunicacionamento, 4) comunicado<sup>7</sup>

Correct answer: 2

19)

O aluno tem um caso\_\_\_\_\_para contar para a turma.

The student has a\_\_case to tell the class.

1) curioso, 2) curiosista, 3) curiosidade, 4) curiótico<sup>8</sup>

Correct answer: 1

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6 Answers 2, 3, and 4 are pseudowords.

7 Answers 1 and 3 are pseudowords and 4 means a statement.

8 Answers 2 and 4 are pseudowords, and 3 means curiosity.

The effect of -transfer and -familiar created the lowest percentage of correct answers for nouns at 50% and the second lowest percentage of correct answers for adjectives at 48%. The results demonstrated that the heritage group struggled with words that were different in form from English Latinate words and were non-colloquial. The heritage group performed poorly in instances such as the ones below:

20)

O juiz concedeu o pedido do\_.

The judge granted the request of the\_\_\_

1)requereiro, 2) requerício, 3) requeresco, 4) requerente<sup>9</sup>

Correct answer: 4

21)

*Ela gostou da floresta\_\_\_\_\_da amazônia.* She liked the\_\_forest of the Amazon

1)verdejante, 2) verdejeira, 3) verdisma, 4) verdista<sup>10</sup>

Correct answer: 1

The results demonstrate that heritage speakers can break word into parts to extract meaning of +transfer and +familiar words. They can decode meaning from Latinate and colloquial words to perform the task significantly better than words not Latinate in the dominant language and non-colloquial in Portuguese.

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9 Answers 1,2, and 3 are pseudowords.

10 Answers 2,3, and 4 are pseudowords.



Correct Response	Coefficient	Standard Error	Z	P>  Z	95% Confidence Interval
Part of Speech	.0661125	.429408	0.15	0.878	-.7755118 .9077367
Familiarity	1.048105	.3491255	3.00	0.003	.3638318 1.732378
Transferability	.0661125	.3899567	0.17	0.865	-.6981887 .8304136

Table 5- Hierarchical logistic regression results for the control group

Part of speech and transferability are not statistically significant ( $p>.05$ ) for the control group. However, familiarity is statistically significant ( $p<.005$ ). The hierarchical logistic regression shows that the control group also performed significantly better when words were +familiar.

The results indicate that colloquial complex words are easier to decode than non- colloquial complex words. The control group is also more morphologically aware of +familiar words.

## Final Considerations

Test items such as 14 and 15 presented in section 4 may be too non-colloquial to be part of the vocabulary of heritage speakers in this study compared to L1 Portuguese speakers. Derivational words are generally more infrequent because derivational processes are less productive and composed of a higher number of morphemes than inflectional processes. Therefore, heritage speakers may know a smaller set of derivational words compared to L1 speakers. Moreover, the heritage group may be disadvantaged in this task because they did not have extensive language exposure via reading and writing in Portuguese in the school environment to achieve a high vocabulary learning of infrequent words. They are young adults with only 5.1 years of formal Portuguese language schooling, compared to >16 years of the control group.

Heritage speakers in this study may have the same difficulty as many second language learners regarding morphological awareness of complex words in a language other than their dominant one. This is due to their limited knowledge of words in the additional language (Zhang, Koda, 2012). One reason for this common difficulty may be that heritage and second language speakers may not have language exposure via reading academic texts in their target languages. A second language speaker needs, on average, 10,000 words to read challenging academic texts in English (Schmitt, 2000), and many of the new words in academic texts are formed via derivational processes (Anglin, 1993; Guz, 2010; Nagy & Anderson, 1984). Many heritage and second language speakers lack this depth and breadth of vocabulary. However, Zhang and Koda (2012) have shown that morphological awareness contributes to vocabulary learning in second languages. One possible solution for heritage speakers to increase vocabulary learning is explicitly teaching morphological awareness via pedagogical activities to heritage learners as they progress in their heritage language studies. Learners should be exposed to the explicit process of morphological awareness in the heritage language via morphology activities to become more aware of the relationship between the form and meaning of stems and suffixes. Morphological awareness in the heritage language may also lead to increased vocabulary learning and greater reading comprehension in heritage Portuguese. This hypothesis needs to be confirmed by future testing.

The results showed that heritage speakers performed poorly with noun and adjective complex words. This may be due to a lack of exposure to syntactic alternations with derivational morphemes. One suggestion for Portuguese heritage language teaching is to make this syntactic awareness alternation process explicit. For example, show students that *educação*, education and *educacional*, educational or *amante*, lover and *amável*, lovable alternate in terms of part of speech by providing sentences, contexts, and collocations with these alternations. This explicit morphological awareness

process may increase syntactic awareness through derivational suffixes and vocabulary learning in the heritage language.

The heritage speaker group significantly performed better with derived words that transfer from English than with words that do not transfer from this same language. This result is consonance with properties of second/additional languages in which the linguistic system from the dominant language, via form-meaning relationships, transfers to the second/additional language(s). The acquisition of additional language properties may start from the access to and transfer from the first language (Schwartz & Sprouse, 1996) and, in the case of heritage speakers, from the dominant language. The heritage group may be using their knowledge of the English lexicon of Latinate stems and suffixes to perform the task significantly better with +transfer words than -transfer ones in Portuguese. By knowing the stems and the suffixes of these types of words, they can choose the correct derivational words in the task.

The effect of -transfer and -familiar created the lowest percentage of correct answers for nouns (50%) and the second lowest percentage of correct answers for adjectives (48%). This may be predictable since non-colloquial, infrequent words are usually presented in reading academic texts, and heritage speakers in this study have had limited access to formal schooling in Portuguese due to the language's minority status. Thus, the findings align with well-known facts about heritage languages.

+Transfer words may be helpful in strengthening the explicit process of morphological awareness and increasing vocabulary. Since heritage speakers may know some of the most frequent Latinate stems and suffixes transferred from English, they can focus on the explicit process of building form and meaning of related complex words. Suppose a Portuguese heritage learner knows *comunicação*, communication. In that case, they can learn *comunicacional*, communicational *comunicacionalizar*, comunicacionalize *comunicacionalismo*, and comunicacionalism, increasing their vocabulary and strengthening the decoding and derivation of closely related word formation processes (Nation and Bauer, 2023). Being morphologically aware

of +transfer words may also strengthen the learning of writing through the explicit exhibition of orthographical rules of complex words that follow transparent morphological principles in Portuguese. These rules may be easier to notice and learn with transfer words through explicit instructional activities on morphological awareness.

The results show that colloquial usage positively impacts performance with derived words. Speculation for the strong effect of familiarity is the fact that, on average, heritage speakers may have as their lexical inventory a small number of lexical items (around 5,000), which are made up of high-frequency words they know at least on a receptive level (Fairclough, 2011). This may explain why the heritage group performed better with colloquial derived words in the fill-in-the-blank task. These were the test items with the highest frequency ranking on the corpus *Linguateca*.

Moreover, the context of using a heritage language is a minority one, which may be restricted to parents, family, or social gatherings (Valdés, 2000). Thus, the vocabulary depth and breadth of the heritage language are low in terms of quality and quantity of words. (Zhang, 2013; Nassaji, 2006). Heritage speakers in this study may know a more straightforward and smaller number of complex words compared to their dominant language, and this may be due to their limited access to Portuguese language schooling. Thus, we see in the results that the heritage group answers the questions correctly when complex words are colloquial, and they answer them incorrectly when the complex words are non-colloquial. In other words, they perform well with a limited number of complex words, which are simpler and more frequent in oral input, and poorly with non-colloquial, infrequent words, which are usually exposed via reading academic texts in an educational setting.

The control group also performed significantly better with colloquial derivational words. They obtained 98% of correct responses with colloquial nouns and adjectives. These speakers perform almost at the ceiling with complex words that are colloquial and more present in oral language. They perform significantly worse with complex words that are non-colloquial.

The results show that even for the control group derivational processes are more straightforward with colloquial words. These words are more frequent in Portuguese and do not have to be learned inductively through reading academic texts or oral exposure.

To understand more non-colloquial words, some heritage students of Portuguese may need to be exposed to more stems and suffixes in the language through reading activities, and this may be done through explicit teaching on how to form and decode complex words in Portuguese when working with reading assignments. Portuguese Language teachers of heritage students should take advantage of times when the productivity of the suffix allows for some analogy patterns to take place and decode these instances in class to establish a strong comprehension of meaning. For example, with the infrequent adjectival suffix *-estre* in non- colloquial words such as *silvestre*, wild, *equestre*, equestrian, *campestre*, rural, the stems that combine with this suffix need to be given meaning. This meaning can be contextualized within a reading activity or via visuals so that complex words with the suffix *-estre* can become prominent. In this case, the meaning of the suffix *-estre* denotes properties of kind or place to the meaning of its corresponding stem. The meaning of these complex words should then be elicited by asking students to explain what the words *silvestre*, *equestre*, *campestre* mean within the context of the teaching activity.

Heritage speakers of Portuguese significantly performed worse with derivational words than Portuguese dominant speakers. However, heritage speakers performed significantly better with words that can be transferred from English and are colloquial. Colloquial usage also significantly helped the control group perform the task better within the control group. Since Latinate and non-colloquial words are primarily present in academic Portuguese texts, I encourage explicitly teaching morphological awareness and increasing reading activities of academic texts to increase vocabulary learning. Studies have shown that morphological awareness correlates with reading in the first and second languages/bilinguals reciprocally. It is unknown whether

it impacts reciprocally reading comprehension in adult heritage speakers of Portuguese in a college setting. Finding the answer to this gap in the literature is the objective of future work.

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