Language and Cognition (2026), 18, e70, 1–24
doi:10.1017/langcog.2026.10112

ARTICLE

Morphological processing of inclusive language in Spanish: A usage-based account

Kendra V. Dickinson[1] and Ezequiel M. Durand-López[2,3]

[1]Department of Spanish and Portuguese, Rutgers The State University of New Jersey, USA; [2]Department of Hispanic Studies, College of Charleston, USA and [3]Department of Psychology, College of Charleston, Charleston, USA
Corresponding author: Kendra V. Dickinson; Email: kendra.dickinson@rutgers.edu

(Received 23 June 2026 UTC; Revised 21 August 2026 UTC; Accepted 25 August 2026 UTC)

Abstract
We examine how form and usage shape the processing of the Spanish gender-inclusive morpheme *-e*. Within usage-based models, repeated exposure strengthens representations, allowing high-frequency forms to be retrieved holistically while infrequent forms remain compositionally demanding. To test these predictions, we compare the processing of the relatively frequent pronominal quantifier *tod-e-s* ('everyone-INC-PL') with its masculine counterpart *tod-o-s* ('everyone-M-PL') and plural inclusive adjectives such as *content-e-s* ('happy-INC-PL') with masculine forms such as *content-o-s* ('happy-M-PL'). First-language Spanish speakers completed a word-by-word self-paced reading task in which these forms referred to mixed-gender groups, followed by a sociolinguistic questionnaire. The results showed no reliable processing cost for *todes* relative to *todos* at the precritical, critical and postcritical regions. By contrast, inclusive adjectives elicited longer reading times than masculine adjectives at the critical word and spillover region. This cost appeared across most participant groups but was absent among those reporting the highest use of inclusive language. A participant-level bootstrap comparison showed that the processing burden was reliably greater for inclusive adjectives than for *todes*. These findings indicate that inclusive morphology is not processed uniformly across grammatical contexts. Instead, grammatical categories and individual experience modulate entrenchment, suggesting adult speakers can incorporate emergent morphology into real-time processing routines through exposure.

Keywords: inclusive language; morphology; Spanish; usage-based grammar

1. Introduction

Language is both a cognitive system and a social practice: speakers not only store and retrieve linguistic forms in memory but also encounter, use and interpret them in

© The Author(s), 2026. Published by Cambridge University Press. This is an Open Access article, distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike licence (http://creativecommons.org/licenses/by-nc-sa/4.0), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the same Creative Commons licence is used to distribute the re-used or adapted article and the original article is properly cited. The written permission of Cambridge University Press or the rights holder(s) must be obtained prior to any commercial use.

https://doi.org/10.1017/langcog.2026.10112 Published online by Cambridge University Press

context. Research has shown that our experience with linguistic forms can influence how we process them (Bybee, 2006; Kroll et al., 2010; *inter alia*). This is particularly relevant for morphology, which is one of the most challenging components of language to acquire (Ravid, 2019; Wulff & Ellis, 2018), due to its complex interaction of form and meaning, lower perceptual saliency, and higher cognitive load. Nevertheless, frequent use of and exposure to linguistic forms has been shown to facilitate morphological processing by shifting speakers away from morphological decomposition and toward whole-word processing, or *chunking*, thereby reducing cognitive load (e.g., Bybee, 2012; Caramazza et al., 1988; Durand-López & Garrido-Pozú, 2025; Ellis, 2002a, 2002b).

This relationship between experience and morphological processing is especially relevant in contexts of linguistic innovation. One such innovation is gender inclusive language in Spanish, which replaces the traditionally masculine gender suffix *-o* with the alternative gender neutral morpheme *-e* to refer to mixed-gender groups, the focus of the current study (Guidotti-Hernández, 2017; Papadopoulos, 2022).

Within this broader innovation, however, not all *-e* forms are equally frequent or familiar. Pronominal *tod-e-s* ('everyone-INC-PL' cf. *tod-o-s* 'everyone-M-PL') is often recognized as one of the first widespread instantiations of the *-e* morpheme in Spanish. Though much of its early diffusion was marked by jocular or dismissive uses (López, 2018; Rodríguez, 2021), *todes* became a societally recognizable form, even if not always employed with inclusive intent (González Camaño & Brown, 2022). This familiarity, alongside the already high frequency of its masculine counterpart *todos* as a form for both referring to and directly addressing mixed-gender groups, has contributed to making this instantiation of the *-e* morpheme in *todes* more frequent than in other grammatical categories (Martínez, 2019).

In light of these considerations, in this article we investigate how frequency of exposure to and use of inclusive language forms with *-e* influences their processing in Spanish while also exploring whether processing differs by grammatical function through a comparison of *todes*, a relatively frequent and socially salient pronominal instantiation of the inclusive *-e* morpheme, with less frequent inclusive *-e* adjectives among first-language Spanish speakers.[1]

2. Background

2.1. Gender and inclusive language in Spanish

Spanish grammatical gender classifies nouns as masculine or feminine (Alarcos Llorach, 1994), and regular inanimate nouns follow morphological rather than semantic assignment. Those ending in *-o* are masculine (e.g., *escritorio* 'desk') while those ending in *-a* are feminine (e.g., *ventana* 'window'). Exceptions such as *la mano* ('the.F hand') and *el día* ('the.M day') belong to a small class of nouns which deviate from expected gender patterns. In contrast, for animate nouns, grammatical gender generally maps onto sociocultural gender. Many personal and professional terms reflect this distinction (e.g., *enfermer-o* 'nurse-M' vs. *enfermer-a,* 'nurse-F').

Gender marking becomes especially consequential when referring to groups of people. Although Spanish distinguishes masculine and feminine forms in many

[1]We use this term as a demographic descriptor for speakers who have had lifelong exposure to grammatical gender to avoid the implications of a homogeneous or idealized group associated with terms like *native speaker* (Cheng et al., 2021; Dewaele et al., 2021).

https://doi.org/10.1017/langcog.2026.10112 Published online by Cambridge University Press

animate nouns, plural mixed-gender groups have traditionally been referred to with the so-called 'generic masculine,' where the masculine plural is used to refer to groups of multiple genders (e.g., *los enfermer-o-s* 'the.M nurse-M-PL'). This convention has become a central focus of inclusive language proposals in Spanish, with some accounts suggesting that it reinforces the association between grammatical and sociocultural gender, particularly through common masculine/feminine alternations (e.g., *herman-o/herman-a* 'brother/sister') (Bender et al., 2018; Casado et al., 2021).

Over the past half century, the generic masculine has been increasingly debated, with opponents arguing that it reinforces both gender biases and the gender binary (Papadopoulos, 2022). This concern is supported by empirical psycholinguistic evidence: readers and listeners of Spanish tend to interpret the generic masculine as male-referring rather than as truly generic, with corresponding processing costs when this interpretation conflicts with contextual or stereotypical information (Vela-Plo et al., 2025; see Heap, 2024, for a review of the Spanish and French empirical literature). Comparable male biases associated with the generic masculine have also been documented in other Romance and Germanic languages, including French (Gygax et al., 2012), as well as German (Stahlberg et al., 2001). These critiques have led to several proposals for alternative language forms, including coordinated masculine and feminine forms (e.g., *tod-o-s y tod-a-s* 'everyone and everyone') or epicene noun phrases (e.g., *todo el mundo* 'everyone'). Orthographic dual-gender options such as *-o/a* and *-@* emerged (Guidotti-Hernández, 2017). More recent strategies have moved toward gender neutrality, incorporating symbols such as *-x* to more explicitly detach gendered associations from morphological endings (Salinas & Lozano, 2021).

One proposal that has been gaining more recent traction is the use of the *-e* suffix as a non-gendered alternative. Inclusive *-e* can be used to refer to a specific nonbinary individual in the singular, with *-e* appearing on the noun and on agreeing determiners and adjectives (e.g., *le maestr-e dedicad-e* 'the.INC dedicated-INC teacher-INC'), as well as for generic use for groups that are mixed-gender, nonbinary or otherwise not represented by the masculine generic (e.g., *le-s maestr-e-s dedicad-e-s* 'the.INC-PL dedicated-INC-PL teacher-INC-PL'). Here, we focus on the latter.

Supporters of inclusive *-e* point to its phonological and morphological coherence with pre-existing structures in Spanish, such as *estudiante* ('student') and *cantante* ('singer') (Barrera Linares, 2019; Cabello Pino, 2020; Fábregas, 2023; Muelas-Gil, 2025), which belong to a class of human-referring nouns that do not alternate between gendered morphological inflections.[2] Nevertheless, inclusive *-e* is not endorsed by the Real Academia Española (RAE), the language's foremost prescriptive authority. This lack of institutional support shapes the ideological landscape in which speakers encounter inclusive language (see González Rivera, 2025).

Recent corpus-based work documented usage patterns of inclusive morphology in Spanish. One of the earliest large-scale studies examined 128,649,761 tweets from Argentina between 2007 and 2020 (Kalinowski, 2020). This study examined both the singular and the plural of coordinated forms (e.g., *amig-o y amig-a* 'friend-M and friend-F'), slash forms (e.g., *amig-o/a* 'friend-M/F') and forms marked with *-@, −x* and *-e* morphology. Results revealed that these inclusive forms remained

[2]Though such forms provide a morphological model for the use of *-e* in animate reference, they are not free of gendered interpretation and stereotypes (Román-Irizarry & Guzzardo Tamargo, 2025).

https://doi.org/10.1017/langcog.2026.10112 Published online by Cambridge University Press

quantitatively limited (225.68/million words) and were concentrated among just a few lexical items. Even in 2019, the year of highest use, only slightly over 0.35% of tweets contained any inclusive form. Another recent study examined 3,510 instances of first-person plural Spanish subject morphology on Twitter, finding that masculine (*nosotr-o-s* 'we-M-PL') and feminine (*nosotr-a-s* 'we-F-PL') forms accounted for 55.8% and 33.87% of the tokens, respectively (Samples, 2024). The remaining 10.33% of tokens included forms utilizing the *-@, −x* and *-e* variants, including just 0.6% ($n = 21$) with the *-e* morpheme.

Existing work also suggests that inclusive morphemes are unevenly distributed across lexemes and syntactic categories. In their study of educational communities on Twitter, Núñez-Román et al. (2023) found that, apart from the lexical item *alumnado* ('student body'), *−x* appeared most frequently in pronominal *tod-x-s* ('everyone-INC-PL') when referring to groups of students. The same marker was attested less often with other lexemes, such as *alumn-x-s* ('student-INC-PL'). Similarly, our search of the Spanish Web corpus esTenTen23 (Kilgarriff & Renau, 2013) returned 14,259 instances of *todes*, compared with only 336 instances of *-e* across a sample of 15 adjectives (see Supplementary Appendix A for full table of our corpus queries).

2.2. Usage-based grammar and morphological processing

In usage-based models of grammar, frequency is a central mechanism of both language learning and language variation (Bybee, 2006, 2012). Crucially, *token frequency* and *type frequency* support different kinds of linguistic generalization: *token frequency* refers to the number of occurrences of a particular linguistic unit, whereas *type frequency* refers to the number of different forms that follow a particular pattern. In other words, repeated exposure to the same form strengthens familiarity with that particular item, while exposure to the same pattern across many different forms provides evidence that the pattern can be generalized. This distinction is especially relevant to inclusive *-e*, which is unevenly distributed across Spanish. A form such as *todes*, for example, may be encountered relatively often, providing speakers with repeated experience with that particular lexical item. By contrast, encounters with *-e* across different lexical items provide evidence that *-e* functions as a broader morphological pattern. Thus, token and type frequency provide complementary ways of characterizing the distributions of inclusive *-e* in Spanish. Whereas token frequency reflects how often particular forms occur, type frequency reflects how broadly *-e* is distributed across different lexical items.

These two frequency measures are expected to have different consequences for linguistic representation and processing. When the same form is encountered repeatedly, its representation becomes stronger, or more entrenched, in memory (Langacker, 1987). As a result, high-token-frequency forms may become increasingly familiar and can be processed more readily as whole units, or chunks, rather than being analyzed into their component parts on each encounter (Bybee, 2012; Ellis, 2002a, 2002b; Gobet et al., 2001), a process also described as *automatization* (Diessel, 2015). When the same morphological pattern occurs across many different lexical items, it provides evidence for a more abstract representation of that pattern, which can support the interpretation of less familiar or novel forms. In usage-based accounts, this ability to extend a pattern beyond the individual forms in which it has been encountered is referred to as *morphological productivity* (Bybee, 1985,

https://doi.org/10.1017/langcog.2026.10112 Published online by Cambridge University Press

1995). Thus, while high token frequency primarily strengthens the representation of particular lexical items, high-type frequency supports the representation of a broader morphological pattern. For this study, this distinction means that the relatively high token frequency of *todes* may facilitate the processing of that particular form, whereas the processing of less frequent *-e* adjectives may depend more heavily on the extent to which *-e* is represented as a broader morphological pattern.

Experimental evidence further supports the role of frequency in morphological learning. For example, Endress and Hauser (2011) found that participants learned exceptional affixation patterns more successfully as the token frequency of those exceptions increased. This distinction is central to this study because while the aforementioned documented distribution of inclusive forms in Spanish tells us how often particular forms occur, it does not reveal how broadly the inclusive *-e* morpheme extends as a productive pattern across the grammar. Thus, even if a specific form such as *todes* is relatively frequent, its frequency does not necessarily show that speakers have generalized *-e* as a productive strategy for inclusive language in Spanish.

These usage-based predictions about entrenchment and productivity connect to a broader question in morphological processing about whether complex forms are decomposed into morphemes or accessed as whole lexical units during language processing. Decomposition-based accounts propose that complex words are parsed into their constituent morphemes before lexical access (Taft, 2004), whereas whole-word accounts propose that complete forms can be stored and retrieved directly, with more frequent forms benefiting from stronger lexical representations (Butterworth, 1983).

In line with usage-based approaches, the present study draws on hybrid models, particularly the Augmented Addressed Morphology Model (Burani et al., 1984; Burani & Laudanna, 1992; Caramazza et al., 1988), which proposes that speakers may rely on either whole-word retrieval or morphological decomposition depending on factors related to language experience, such as lexical frequency. Under this account, high-frequency words develop stable lexical representations and can be accessed as whole units, whereas low-frequency or novel forms are more likely to be decomposed into morphemic components and recombined during recognition. Evidence from first-language speakers supports this frequency-sensitive account, showing greater evidence of whole-word processing for high-frequency forms and greater reliance on decomposition for less frequent forms (Domínguez et al., 2004; Giraudo et al., 2016; Lehtonen & Laine, 2003). This model is particularly relevant to the present study because it links morphological processing to patterns of exposure, allowing for predictions about whether inclusive *-e* forms are accessed as productive morphological combinations or as more item-specific lexical forms.

2.3. Online processing of novel morphology in Spanish

This aforementioned distinction between whole-word retrieval and morphological decomposition provides the basis for interpreting online processing studies of inclusive morphology in Spanish, where slower or faster reading times (RTs) may reflect this difference. Studies in this area have had a range of results, and interpreting them requires attending carefully to differences in dependent variables, experimental manipulations and participant populations.

https://doi.org/10.1017/langcog.2026.10112 Published online by Cambridge University Press

For instance, Nadal and Bove (2024) found that Spanish gender doublets (e.g., *niños/as* 'children-M-PL/F-PL') produced longer RTs than generic masculine forms, suggesting that some inclusive strategies increase processing effort. Examining a different inclusive strategy, Zarwanitzer and Gelormini-Lezama (2023) found that monolingual Rioplatense Spanish speakers read sentences including lexical items with *-e* and *-x* forms (e.g., *hij-e-s* and *hij-x-s* 'offspring-INC-PL'), more slowly than those with generic *-o*. In a related study, Stetie and Zunino (2024) used RTs in a task in which inclusive *-e* appeared on stereotyped role nouns (e.g., *les niñeres* 'the-INC-PL nanny-INC-PL,' *les marineres* 'the-INC-PL sailor-INC-PL'). Unlike Zarwanitzer and Gelormini-Lezama (2023), they parsed RTs into distinct regions and found a semantic bias effect only at the spillover word, with no significant differences in total sentence RTs. This regional analysis led them to conclude that processing difficulty associated with *-e* is local and does not extend to global sentence RTs. Also, the authors attributed the longer RTs for female-biased role nouns in part to the lower frequency with which the *-e* morpheme tends to co-occur with such nouns in naturalistic usage, suggesting that distributional frequency shapes local processing difficulty even when global computation remains unaffected.

Román-Irizarry et al. (2025) extended this work to inclusive pronouns, including anaphoric quantifiers *much-x-s/much-e-s* ('many-INC-PL') versus *much-o/a-s* ('many-M/F-PL'). They found processing costs for inclusive forms at the critical and spillover regions, with *-x* producing the longest RTs, followed by *-e*, *—a* and *-o*. These costs did not affect comprehension accuracy, suggesting a measurable but limited disruption. Importantly, participants' prior exposure and gender/sex diversity beliefs moderated processing, where more gender-normative beliefs were associated with longer RTs. Complementing this work, Román-Irizarry and Guzzardo Tamargo's (2025) eye-tracking study found that *-x* pronouns were more costly than *-o* across early and late measures and more costly than *-a* in some measures, again without reducing comprehension accuracy. They also found evidence that positive attitudes toward gender-inclusive language were associated with faster processing of *-x*.

Together, these studies suggest that the processing of inclusive morphology in Spanish is not altogether straightforward and that apparent discrepancies across studies may reflect genuine differences tied to linguistic context, scope of analysis and participant characteristics. Therefore, in this work, we explore the potential roles of syntactic category, comparing adjectives and the pronominal quantifier *todes* in addition to reported usage patterns in the processing of inclusive *-e*, in order to contribute to the growing understanding of the complex mechanisms underlying how inclusive *-e* forms in Spanish are processed.

3. The study

Although inclusive language in Spanish has existed for some time, its recent growth has outpaced research on how first-language speakers process these forms online. Existing studies report mixed findings regarding the processing costs of inclusive morphology during sentence comprehension (Marchesini, 2019; Román-Irizarry et al., 2025; Stetie et al., 2024; *inter alia*). Key questions therefore remain concerning how adults represent and process these forms: as relatively fixed lexicalized items, as instances of a productive morphological pattern or through some combination of

https://doi.org/10.1017/langcog.2026.10112 Published online by Cambridge University Press

lexical and morphological representations, and how processing is shaped by lexical frequency, morphosyntactic context and individual exposure.

The present study builds on our previous work on the processing of Spanish adjectives marked with inclusive *-e* among first-language speakers of Spanish (Durand-López & Dickinson, 2025). That study not only found longer self-paced reading task RTs for inclusive *-e* adjectives than for their generic masculine *-o* counterparts but also found that reported frequency of inclusive language use modulated these costs. Specifically, speakers who reported the highest frequency of use of inclusive language showed no difference in processing times between *-e* and *-o* adjectives.

These findings are limited in two respects. First, they concern a single syntactic category. Second, *–e* has lower token frequency in adjectives than in other forms, including pronominal quantifiers such as *todes*. The present study therefore examines the processing of inclusive *-e* in *todes* alongside plural adjectives. *Todes* is a particularly useful case because its generic masculine counterpart *todos* is already widely used for collective reference and as a vocative, allowing speakers to refer to or address groups of people. As an inclusive alternative, *todes* is structurally familiar, communicatively useful in contexts involving multiple or unknown gender identities and socially salient in media, education and social networks (González Camaño & Brown, 2022; López, 2018; Rodríguez, 2021). These factors may increase speakers' exposure to the form and contribute to its lexical entrenchment.

Building on the theoretical questions and methodological concerns described above, the present study contributes to our understanding of language in that it (a) assesses gender agreement with the inclusive *-e* suffix between a plural subject (a mix of names typically associated with men and women) and coreferential pronominal quantifier, (b) compares the processing burdens of inclusive language forms with the *-e* morpheme across grammatical functions (adjective vs. pronominal quantifier) and (c) includes frequency of use of inclusive language as a predictor to explore whether exposure to the *-e* suffix modulates how this form is processed and potentially represented in adulthood. As such, the present work addresses the following research questions:

RQ1A: Does the inclusive pronominal quantifier *todes* impose greater processing costs than the generic masculine *todos* during sentence comprehension among first-language Spanish speakers?

RQ1B: Do inclusive plural adjectives with *-e* impose greater processing costs than the generic masculine plural adjectives with *-o* during sentence comprehension among first-language Spanish speakers?

RQ2A: Does self-reported inclusive language use modulate the processing of *todes*?

RQ2B: Does self-reported inclusive language use modulate the processing of plural inclusive adjectives?

RQ3: Do inclusive adjectives with lower token frequency impose relatively greater processing costs than the higher token frequency form *todes*, when compared to their generic masculine counterparts?

Because the present study examines how established inclusive forms such as todes and *-e* adjectives are in speakers' processing systems, we treat processing cost as an indirect measure of the relative ease with which these forms are accessed during comprehension. Rather than assuming a categorical distinction between acquired and nonacquired forms, we adopt a gradient view in which reduced processing costs may reflect greater familiarity and entrenchment, whereas greater processing costs

https://doi.org/10.1017/langcog.2026.10112 Published online by Cambridge University Press

may reflect less established representations or a greater reliance on morphological analysis. We predict that both *todes* and plural *-e* adjectives will yield longer RTs than their generic masculine counterparts, consistent with prior work suggesting that inclusive morphology can incur processing costs (e.g., Marchesini, 2019; Román-Irizarry et al., 2025; Zarwanitzer & Gelormini-Lezama, 2023). However, we also predict that *todes*, as a high token frequency item, will be processed more quickly than lower-frequency *-e* adjectives. This prediction follows from usage-based and hybrid models of morphological processing, which suggest that high-frequency items become entrenched in memory and are more likely to be accessed holistically (Burani & Laudanna, 1992; Bybee, 2012; Caramazza et al., 1988; Diessel, 2015). By contrast, lower-token-frequency but higher-type-frequency *-e* adjectives may require morphological decomposition, increasing processing cost. Finally, we predict that participants' self-reported use of inclusive language will modulate processing times for both *todes* and *-e* adjectives, with more frequent users showing reduced RTs. Together, these analyses provide insight into the learnability of inclusive morphology and the role of frequency in adult acquisition of novel grammatical forms, as well as the productivity of the inclusive *-e* morpheme across the grammar.

4. Methods

4.1. Participants

A total of 62 first-language Spanish speakers residing in majority Spanish-speaking countries[3] participated in the study.[4] Half of the participants ($n = 31$) reported never using the inclusive morpheme *-e*, while the remaining half reported using it to varying degrees (Table 6). Participants ranged in age from 19 to 57 years ($M = 29.52$, $SD = 6.91$). They came from across the Spanish-speaking world, with the largest groups from Argentina ($n = 32$, 51.6%) and Mexico ($n = 12$, 19.4%), as well as Bolivia, Chile, Colombia, Costa Rica, Ecuador, Peru, Spain and Venezuela. In an open-ended gender question, 31 participants identified as female (50%), 25 as male (40.3%), 3 as nonbinary (4.8%), 1 as trans feminine (1.6%) and 2 as gender fluid (3.2%). See Supplementary Appendix B for additional participant information.

4.2. Materials and procedure

Before completing the study instruments, all participants reviewed informed consent documentation explaining their rights. After consenting, participants completed a self-paced reading task in Spanish followed by a sociolinguistic questionnaire. The study was completed remotely on participants' personal devices, with instructions

[3]We included country as a random intercept in all models in order to account for potential baseline differences in RTs across national groups. However, inspection of the variance components indicated that participant country of origin accounted for relatively little variance compared to participant-level, item-level and residual variation in all models. Nevertheless, this dataset is intended as a preliminary investigation into processing times related to inclusive language, with future research aimed at incorporating a more diverse participant pool to enhance generalizability.

[4]A limitation of this study is the absence of an a priori power analysis. Since post hoc power analyses are generally considered uninformative and misleading (Heinsberg & Weeks, 2022), we acknowledge this limitation and interpret the findings with appropriate caution, particularly for null effects and higher-order interactions.

https://doi.org/10.1017/langcog.2026.10112 Published online by Cambridge University Press

provided regarding browser and technical requirements. Participants were compensated for completing all parts of the study. All study materials, data and code for analysis are available via an open repository. Please see Supplementary Appendix C to access study materials.

4.2.1. Self-paced reading task

The self-paced reading task, conducted in PsychoPy (Peirce, 2007), used a noncumulative moving-window paradigm. Each trial began with a fixation cross displayed for 1 s, followed by a Spanish sentence that participants advanced word by word by pressing the space bar. After the final word, participants answered a yes/no question targeting content unrelated to the study's critical regions to ensure comprehension. PsychoPy recorded word-by-word RTs and comprehension accuracy.

A total of 92 sentences (excluding three practice items presented at the beginning of the experiment) were divided into two counterbalanced lists, each containing 16 pronominal sentences, evenly divided between *todes* and *todos*; 16 adjectival sentences, evenly divided between *-e* and *-o* forms; and 14 filler sentences. Items were pseudorandomized within each list to avoid consecutive presentation of the same condition or structure. The number of items per condition (8) follows common recommendations in psycholinguistic experimental design (Jegerski, 2014).

All sentences contained 12 words. In the adjectival condition, each sentence began with a carrier phrase (e.g., *Dicen que* 'they said that'), followed by a sentential subject consisting of four names: two traditionally masculine names (e.g., Pedro, Néstor) and two traditionally feminine names (e.g., Carmen, Ana), presented in alternation. These names were followed by the verb *están* ('they are') followed by the critical position. This critical item was an adjective with generic masculine *-os* or inclusive plural *-es* marking in the plural (e.g., *content-o-s* 'happy-M-PL' or *content-e-s* 'happy-INC-PL'). The sentences ended with a prepositional phrase. A sample sentence can be found in (1).

(1) Dicen que Luis, María, Jorge, y Julia están content-o/—e-s
say that Luis María Jorge and Julia are happy-M/INC-PL
con su trabajo.
with their work.
'They say that Luis, María, Jorge, and Julia are happy with their work.'

Pronominal stimuli began with a sentential subject, following the same four-name structure described above. These were followed by a third-person plural transitive verb in the present tense transitive verb (e.g., *bailan* 'dance-3PL.PRES') and its direct object (e.g., *cumbia* 'cumbia'). The second sentence included the subject *tod-o-s* ('everyone-M-PL') or *tod-e-s* ('everyone-INC-PL'), the verb *están* (be-3PL.PRES) and a prepositional phrase (e.g., *en el bar* 'at the bar'). A sample base sentence can be found in (2).

(2) Luis, María, Jorge, y Julia bailan cumbia; Tod-o/e-s están
Luis, María, Jorge, and Julia dance cumbia all-M/INC-PL are
en el bar.
in the bar.
'Luis, María, Jorge, and Julia dance cumbia. They are all in the bar.'

https://doi.org/10.1017/langcog.2026.10112 Published online by Cambridge University Press

In this study, the areas of interest within sentences included the *N-1 position* (the pre-critical region; the word *cumbia* in the sample sentence), the *N position* (*todos*/*todes*) and the *N + 1 position* (the post-critical word; *están*). We analyzed data from the N-1 position to confirm that both conditions required equal processing effort before encountering the critical word. This allowed us to ensure that any differences observed at N are not simply the result of spillover effects from the preceding word. Similarly, we analyzed RTs from the N + 1 position to examine potential spillover effects.

4.2.2. Sociolinguistic questionnaire

To facilitate the examination of how processing relates to individual characteristics and experiences with inclusive language, participants completed an online questionnaire (Qualtrics, n.d.). The first section collected demographic information, including age, gender, education level, place of origin and residence. Participants then answered questions about their familiarity with inclusive language, their use of *-e* across modalities (e.g., writing, speech) and contexts (e.g., *con amigos* 'with friends') as well as when they first heard or began using inclusive *-e*. When asked whether they used inclusive *-e*, participants were instructed that any amount of use counted, from frequent to infrequent use. Those who affirmed using inclusive language then indicated how often they used it, selecting between *con poca frecuencia* ('rarely'), *a veces* ('sometimes'), *con mucha frecuencia* ('often') or *siempre que puedo* ('as much as I possibly can'). This measure served as an individual-difference predictor of self-reported habitual use.[5]

4.3. Statistical methods

Following standard procedures for self-paced reading studies (e.g., Futrell et al., 2021; Jegerski, 2014), trials with RTs shorter than 200 ms or longer than 3,000 ms were excluded, as these values likely reflect accidental key presses, lapses in attention or distraction. All data visualization was performed using the `ggplot2` package (Wickham, 2016) in R (R Core Team, 2026). All descriptive statistics and figures are presented in milliseconds to facilitate interpretation. However, due to the positive right skew typical of RT data, RTs were log10-transformed prior to inferential analysis. Additionally, because the adjectival and pronominal stimuli differed structurally, most notably in critical-word length, the two datasets were analyzed separately. This approach avoids confounds related to word length and sentence position while allowing the same preprocessing steps, model-building strategies and potential predictors to be applied to both datasets.

Following standard procedures in the psycholinguistic literature for the self-paced reading method (e.g., Jegerski, 2014), we analyzed RTs at the N-1 position, the N position and the N + 1 position for both datasets. For each position in each dataset (adjectives, *todos* vs. *todes*), we constructed a series of nested mixed-effects linear regression models using the 'lme4' package (Bates et al., 2015), with log-transformed

[5]We interpret this variable as an index of participants' reported experience with and orientation toward inclusive forms, not as a direct measure of exposure or production. Such measures are widely used in sociolinguistic and psycholinguistic research and can validly capture broad differences in usage patterns (Dollinger, 2012; Kaushanskaya et al., 2020).

https://doi.org/10.1017/langcog.2026.10112 Published online by Cambridge University Press

RT as the dependent variable. Potential fixed effects included grammatical gender, participant age, participant gender, and self-reported use of inclusive language. In addition to simple effects, we also tested an interaction between reported inclusive language usage frequency and gender morpheme (*–e* vs. *-o*). This interaction was motivated by the usage-based account outlined in Section 2, according to which greater experience with a linguistic form or pattern strengthens its representation and can facilitate processing. Our research questions ask whether the processing difference between inclusive *-e* and generic masculine *-o* varies as a function of participants' reported inclusive language use.

Grammatical gender was treatment-coded, with *-o* adjectives and *todos* serving as the generic masculine reference levels. Other categorical predictor variables were sum coded, because this coding scheme allows lower-order effects to be interpreted as average effects across the levels of the other predictors, rather than as effects evaluated at a single reference level. This approach preserves the theoretically motivated comparison between inclusive and generic masculine forms while avoiding reference-level interpretations for the remaining predictors involved in interactions. Furthermore, we included a random intercept for each participant to account for individual variation in reading behavior and repeated measures. We also included random intercepts for item and participant country of origin.[6]

Nested models were compared using likelihood ratio tests via the anova function. For the selected models, marginal and conditional R^2 values were calculated following Nakagawa and Schielzeth (2013). When models included interactions, conditional effects were examined using estimated marginal means with the 'emmeans' package (Lenth & Piaskowski, 2026). Pairwise comparisons were conducted from the fitted models rather than raw means, allowing contrasts to reflect the fixed- and random-effects structure.

Finally, we compared the adjectival and *todos/todes* datasets by calculating the relative RT increase for inclusive forms within each word type: *-e* adjectives relative to *-o* adjectives and *todes* relative to *todos.* Because this measure expresses the inclusive-form cost relative to each word type's own generic masculine baseline, it reduces the influence of absolute RT differences attributable to word length and syllable count. For each participant and grammatical function, we calculated these relative increases and then derived a difference score, subtracting the pronominal increase from the adjectival increase, to assess whether inclusive adjectives imposed a greater processing cost than *todes* on average across participants.

To assess the reliability of this difference, we used a nonparametric cluster bootstrap with 5,000 resamples. Because the data included repeated observations from the same participants, resampling was conducted at the participant level: on each iteration, participants were sampled with replacement, and the mean adjectival–pronominal difference score was recalculated. This procedure preserves the participant-level dependency structure while estimating sampling variability directly from the data (Efron & Tibshirani, 1993). The resulting bootstrap distribution was used to derive a 95% confidence interval and evaluate whether the observed difference reflected a robust pattern across participants.

[6]We included country as a random intercept in all models in order to account for potential baseline differences in RTs across national groups. However, inspection of the variance components indicated that participant country of origin accounted for relatively little variance compared to participant, item-level and residual variation in all models.

https://doi.org/10.1017/langcog.2026.10112 Published online by Cambridge University Press

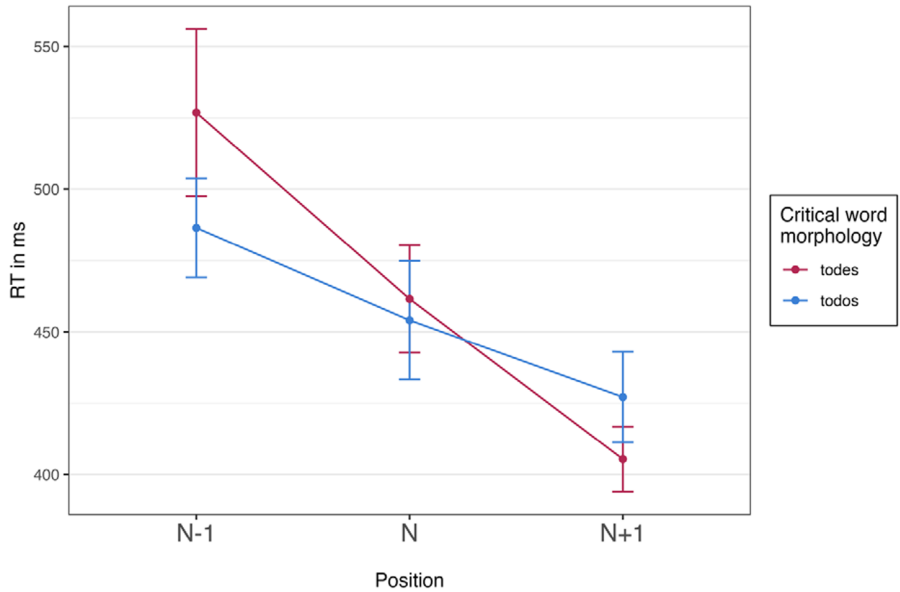


Figure 1. Average RTs for the precritical, critical and postcritical words by gender condition for pronominal data. *Note*: Error bars represent approximate 95% confidence intervals around the mean.

5. Results

5.1. Todos *and* todes

5.1.1. Overview of the data

The present analysis focuses on 966 critical word RT measures for *todos* ($n = 489$) and *todes* ($n = 477$). Descriptively, RTs were nearly identical across conditions. Specifically, participants took 461.56 ms ($SD = 206.08$ ms) on average to read *todes*, compared to 454.08 ms ($SD = 229.85$ ms) for *todos*, as visualized in Figure 1.

5.1.2. Inferential analysis of the todos *and* todes *dataset*

We first examined the pre-critical region (N-1) to ensure that any critical-word effects were not driven by earlier differences between conditions. The null model, including only random intercepts for participant, country and item, provided the best fit and the model including grammatical gender showed no reliable effect of condition (Table 1).[7] Thus, we found no evidence for a difference between the two conditions prior to the critical word.

The same pattern emerged at the critical word position. The null model provided the best fit, and the model including grammatical gender showed only a negligible difference between RTs associated with *todes* relative to *todos* (Table 2).[8] Thus, we found no evidence that *todes* incurs a processing cost relative to *todos*. Additionally, marginal R^2 was 0.001, indicating that the fixed effects explained ~0% of the variance.

[7]lmer(logRT~grammatical gender+(1|participant) + (1|sentence) + (1|country))
[8]lmer(logRT~grammatical gender+(1|participant) + (1|sentence) + (1|country))

https://doi.org/10.1017/langcog.2026.10112 Published online by Cambridge University Press

Table 1. Output of the linear model including gender for pronominal data at the *N* − 1 position

	Factor value	Estimate	Std. error	*t*-value
Grammatical gender (reference level: *todos*)	Intercept	2.63901	0.02234	118.147
	todes	0.01314	0.01421	0.924

Table 2. Output of the linear model including gender for pronominal data at the *N* position

	Factor value	Estimate	Std. error	*t*-value
Grammatical gender (reference level: *todos*)	Intercept	2.60977	0.01807	144.435
	todes	0.01073	0.01348	0.796

Table 3. Output of the linear model including gender for pronominal data at the *N* + 1 position

	Factor value	Estimate	Std. error	*t*-value
Grammatical gender (reference level: *todos*)	Intercept	2.59341	0.01592	162.929
	todes	−0.01395	0.01074	−1.299

Conditional R^2 was .361, showing that including random intercepts increased the explained variance to ~36.1%. Most of this additional variance was attributable to differences between participants, with the country contributing a smaller share.

The postcritical region (N + 1) also showed no evidence of spillover effects. Words following *todes* were read in 405.41 ms on average (*SD* = 124.85), compared to 427.16 ms (*SD* = 175.31) for words following *todos.* The null model again provided the best fit, and the model including grammatical gender showed no reliable effect of the preceding form (Table 3).[9]

Overall, the pronominal data show no meaningful effect of morphological gender at the precritical, critical or postcritical region. Nevertheless, questions remain as to the role of other factors in this finding, namely, the degree to which this pattern aligns with or differs from the RTs associated with adjectival inclusive language forms.

5.2. Adjectives

5.2.1. Overview of the data[10]

The present analysis focuses on 950 critical word RT measures for generic masculine adjectives (*n* = 481) and inclusive adjectives (*n* = 469). Overall results show observably longer RTs for inclusive adjectives compared to their generic masculine counterparts. Specifically, participants took 518.49 ms (*SD* = 301.32 ms) on average to read

[9]lmer(logRT~grammatical gender+(1|participant) + (1|sentence) + (1|country))

[10]As noted, our adjectival analysis is composed of data points collected in two rounds of data collection, the first of which has been previously published in Durand-López and Dickinson (2025). The goal of the inclusion of an adjectival analysis in the present article is to incorporate the second round of collected data into the analysis and facilitate cross-grammatical context comparison with the heretofore unexplored pronominal data.

https://doi.org/10.1017/langcog.2026.10112 Published online by Cambridge University Press

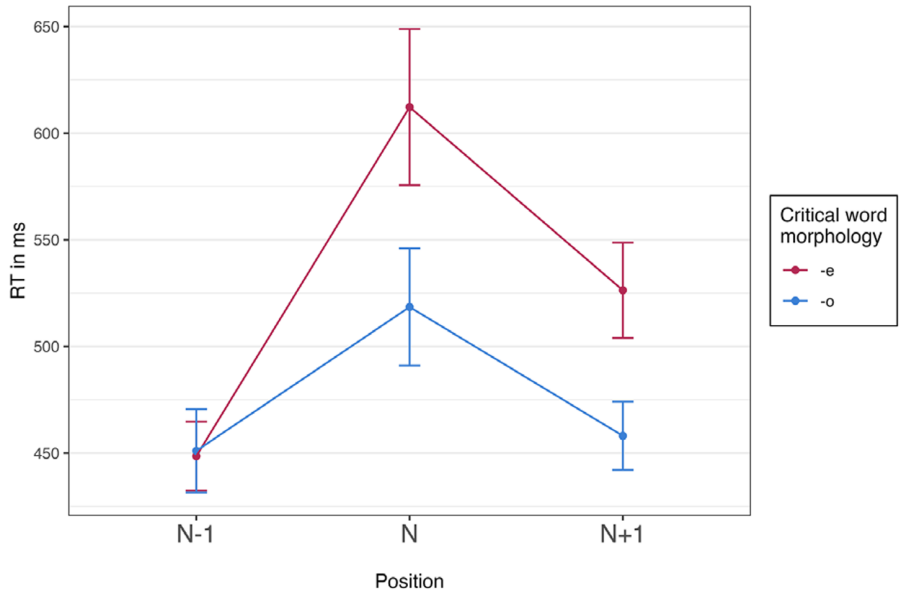


Figure 2. Average RTs for the precritical, critical and postcritical words by gender condition for adjectival data. *Note*: Error bars represent approximate 95% confidence intervals around the mean.

generic masculine adjectives, compared to 612.19 ms (*SD* = 396.57 ms) on average for inclusive forms, as visualized in Figure 2.

5.2.2. *Inferential adjectival analysis*

We first examined the precritical region (N–1) to ensure that critical-word effects were not driven by earlier differences between conditions. Words preceding generic masculine adjectives had a mean RT of 451.07 ms (*SD* = 214.28, *n* = 481), while words preceding inclusive adjectives had a mean RT of 448.59 ms (*SD* = 178.18, *n* = 487). The null model provided the best fit, and the model including grammatical gender showed no reliable effect of condition (Table 4).[11]

We then followed the same procedure to construct a series of models for the critical word (N) position. The best-fit model for these data included a simple effect of word gender (*–o* vs. *-e*), as well as an interaction between word gender and participant-reported frequency of inclusive language use. The output of this model is shown in Table 5.[12]

Table 4. Output of the linear model including gender for adjectival data at the *N* − 1 position

	Factor value	Estimate	Std. Error	t-value
	Intercept	2.596028	0.020304	127.857
Grammatical gender (reference level: *-o*)	*-e*	0.007776	0.013259	0.586

[11]lmer(logRT~grammatical gender+(1|participant) + (1|sentence) + (1|country))
[12]lmer(logRT~grammatical gender*freq_e + (1 | participant) + (1|country) + (1|sentence))

https://doi.org/10.1017/langcog.2026.10112 Published online by Cambridge University Press

Table 5. Output of the linear model including gender for adjectival data at the *N* position

	Factor value	Estimate	Std. Error	t-value
	Intercept	2.634594	0.032002	82.326
Grammatical gender (reference level: *-o*)	*-e*	0.056629	0.020681	2.738
Reported Frequency of use of *-e*	Never	−0.005788	0.030394	0.190
	Rarely	−0.007136	0.052990	−0.135
	Sometimes	−0.037654	0.037753	−0.997
	Often	0.021015	0.046142	0.455
Grammatical gender *	Never * e	−0.009011	0.019211	−0.469
Reported frequency of use of *-e*	Rarely * e	0.033294	0.033635	0.990
	Sometimes * e	0.014062	0.023907	0.588
	Often * e	0.031270	0.028786	1.086

The results of the best-fit model indicate a positive effect of grammatical gender at the critical word position. Because inclusive language frequency was sum-coded, the coefficient for grammatical gender represents the average contrast between inclusive *-e* adjectives and generic masculine *-o* adjectives across levels of reported inclusive language use. Relative to generic masculine adjectives, inclusive adjectives were associated with longer RTs overall ($\beta = 0.056629$, $SE = 0.020681$, $t = 2.738$), corresponding to an approximate average increase in the processing time of 14%[13] for inclusive adjectives with *-e*, suggesting a general processing cost for inclusive adjectival morphology.

Because frequency of inclusive language use was sum-coded, the fixed-effect coefficients compare each level of use to the grand mean rather than providing direct comparisons within each use-frequency group. To make the pattern more interpretable, we conducted pairwise comparisons of gender morphology within each level of reported inclusive language use (Table 6). Negative estimates indicate slower RTs for *-e* adjectives relative to *-o* adjectives.

Pairwise comparisons in Table 6 show that *-e* adjectives were read significantly more slowly than -o adjectives in all groups except the highest-use group. Among

Table 6. Pairwise comparisons of gender morphology RTs within levels of reported *-e* use

Reported use of *-e*	Estimate	SE	t	p
Never ($n = 31$)	−0.0476	0.0232	−2.050	0.043
Rarely ($n = 5$)	−0.0899	0.0430	−2.094	0.037
Sometimes ($n = 12$)	−0.0707	0.0298	−2.374	0.018
Often ($n = 7$)	−0.0879	0.0362	−2.428	0.016
As much as I possibly can ($n = 7$)	0.0130	0.0354	0.366	0.714

Note: Planned simple-effects comparisons examined the *-o* versus *-e* contrast separately at each frequency level. Frequency level was specified as the by factor in the 'emmeans' package. Thus, multiplicity adjustments were defined relative to each frequency-level group rather than jointly across all frequency levels. Because each group contained only one *-o* versus *-e* contrast, no additional multiplicity adjustment across frequency levels was applied.

[13]Because the dependent variable was log10-transformed RT, this estimate was converted to a percent change using the formula ((10^\beta - 1) \times 100). Thus, ((10^{0.056629} - 1) \times 100 = 13.9), indicating that inclusive *-e* adjectives were associated with approximately 13.9% longer RTs than generic masculine *-o* adjectives.

https://doi.org/10.1017/langcog.2026.10112 Published online by Cambridge University Press

Table 7. Output of the linear model including gender for adjectival data at the *N* + 1 position

	Factor value	Estimate	Std. error	*t*-value
	Intercept	2.63019	0.01582	166.277
Grammatical Gender (reference level: *-o*)	*-e*	0.0511	0.01407	3.633

participants who reported using inclusive language 'as much as I possibly can,' the contrast was not significant and numerically reversed, with *-e* adjectives read slightly faster than *-o* adjectives (p = .714). Thus, the processing cost for inclusive adjectival morphology was present across most use-frequency groups but absent among the most frequent users.

The postcritical region showed spillover effects. Words following inclusive adjectives were read more slowly than those following generic masculine adjectives, 526.32 ms (SD = 248.04, n = 493) versus 458.09 ms (SD = 177.00, n = 487). The best-fit model again included a simple effect of grammatical gender as shown in Table 7,[14] consistent with the elevated RTs following inclusive adjectives in Figure 2.

Overall, these results indicate that inclusive adjectival morphology (*−e*) incurs a measurable processing cost relative to generic masculine forms (*−o*). This effect is visible both at the critical word itself and in the subsequent spillover region, suggesting that readers require additional time to integrate the inclusive form during sentence processing. At the same time, the interaction between gender and self-reported inclusive language use suggests that experience with inclusive forms may modulate this cost for some speakers. Critically, the expanded dataset replicates the core pattern reported in Durand-López and Dickinson (2025), confirming with additional data that inclusive adjectives are processed more slowly than their generic masculine counterparts while also revealing individual variation related to participants' familiarity with inclusive language.

5.3. Comparing grammatical functions

We next compared the effect of inclusive *-e* morphology across grammatical functions by contrasting the adjectival data with the *todos/todes* data. Because both datasets came from the same participants and used the same experimental procedures, this comparison reduces the risk that differences reflect methodological variation. However, raw RTs were not directly comparable because the adjectives were trisyllabic, whereas *todos/todes* are disyllabic. We therefore compared relative processing costs within each grammatical function: *-e* versus *-o* adjectives and *todes* versus *todos*.

To assess whether this difference was reliable, we conducted a nonparametric cluster bootstrap with 5,000 participant-level resamples on the log-transformed data. For each participant, we calculated the inclusive-noninclusive RT difference within each grammatical function, converted it to a percentage increase, and then subtracted the pronominal difference from the adjectival difference. The bootstrap distribution yielded a mean difference of 11.5 percentage points in processing cost between inclusive adjectival forms and *todes*. The 95% bootstrap confidence interval was [4.08%, 19.46%], indicating that the processing burden was reliably greater for *-e* adjectives than for *todes* (Figure 3).

[14]lmer(logRT~ grammatical gender + (1 | participant) + (1|sentence) + (1|country))

https://doi.org/10.1017/langcog.2026.10112 Published online by Cambridge University Press

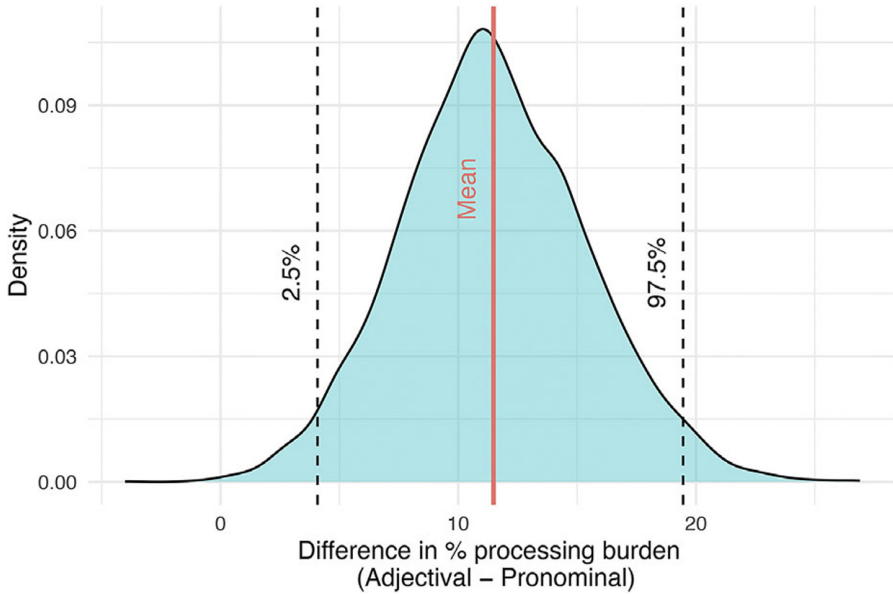


Figure 3. Bootstrap distribution of the processing burden between adjectival and pronominal forms with 5,000 resamples.

In combination with the descriptive comparisons, the results of the bootstrap analysis indicate that the effect of grammatical gender was systematically stronger for adjectives with *-e* than for the pronoun *todes*.

6. Discussion

We investigated whether inclusive *-e* morphology imposes processing costs during sentence comprehension among first-language Spanish speakers, and whether such costs vary by grammatical function, lexical frequency and speaker experience. To this end, we compared the processing of *todes* with generic masculine *todos*, plural inclusive *-e* adjectives with generic masculine *-o* adjectives and examined whether self-reported inclusive language use modulated processing in each context. We also compared the relative processing burden of lower-token-frequency inclusive adjectives with that of the higher-token-frequency form *todes*. This line of research is especially relevant in light of the increasing use of inclusive morphology in Spanish and the limited empirical evidence on how adult first-language speakers process forms that were not part of their linguistic input during childhood acquisition. Existing studies have produced mixed results, and key factors such as grammatical category and lexical frequency remain underexplored. Investigating these factors can help determine how frequency and experience shape the representation and processing of new morphophonological cues such as *-e* during real-time comprehension.

Our findings provide partial support for our predictions. We predicted that first-language speakers (a) would take longer to process *todes* compared to the generic masculine *todos*, (b) would process the inclusive *-e* morpheme in *todes* faster than in

https://doi.org/10.1017/langcog.2026.10112 Published online by Cambridge University Press

adjectives, given the relatively high frequency of *-e* in this pronominal quantifier and (c) would process inclusive forms differently depending on their reported frequency of inclusive language use. While inclusive *-e* morphology was associated with longer RTs in adjectival forms, only a trivial difference on average for *todes* over *todos* (<8 ms) was found. Additionally, the adjectival data revealed that the magnitude of the *-e* processing cost varied as a function of speakers' reported use of inclusive language, an effect not present in the pronominal data.

One plausible explanation for this difference involves lexical frequency and distribution. Prior research has shown that inclusive forms in Spanish have not diffused evenly across lexical items or syntactic categories (Núñez-Román et al., 2023). Corpus evidence from the Spanish Web Corpus esTenTen23 supports this pattern in the present study: *todes* appeared 14,259 times, whereas the inclusive adjectives used in our stimuli were far less frequent, often appearing fewer than 100 times or not at all. For example, *content-e-s* ('happy-INC-PL') occurred 89 times, *cansad-e-s* ('tired-INC-PL') 69 times and *molest-e-s* ('annoyed-INC-PL') did not occur at all. Even more tellingly, when each inclusive form was calculated as a proportion of the combined masculine and inclusive tokens, the proportion of *todes* was approximately twice the highest adjective-specific proportion and nearly 24 times the pooled proportion across all adjective pairs (0.17% vs. 0.007%; see Supplementary Appendix A for the full results). This distributional asymmetry suggests that speakers are more likely to have encountered *todes* repeatedly than to have encountered many individual inclusive adjective forms, and the proportional comparison indicates that this advantage cannot be attributed solely to the much higher baseline frequency of *todos.* The reduced processing cost for *todes* may therefore reflect greater familiarity with, and item-specific entrenchment of, this specific lexical item.

This interpretation is consistent with usage-based models of grammar, which posit that frequency of exposure strengthens mental representations and facilitates processing (Bybee, 2006, 2012; Ellis, 2002a, 2002b; Langacker, 1987). Under this view, high-token-frequency forms are more likely to become entrenched and processed as familiar units, while lower-frequency forms may rely more heavily on morphological analysis. The present findings align with this account: *todes*, as a relatively frequent and socially salient form, appears to be processed with relative ease among our participants, whereas inclusive adjectives show a clearer processing burden. This pattern also converges with experimental evidence showing that token frequency can strengthen representations of particular forms and facilitate their processing (Endress & Hauser, 2011).

Beyond differences in processing speed, our experimental findings may also reflect differences in how these inclusive language forms are stored in memory and processed. Usage-based models predict that frequent forms like *todes* are more likely to develop strong lexical representations that permit whole-word access, while less frequent forms may rely more heavily on online morphological analysis (Bybee, 2012; Diessel, 2015; Ellis, 2002a, 2002b; Gobet et al., 2001). Hybrid models of morphological processing (Burani & Laudanna, 1992; Caramazza et al., 1988) similarly posit that high-frequency forms tend to bypass morphological decomposition and are instead retrieved directly from the mental lexicon. In contrast, low-frequency forms, especially those that are morphologically regular but novel, may be processed through decomposition and recombination, potentially increasing processing demands. Thus, although *todes* and the inclusive adjectives both utilize the same novel *-e* morpheme at the surface, their processing profiles may diverge in ways that can be explained by frequency-driven entrenchment mechanisms (Bybee, 2012;

https://doi.org/10.1017/langcog.2026.10112 Published online by Cambridge University Press

Langacker, 1987). This interpretation should be treated as provisional, however, since self-paced reading cannot directly distinguish whole-word retrieval from decomposition. Future work using masked priming, eye-tracking or event-related potentials (ERPs) could test these processing mechanisms more directly.

Beyond lexical frequency, this study examined how individual patterns of reported inclusive language use relate to RTs. Adjectival *-e* forms were sensitive to participants' reported frequency of inclusive language use, whereas *todes* showed no meaningful processing cost. This contrast is consistent with *todes* being entrenched as an individual lexical item but does not necessarily indicate that speakers represent *-e* as a productive morphological pattern across other lexical items. Overall, these findings support usage-based accounts in which repeated exposure and use promote entrenchment and reduce cognitive load during comprehension. From this perspective, slower processing of inclusive adjectives among infrequent and nonusers is consistent with lower familiarity and weaker entrenchment. Although the reduced cost among frequent users could in principle reflect facilitation from individual lexical entrenchment, our adjectival stimuli sampled a wide range of lexical items, which makes it less likely that this effect is driven primarily by repeated exposure to those specific tested forms. This pattern is more consistent with facilitated access to -e as a recurring morphological cue across items than with retrieval of prestored whole-word representations, though our data cannot adjudicate between a fully productive, structurally integrated schema and a more diffuse, item-general familiarity effect that falls short of complete grammatical integration (Bybee, 2012; Ellis, 2002a, 2002b).

The contrast between adjectival *-e* forms and *todes* suggests that the latter may have stabilized as a lexicalized form that does not impose meaningful additional processing demands. This pattern likely reflects the comparatively high frequency and broader recognizability of *todes*: speakers may be more likely to have encountered *todes* than any given inclusive adjective. In contrast, exposure to individual inclusive adjectives is more variable and more strongly tied to frequency of inclusive language use, such that frequent users are more likely to have encountered the *-e* morpheme across a wider range of adjectival forms. In usage-based terms, *todes* may therefore benefit from high token frequency and item-specific entrenchment, whereas experience with *-e* across multiple adjective types could support a broader morphological schema.

Our results also show that inclusive morphology should not be treated as a single processing phenomenon. The absence of a cost for *todes* does not mean that inclusive *-e* morphology is uniformly easy to process, just as the cost for adjectives does not mean that all *-e* forms are equally difficult. Rather, processing appears to depend on a combination of factors, including form frequency, grammatical function, lexical distribution, and speaker experience. This interpretation aligns with the finding that processing costs for nonbinary morphemes are shaped not only by structural novelty but also by social-cognitive factors such as gender beliefs, working memory and language dominance (Román-Irizarry et al., 2025).

These findings have important implications for the acquisition of novel morphological forms by first-language Spanish speakers. They suggest that high token frequency can facilitate lexical entrenchment before a fully productive morphological rule emerges, while schema-level generalization likely requires repeated exposure across multiple lexical items (Baayen & Lieber, 1991; Bybee, 1995, 2012; Ellis, 2002a, 2002b). More broadly, the results are compatible with adult speakers integrating noncanonical forms into real-time processing routines when exposure and communicative relevance are sufficient, an outcome broadly consistent with accounts in which speakers'

https://doi.org/10.1017/langcog.2026.10112 Published online by Cambridge University Press

grammars can continue to change incrementally across the lifespan (Blythe & Croft, 2021). Although prescriptive norms may shape attitudes toward inclusive language, they do not appear to fully constrain what speakers learn, use or process. The potential uptake of the *-e* morpheme among the high-frequency user group of our participants raises the possibility that adult first-language speakers can gradually incorporate novel functional morphology into established processing routines. We stress, however, that our data speak to facilitated online processing rather than to a confirmed structural reorganization of the grammatical system. Whether this reflects primarily lexical entrenchment, the emergence of a broader morphological schema or some combination of the two remains an empirical question that the present design cannot resolve.

These findings must be interpreted within the study's limitations. First, the largest proportion of our participants came from Argentina, a country with comparatively high visibility of inclusive language, which may limit generalizability of our findings to other regions of the Spanish-speaking world. Second, the study did not model grammatical function and lexical frequency in a unified statistical framework, instead relying on comparisons across separately run analyses. Finally, our stimuli presented a mix of traditionally gendered names. If participants associated *todes* primarily with nonbinary reference, integrating it with a context composed of stereotypically gendered names may have created a referential mismatch and increased RTs; a broader inclusive interpretation may have produced little or no such cost. Clarifying how the *-e* morpheme is processed in different contexts remains an important area for future research.

Nevertheless, the findings of the present work point toward a broader question about the diffusion of novel morphology. Building on Bybee's (2012) exemplar-based account of grammatical meaning, which emphasizes the role of frequency and context in diachronic morphological change, these results suggest that high-frequency tokens within an exemplar network may help create conditions for the later generalization of new morphological patterns. In this view, high-frequency exemplars such as *todes* could act as entry points for novel morphology, supporting later generalization to broader paradigmatic contexts. Although the present study does not test this developmental sequence directly, it identifies a processing pattern consistent with its initial, item-specific stage.

In the present data, *todes* is consistent with this possibility. Despite being morphologically innovative, its relatively high frequency and use in vocative or group-reference contexts may make it especially likely to become entrenched and readily processed. By contrast, inclusive adjectives with the *-e* morpheme, such as *bonit-e-s* ('beautiful-INC-S,') remained more difficult to process, suggesting that the entrenchment of one form does not necessarily entail full productivity across the morphological system. Rather, frequent lexical items that contain novel morphology may provide speakers with salient exemplars that facilitate familiarity with a new pattern, while broader productivity likely depends on repeated exposure across a wider range of lexical and grammatical contexts. When supported by social salience and repeated use, such exemplars may help scaffold the extension of novel forms into related morphological schemas.

This possibility generates several directions for future research. In the specific case of inclusive *-e* in Spanish, other high-frequency inclusive forms used in address or group-reference contexts, such as *chiqu-e-s* ('young person-INC-PL') and *amigu-e-s* ('friend-INC-PL'), may show similar processing advantages among first-language speakers. More broadly, future work could test whether entrenched and socially

https://doi.org/10.1017/langcog.2026.10112 Published online by Cambridge University Press

salient lexical items facilitate the uptake and processing of novel morphology beyond their original lexical contexts.

7. Conclusion

The present study examined the processing of the inclusive pronominal quantifier *todes* in comparison with masculine *todos* and contrasted these findings with earlier results comparing inclusive *-e* adjectives and their generic masculine counterparts. The results suggest that the processing consequences of inclusive morphology are not uniform across grammatical contexts: while inclusive *-e* adjectives incurred a significant processing cost relative to generic masculine adjectives, *todes* did not require significantly greater RTs than *todos*. A direct comparison between word types further indicated that the effect of inclusive morphology on RTs was stronger for adjectives than for pronominal quantifiers.

These findings contribute to growing evidence that lexical frequency and patterns of use modulate the processing of innovative forms, consistent with usage-based models in which exposure promotes entrenchment and facilitates online comprehension. More broadly, the reduced processing burden of *todes* suggests that high-frequency exemplars may serve as entry points for emergent morphological categories, supporting later generalization to broader paradigmatic contexts. At the same time, variability across participants underscores that the diffusion of inclusive morphology is not uniform but mediated by differences in experience and usage. Future research should further examine the social and cognitive dimensions of inclusive-form processing, including factors such as language ideologies and working memory (see Román-Irizarry et al., 2025), and test whether frequent, socially salient exemplars facilitate the uptake and extension of novel morphology across languages and morphological systems.

Supplementary material. The supplementary material for this article can be found at http://doi.org/10.1017/langcog.2026.10112.

Data availability statement. Anonymized data, as well as reproducible R codes and study materials can be found here: https://osf.io/zg7vj/.

Funding statement. This work was supported by internal departmental funds provided to the authors by Rutgers University and the College of Charleston.

Competing interests. The authors declare none.

Ethical standards. All procedures performed in this study had been approved by the Institutional Review Boards at Rutgers University (Protocol number: Pro2023000742) and the College of Charleston (Protocol number: 2023-02-014) prior to data collection.

References

Alarcos Llorach, E. (1994). *Gramática de la lengua española*. Espasa-Calpe.

Baayen, R., & Lieber, R. (1991). Productivity and English derivation: A corpus-based study. *Linguistics*, 29(5), 801–844. https://doi.org/10.1515/ling.1991.29.5.801

Barrera Linares, L. (2019). Relación género/sexo y masculino inclusivo plural en español. *Literatura y Lingüística*, 40, 327–354. https://doi.org/10.29344/0717621x.40.2070

Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software*, 67(1). https://doi.org/10.18637/jss.v067.i01

https://doi.org/10.1017/langcog.2026.10112 Published online by Cambridge University Press

Bender, A., Beller, S., & Klauer, K. C. (2018). Gender congruency from a neutral point of view: The roles of gender classes and conceptual connotations. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 44(10), 1580–1608. https://doi.org/10.1037/xlm0000534

Blythe, R. A., & Croft, W. (2021). How individuals change language. *PLoS One*, 16(6), e0252582. https://doi.org/10.1371/journal.pone.0252582

Burani, C., & Laudanna, A. (1992). Units of representation for derived words in the lexicon. In R. Frost & L. Katz (Eds.), *Orthography, phonology, morphology and meaning* (pp. 361–376). North-Holland.

Burani, C., Salmaso, D., & Caramazza, A. (1984). Morphological structure and lexical access. *Visible Language*, 18(4), 342–352.

Butterworth, B. (1983). Lexical representation. In B. Butterworth (Ed.), *Language production* (pp. 257–294). Academic Press.

Bybee, J. (1985). *Morphology: A study of the relation between meaning and form*. John Benjamins Publishing Company. https://doi.org/10.1075/tsl.9

Bybee, J. (1995). Regular morphology and the lexicon. *Language and Cognitive Processes*, 10(5), 425–455. https://doi.org/10.1080/01690969508407111

Bybee, J. (2006). From usage to grammar: The mind's response to repetition. *Language*, 82(4), 711–733. https://doi.org/10.1353/lan.2006.0186

Bybee, J. (2012). *Language, usage and cognition*. Cambridge University Press. https://doi.org/10.1017/CBO9780511750526

Cabello Pino, M. (2020). Esbozo de una bibliografía crítica sobre–x-y–e-Como alternativas al masculino genérico en español (2014–2019). *Tonos Digital*, 39(II), 1–25.

Caramazza, A., Laudanna, A., & Romani, C. (1988). Lexical access and inflectional morphology. *Cognition*, 28(3), 297–332. https://doi.org/10.1016/0010-0277(88)90017-0

Casado, A., Palma, A., & Paolieri, D. (2021). The scope of grammatical gender in Spanish: Transference to the conceptual level. *Acta Psychologica*, 218, 103361. https://doi.org/10.1016/j.actpsy.2021.103361

Cheng, L. S. P., Burgess, D., Vernooij, N., Solís-Barroso, C., McDermott, A., & Namboodiripad, S. (2021). The problematic concept of native speaker in psycholinguistics: Replacing vague and harmful terminology with inclusive and accurate measures. *Frontiers in Psychology*, 12. https://doi.org/10.3389/fpsyg.2021.715843

Dewaele, J.-M., Bak, T. H., & Ortega, L. (2021). Why the mythical "native speaker" has mud on its face. In N. Slavkov, S. Melo-Pfeifer, & N. Kerschhofer-Puhalo (Eds.), *The changing face of the "native speaker": Perspectives from multilingualism and globalization* (pp. 25–45). De Gruyter.

Diessel, H. (2015). Usage-based construction grammar. In E. Dąbrowska & D. Divjak (Eds.), *Handbook of cognitive linguistics* (pp. 296–322). De Gruyter.

Dollinger, S. (2012). The written questionnaire as a sociolinguistic data gathering tool. *Journal of English Linguistics*, 40(1), 74–110. https://doi.org/10.1177/0075424211414808

Domínguez, A., De Vega, M., & Barber, H. (2004). Event-related brain potentials elicited by morphological, homographic, orthographic, and semantic priming. *Journal of Cognitive Neuroscience*, 16(4), 598–608. https://doi.org/10.1162/089892904323057326

Durand-López, E. M., & Dickinson, K. V. (2025). Gender-inclusive morphology in Spanish: Learnability, processing costs, and use. *Studies in Hispanic and Lusophone Linguistics*, 18(2), 391–424. https://doi.org/10.1515/shll-2025-2013

Durand-López, E. M., & Garrido-Pozú, J. J. (2025). Experimental increase in lexical frequency improves morphological computation of Spanish. *International Journal of Bilingualism*, 29(4), 815–830. https://doi.org/10.1177/13670069241252725

Efron, B., & Tibshirani, R. J. (1993). *An introduction to the bootstrap*. Chapman & Hall/CRC.

Ellis, N. C. (2002a). Frequency effects in language processing. *Studies in Second Language Acquisition*, 24(2), 143–188. https://doi.org/10.1017/s0272263102002024

Ellis, N. C. (2002b). Reflections on frequency effects in language processing. *Studies in Second Language Acquisition*, 24(2), 297–339. https://doi.org/10.1017/s0272263102002140

Endress, A. D., & Hauser, M. D. (2011). The influence of type and token frequency on the acquisition of affixation patterns: Implications for language processing. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 37(1), 77–95. https://doi.org/10.1037/a0020210

Fábregas, A. (2023). El género inclusivo: Una mirada gramatical. *Cuadernos de Investigación Filológica*, 51, 25–46. https://doi.org/10.18172/cif.5292

https://doi.org/10.1017/langcog.2026.10112 Published online by Cambridge University Press

Futrell, R., Gibson, E., Tily, H. J., Blank, I., Vishnevetsky, A., Piantadosi, S. T., & Fedorenko, E. (2021). The natural stories corpus: A reading-time corpus of English texts containing rare syntactic constructions. *Language Resources and Evaluation*, 55(1), 63–77. https://doi.org/10.1007/s10579-020-09503-7

Giraudo, H., Dal Maso, S., & Piccinin, S. (2016). The role of stem frequency in morphological processing. *Mediterranean Morphology Meetings*, 10, 64–72. https://doi.org/10.26220/mmm.2725

Gobet, F., Lane, P. C., Croker, S., Cheng, P. C., Jones, G., Oliver, I., & Pine, J. M. (2001). Chunking mechanisms in human learning. *Trends in Cognitive Sciences*, 5(6), 236–243. https://doi.org/10.1016/s1364-6613(00)01662-4

González Camaño, E., & Brown, R. (2022). "¡Hola a todes!" language becomes a political battleground in Latin America. *Americas Quarterly*. https://americasquarterly.org/article/hola-a-todes-language-becomes-a-political-battleground-in-latin-america/

González Rivera, M. (2025). Perspectivas sobre el sexismo lingüístico y el lenguaje inclusivo en el contexto puertorriqueño. *Anuario de Letras, Lingüística y Filología*, 13(2), 189–250. https://doi.org/10.19130/iifl.adel.2025.13.2/01x225s4w96

Guidotti-Hernández, N. M. (2017). Affective communities and millennial desires: Latinx, or why my computer won't recognize Latina/o. *Cultural Dynamics*, 29(3), 141–159. https://doi.org/10.1177/0921374017727853

Gygax, P., Gabriel, U., Lévy, A., Pool, E., Grivel, M., & Pedrazzini, E. (2012). The masculine form and its competing interpretations in French: When linking grammatically masculine role names to female referents is difficult. *Journal of Cognitive Psychology*, 24(4), 395–408. https://doi.org/10.1080/20445911.2011.642858

Heap, D. (2024). Los masculinos no tan "genéricos": Estudios empíricos sobre interpretaciones en español y en francés. *Círculo de Lingüística Aplicada a la Comunicación*, 97, 217–230. https://doi.org/10.5209/clac.79361

Heinsberg, L. W., & Weeks, D. E. (2022). Post hoc power is not informative. *Genetic Epidemiology*, 46(7), 390–394. https://doi.org/10.1002/gepi.22464

Jegerski, J. (2014). Self-paced reading. In B. VanPatten & J. Jegerski (Eds.), *Research methods in second language psycholinguistics* (pp. 20–49). Routledge.

Kalinowski, S. (2020). Lenguaje inclusivo en usuarios de twitter en Argentina: Un estudio de corpus. *Cuarenta Naipes*, 3, 233–259.

Kaushanskaya, M., Blumenfeld, H. K., & Marian, V. (2020). The language experience and proficiency questionnaire (LEAP-Q): Ten years later. *Bilingualism: Language and Cognition*, 23(5), 945–950. https://doi.org/10.1017/s1366728919000038

Kilgarriff, A., & Renau, I. (2013). esTenTen, a vast web corpus of peninsular and American Spanish. *Procedia-Social and Behavioral Sciences*, 95, 12–19. https://doi.org/10.1016/j.sbspro.2013.10.617

Kroll, J. F., Van Hell, J. G., Tokowicz, N., & Green, D. W. (2010). The revised hierarchical model: A critical review and assessment. *Bilingualism: Language and Cognition*, 13(3), 373–381. https://doi.org/10.1017/S136672891000009X

Langacker, R. W. (1987). *Foundations of cognitive grammar: Volume I: Theoretical prerequisites*. Stanford University Press.

Lehtonen, M., & Laine, M. (2003). How word frequency affects morphological processing in monolinguals and bilinguals. *Bilingualism: Language and Cognition*, 6(3), 213–225. https://doi.org/10.1017/S1366728903001147

Lenth, R. V., & Piaskowski, J. (2026). *emmeans: Estimated marginal means, aka least-squares means* (Version 2.0.3) [R package]. https://rvlenth.github.io/emmeans/

López, M. (2018, October 12). *El lenguaje inclusivo y la polémica por decir "todes"*. El País. https://elpais.com/sociedad/2018/10/12/actualidad/1539361523_270157.html

Marchesini, I. D. (2019).*La influencia del lenguaje inclusivo en la categorización de los géneros* [Unpublished doctoral dissertation]. Facultad de Psicología, Universidad de Buenos Aires.

Martínez, A. (2019). Disidencias en la conformación de la gramática: El lenguaje inclusivo. *Heterotopías*, 2(4), 1–17.

Muelas-Gil, M. (2025). Non-sexist, gender-inclusive, and gender-neutral language in Spanish: Sociolinguistic evolution and current challenges. In F. Pfalzgraf (Ed.), *Gender-neutral, gender-fair, gender-inclusive: Towards conceptual clarity across European languages* (Palgrave studies in language, gender and sexuality, pp. 167–192). Palgrave Macmillan.

https://doi.org/10.1017/langcog.2026.10112 Published online by Cambridge University Press

Nadal, L., & Bove, A. (2024). Gender doublets as a mark of gender inclusive language: An experimental study on language processing. *International Journal of Linguistics*, 16(1), 38–57. https://doi.org/10.5296/ijl.v16i1.21597

Nakagawa, S., & Schielzeth, H. (2013). A general and simple method for obtaining R^2 from generalized linear mixed-effects models. *Methods in Ecology and Evolution*, 4(2), 133–142. https://doi.org/10.1111/j.2041-210x.2012.00261.x

Núñez-Román, F., Gómez-Camacho, A., & Hunt-Gómez, C. I. (2023). Gender-inclusive textisms: How Spanish-speaking educational communities promote linguistic innovations on twitter. *Linguistics and Education*, 76, 101191. https://doi.org/10.1016/j.linged.2023.101191

Papadopoulos, B. (2022). A brief history of gender-inclusive Spanish. *DEP: Deportate, Esuli, Profughe*, 48(1), 41–48.

Peirce, J. W. (2007). PsychoPy—Psychophysics software in python. *Journal of Neuroscience Methods*, 162(1–2), 8–13. https://doi.org/10.1016/j.jneumeth.2006.11.017

Qualtrics. (n.d.). *Qualtrics* [Software]. https://www.qualtrics.com

R Core Team. (2026). *R: The R project for statistical computing.* https://www.r-project.org/

Ravid, D. (2019). First-language acquisition of morphology. In *Oxford research encyclopedia of linguistics*. Oxford University Press.

Rodríguez, D. (2021, August 27). *"Todes somos compañeres": El lenguaje inclusivo desata polémica entre los expertos en lingüística.* El País. https://elpais.com/mexico/2021-08-27/todes-somos-companeres-el-lenguaje-inclusivo-desata-polemica-entre-los-expertos-en-linguistica.html

Román-Irizarry, A., Beatty-Martínez, A. L., Torres, J., & Kroll, J. F. (2025). "Todes" and "Todxs", linguistic innovations or grammatical gender violations? *Cognition*, 257, 106061. https://doi.org/10.1016/j.cognition.2025.106061

Román-Irizarry, A., & Guzzardo Tamargo, R. E. (2025). Processing of pronouns with gender-inclusive–x in Spanish: An eye-tracking study. *Social Psychological Bulletin*, 20, 1–39. https://doi.org/10.32872/spb.13611

Salinas, C., Jr., & Lozano, A. (2021). The history and evolution of the term Latinx. In E. G. Murillo, Jr., D. Delgado Bernal, S. Morales, L. Urrieta, Jr., E. Ruiz Bybee, J. Sánchez Muñoz, V. B. Saenz, D. Villanueva, M. Machado-Casas, & K. Espinoza (Eds.), *Handbook of Latinos and education: Theory, research, and practice* (2nd ed., pp. 249–263). Routledge.

Samples, C. E. (2024). Gender-inclusive language in twitter. *Hispania*, 107(1), 139–160. https://doi.org/10.1353/hpn.2024.a921466

Stahlberg, D., Sczesny, S., & Braun, F. (2001). Name your favorite musician: Effects of masculine generics and of their alternatives in German. *Journal of Language and Social Psychology*, 20(4), 464–469. https://doi.org/10.1177/0261927x01020004004

Stetie, N. A., Martínez Rebolledo, C., & Zunino, G. M. (2024). Diversidad de género y variación lingüística en el español de América: Procesamiento de estereotipos y morfología de género en Argentina y Chile. *Revista de Estudos da Linguagem*, 31(2), 636–687. https://doi.org/10.17851/2237-2083.31.2.636-687

Stetie, N. A., & Zunino, G. M. (2024). Do gender stereotypes bias the processing of morphological innovations? The case of gender-inclusive language in Spanish. *Psychology of Language and Communication*, 28(1), 446–469. https://doi.org/10.58734/plc-2024-0016

Taft, M. (2004). Morphological decomposition and the reverse base frequency effect. *The Quarterly Journal of Experimental Psychology Section A*, 57(4), 745–765. https://doi.org/10.1080/02724980343000477

Vela-Plo, L., De Pedis, M., & Ortega-Andrés, M. (2025). Is there a woman in los candidatos? Gender perception with masculine "generics" and gender-fair language strategies in Spanish. *Languages*, 10(7), 175. https://doi.org/10.3390/languages10070175

Wickham, H. (2016). *ggplot2: Elegant graphics for data analysis* (2nd ed.). Springer International Publishing. https://ggplot2.tidyverse.org

Wulff, S., & Ellis, N. C. (2018). Usage-based approaches to second language acquisition. In D. Miller, F. Bayram, J. Rothman, & L. Serratrice (Eds.), *Bilingual cognition and language: The state of the science across its subfields* (pp. 37–56). John Benjamins Publishing Company. https://doi.org/10.1075/sibil.54.03wul

Zarwanitzer, A., & Gelormini-Lezama, C. (2023). Reading times of sentences with inclusive language in Spanish: A psycholinguistic study. *Vertex*, 34(159), 40–46. https://doi.org/10.53680/vertex.v34i159.359

Cite this article: Dickinson, K. V., & Durand-López, E. M. (2026). Morphological processing of inclusive language in Spanish: A usage-based account, *Language and Cognition*, 18, e70, 1–24. https://doi.org/10.1017/langcog.2026.10112

https://doi.org/10.1017/langcog.2026.10112 Published online by Cambridge University Press