

Unveiling DOM optionality in Central Catalan: Asymmetries between acceptance and processing

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Abstract

This paper presents data indicative of optionality in acceptance and processing of Differential Object Marking (DOM) in 27 adult bilinguals of central Catalan-Spanish across two tasks: Acceptability Judgment Task (AJT) and Self-Paced Reading (SPR). Each task contained four conditions with definiteness and animacy of the direct object (DO) manipulated. DOM is present in Spanish, but prescriptive accounts of Catalan claim that its distribution is much more restricted (GIEC 2016), making cross-linguistic influence possible. Additionally, recent work on Catalan-Spanish bilingualism challenges prescriptive accounts, revealing significant variability and optionality for DOM distribution (e.g. Bel and Benito 2024, Benito 2023, Escandell-Vidal 2009, Perpiñán 2018, Puig-Mayenco et al. 2018, Pineda 2023, Zeugin 2021). This project adds to the scant Catalan DOM studies examining both offline and online data by exploring DOM distribution with full DP DOs in central Catalan as well as the linguistic and extralinguistic factors modulating its distribution. Results reveal that optionality is more evident in the offline AJT compared to the online SPR, where participants demonstrate sensitivity to the ungrammaticality of DOM with inanimate

DOs, and with indefinite DOs. Still, results are less conclusive with definite DOs and proper names, indicating some degree of inter-speaker variation in DOM processing.

Keywords: object marking, Catalan, Spanish, bilingualism, language dominance.

1. Introduction

This study examines the distribution of Differential object Marking (DOM) in Spanish-Catalan bilinguals in central Catalonia, with the concurrent aim of identifying the linguistic and extralinguistic factors modulating its distribution. Given the relative complexity of the property itself as well as the fact that DOM is often represented by a morpheme, sometimes (reduced to) a vowel as in Persian and Spanish, and therefore somewhat less salient than other properties, DOM is a rather well-studied property in the acquisition literature. Across studies, factors influencing convergence outcomes include participant age, task type, and language pairing/directionality, among others. Regarding first language acquisition, several studies examining monolingual child speakers of a variety of languages including Hebrew, Spanish, Persian, Estonian, Croatian, Russian, and Korean report that children display rather accurate knowledge of DOM between 2;0-5;0 years (see Avram 2015 for overview, Rodríguez-Mondoñedo 2008 for Spanish, Foroodi-Nejad 2011 for Persian, Chung 2020 for Korean). Still, some studies report delays in native-like convergence (see Guijarro-Fuentes, Pires and Nediger 2017 for Spanish, Ketrez 2015 for Turkish).

Data from early bilinguals tested as children largely comes from corpus and production tasks. Differently from monolingual children, Ticio (2015) reports that bilingual children (5 Spanish-English, 1 Spanish-Catalan) do not demonstrate sufficient evidence of DOM use by 3;06 years, with high rates of omission (76.2%) as well as a protracted first use (2;03–2;11 years as compared to the Spanish monolinguals' of Rodríguez-Mondoñedo first production at 1;09–2;04 years). Similarly, the Basque-Spanish bilingual children of Austin (2020) produce DOM later than Spanish monolingual children (2;08 in Spanish and 2;06 in Basque). Since the monolingual Basque children's earliest DOM production was at 3;0 years, Austin interprets contact with Spanish as influencing DOM production in the bilinguals' Basque. Finally, in a study on Romanian-Hungarian bilingual children, Avram and Tomescu (2020) report that, like Romanian monolingual children, bilinguals demonstrate early production of DOM that is accurate in obligatory contexts, but with overgeneralization to inanimate DOs and nominative arguments. While accuracy on discourse-marked DPs is protracted, it converges with age.

DOM has also been extensively examined in the heritage speaker literature (e.g. Jegerski and Sekerina 2020, Montrul and Bowles 2009, Montrul and Sanchez-Walker 2013, Perpiñán and Moreno Villamar 2013, Thane 2024 for Spanish, Montrul, Bhatt and Girju 2015 for Spanish, Hindi and Romanian, Montrul 2022 for overview) with results largely demonstrating differences (generally omission) between monolingual and heritage speakers. Though the Hindi and Romanian heritage speakers of Montrul, Bhatt and Girju (2015) did not differ significantly from their native counterparts on a bimodal acceptability judgment task, Montrul, Bhatt and Bhatia (2012) and Bhatia and Montrul (2020) report differences for heritage speakers of Hindi

in oral production tasks (omission) and comprehension on picture-matching tasks, respectively. Task differences across this body of research reveal that while production and judgment tasks generally reveal DOM omission, eye-tracking studies reveal target-like comprehension (Jegerski and Sekerina 2020) and some sensitivity to violations of DOM in VSO sentences (Arechabaleta Regulez 2020). Hur (2020) also found that proficiency and verb frequency modulate DOM production in intermediate speakers, while verb frequency had no effect on advanced speakers. In heritage speakers of Turkish residing in Germany, Krause and Roberts (2020) found that proficiency matters, with only higher proficiency speakers judging the acceptability of tokens in line with native speakers.

Finally, in later sequential acquisition (i.e. second and third language), a variety of language pairings and methodologies have been employed to answer questions regarding transfer effects, new feature acquisition, feature reassembly, explicit vs. implicit knowledge, etc. In the second language (L2) literature, this large body of research has investigated a wide range of languages paired with Spanish including Brazilian Portuguese (Yokota 2001), Chinese (Jiao 2017), English (Guijarro-Fuentes and Marinis 2007, amongst many others), German (Hopp and Arraiga 2016), Persian (Judy and Iverson 2020), Romanian (López Otero 2020), Turkish (Montrul and Gürel 2015), and other pairings, such as Balochi-Persian (Bohnacker and Mohammadi 2013), Romanian-Persian (Ciovârname and Avram 2013), Greek-Turkish (Papadopoulou et al. 2011) and English-Korean (Chung 2018)¹. Generalizing broadly across many studies, proficiency, language pairing and directionality, and task type impact the results obtained and conclusions drawn. Importantly, most studies show evidence of L1 transfer, often materialized as omission of obligatory or optional DOM as seen in Spanish heritage speaker research, that can ultimately be overcome (Schwartz and Sprouse, 1996). Similarly, third language (L3) studies have revealed transfer effects, though non-facilitative in nature, from the more typologically similar language (i.e. Spanish in the case of Spanish/English/Brazilian Portuguese, Giancaspro, Halloran and Iverson 2015) and that L2 Spanish speakers can more easily overcome non-facilitative transfer of (presence of) DOM (Cabrelli et al. 2020, Cabrelli and Iverson 2023). Finally, Perpiñán and Montrul (2024) examined bidialectalism, prestige effects, and task effects in Northern bidialectal and Southern bidialectal Italians learning L3 Spanish. Speakers of lower prestige dialects did not employ facilitative transfer from their dialect to Spanish in the written acceptability task, but did so in the oral production task, revealing differential inhibition according to task. The authors point out that this component of L3 acquisition is not captured by current L3 models.

Thus, variability is a common thread in non-monolingual contexts, a finding that is particularly relevant for our study as this variability is evident in early bilinguals (see Avram 2015, Mardale and Montrul 2020, Kabatak, Obrist and Wall 2021 for an overview). With this in mind, and highlighting the fact that the distribution of DOM is highly variable across contexts of acquisition, this variability can be approached from two angles. First, we can examine variability to answer questions about bilingualism to better understand the role of factors such as language use or language

¹ Brazilian Portuguese, Chinese, English, German and modern Greek are generally classified as non-DOM languages, while Balochi, Persian, Romanian, Turkish, Korean do evidence DOM.

dominance, and how they might influence the acquisition and distribution of DOM. Second, we can describe DOM and its behavior within these grammars, providing a more nuanced understanding of its distribution and optionality. Moreover, a combination of both approaches offers a more comprehensive view, as seen in ongoing studies that aim to integrate insights from bilingualism research with detailed grammatical descriptions of DOM.

Therefore, the contributions of the present study are significant. Aside from the addition of a new dataset that addresses the tension between prescriptivism and descriptivism in relation to DOM in Central Catalan, this study combines offline and online methodologies, which are crucial for drawing conclusions regarding the degree of optionality of DOM in Catalan. This is particularly important because, to our knowledge, there are only two studies using online methodologies to explore DOM in the context of Catalan-Spanish bilingualism (Puig-Mayenco et al. 2018, Bel and Benito 2024). Additionally, our study targets a different profile of participants as compared to previous studies, where many participants were in their 20s and were more highly educated, (a common issue in psychology research; Henrich et al. 2010). Differently, our participants are adults with various degrees of education and spanning different age ranges (see Table 2). This is especially important as highly-educated university students likely possess higher metalinguistic awareness of DOM, particularly because prescriptive rules against DOM are emphasized in the educational system (see also Iranzo 2024 regarding Valencian). Another important component of our study is the focus on both *presence* and *absence* of DOM, as both sides of the coin are equally informative in terms of describing the Catalan grammar of these bilinguals. As is discussed in Section 5 and 6, considering both presence and absence of DOM reveals optionality in our dataset. Lastly, the current study further contributes to understanding how linguistic and extralinguistic variables interact in the grammars of highly proficient early bilinguals.

2. The Syntax of Differential Object Marking

As first reported in Bosson (1985), DOM appears in over 300 languages spanning many language families. Within languages that evidence DOM, direct objects (DOs) are divided into those that are marked and those that are unmarked. Marked DOs have been said to evidence properties that are subject-like (agency, animacy), indirect object-like (affectedness), or discourse topic-like (individuation, dislocation; see Iemmolo 2010, López 2016, Gerards 2023), thus making them unlike the prototypical DO (see Laca 1995, Fábregas 2013). Similarity with these elements necessitates differentiation/identification via DOM. Crosslinguistically, languages vary in terms of what triggers the presence of DOM, though in many languages DOM depends on the syntactic, semantic and/or pragmatic features of the DO (and sometimes the subject), and often a combination of the three. Semantically-speaking, the inherent feature of animacy and referential features like definiteness and specificity often condition, individually or together, the distribution of DOM; Aissen (2003) formalizes these features as *prominence* across an animacy scale and a definiteness scale, whereby DOs that are higher on the scale(s) are more likely to be marked. Such is the case for Spanish where [+animate] [+specific] DOs are marked according to prescriptive grammars. Dialectal and speaker variation is seen in descriptive grammars (see Balasch 2011,

Bautista-Maldonado and Montrul 2019, Company Company 2001, 2002, Dumitrescu 1997, Judy and Iverson 2020, Montrul 2013, Zdrojewski 2013). In canonical SVO sentences in Catalan, DOM is comparatively restricted with only strong personal pronouns and some indefinite pronouns (*tothom* ‘everyone’, *ningú* ‘no one’) marked (Bel 2002). Table 1 shows the differences between Spanish and Catalan DOM relevant to this study, while subsections 2.2.1 and 2.2.2 provide further information regarding the distribution of Catalan DOM according to prescriptive accounts and empirical studies.

Table 1. Distribution of Spanish and Catalan DOM *a*

	Proper Name	Human (def) Noun Phrase	Human (indef) Noun Phrase	Inanimate (indef) Noun Phrase
Spanish				
Xavi ha buscado...	a Silvia	a la niña	a una amiga	*a una playa
Catalan				
En Xavi ha buscat...	*a Sílvia	*a la nena	*a una amiga	*a una platja
<i>Xavi has looked for...</i>	<i>Silvia</i>	<i>the girl</i>	<i>a friend</i>	<i>a beach</i>

2.1. Prescriptive Accounts of Catalan DOM

Briefly, prescriptive accounts of DOM in Catalan report restricted use (1) as compared to Spanish, (2) as compared to colloquial/spoken Catalan, and (3) as compared to use in previous centuries (see Moll 1952, Segarra 1985). For example, while Bel (2002) reports modern-day obligatory use of DOM with strong personal pronouns and some indefinite pronouns, Segarra (1985) notes that medieval Catalan use varied with some corpus data showing absence of DOM and some showing use. Formally, DOM is recommended for animate dislocated DOs (Fabra 1918, Solà 1994) and for instances of ambiguity between the subject and DO (GIEC 2016), and recent so-called extensions of DOM to other DOs has been examined as a product of either internal or external variation (Moll 1952, Salvador & Pérez Saldanya 1993). The following section covers recent empirical accounts that may help to elucidate this issue.

2.2. Empirical Accounts Examining Catalan DOM

A small, but growing, body of research has recently examined DOM in Catalan. To start, Puig-Mayenco et al. (2017, 2018) investigated the acceptability and online processing of DOM with Proper Name and inanimate DOs. In line with prescriptive accounts, the offline results showed that Catalan-dominant speakers accepted tokens without DOM to a greater degree than Spanish-dominant speakers. Online processing results revealed slower reaction times (RTs) by Catalan-dominant speakers for tokens with DOM, which the authors interpreted as evidence that dominance in Catalan modulates sensitivity to the presence (or lack) of DOM in Catalan.

Similarly, Benito (2017, 2020 2023) has examined the grammar of Catalan-Spanish bilinguals on the acceptance and use of DOM across different DOs at different levels of the referential stability scale in both Catalan and in Spanish. Results from written production tasks (2017, 2020) reveal optionality, while asymmetries between acceptability and written production obtained in her most recent study (2023). Generally, Benito’s results show that bilinguals have some degree of optionality regarding production and acceptance of DOM in Catalan, and that this optionality is

modulated by referential stability of the DOs as well as language dominance, though to different extents. Bel and Benito (2024) examines crosslinguistic influence (CLI) from Catalan to Spanish in Catalan-Spanish bilinguals and Spanish monolinguals via a Self-Paced Reading task; results show that participants are sensitive to DOM, but that the effect is seen later in the bilinguals' processing of human DOs as compared to monolinguals.

Employing both an acceptability judgment task and oral production task, Perpiñán (2018) also explored the grammar of Catalan-Spanish bilinguals in relation to whether they accepted tokens with and without DOM with [\pm definite] DOs. Acceptability results reveal overall high acceptance of the presence and absence of DOM across bilingual participants of differing language dominance, while the oral production task shows that Spanish-dominant bilinguals produce statistically significantly more instances of DOM than Catalan-dominant bilinguals.

More recently, some studies have begun to examine regional varieties of Catalan. For example, Zeugin (2021) employed a 7-point acceptability task with Catalan speakers in 4 distinct regions of Spain where Catalan is spoken: Central, North-Western, Valencian, and Majorcan. The task manipulated the animacy scale and topicalization/dislocation with/without clitics. Regarding [+human] DOs, Zeugin found regional differences with Valencian and Majorcan allowing the presence and the absence of DOM relatively equally, while Central and North-Western varieties preferred the absence of DOM. Pineda (2023) also explored DOM in Catalan-dominant speakers across Catalan-speaking regions. Results showed that, overall, participants accepted and produced instances of DOM with the exception of those speakers of Catalan spoken in Northern France.

Together, these empirical studies reveal at least two important points. First, task type matters: generally speaking, acceptability and written production tasks seem to reveal optionality for DOM, while oral production tasks reveal lower production rates (c.f. Pineda 2023) and online processing tasks reveal slower RTs to the presence of DOM. Secondly, they reveal a less-restricted distribution and acceptance of DOM in Catalan than prescriptive accounts claim. The disparities between prescriptive and empirical accounts inform the design of this experiment, explained next.

3. Methodology

3.1. Experimental Design and Participants

The previous section outlined differences between prescriptive accounts and empirical evidence to date on the distribution of DOM in Catalan. Given that there is also potential for CLI from Spanish to Catalan and that the presence of DOM in Catalan is characterized by high degrees of optionality with asymmetries depending on the type of data elicited, our study seeks answers to the following inter-related research questions:

RQ1: What is the distribution of DOM in central Catalonia?

RQ2: What linguistic and extralinguistic factors modulate its distribution?

- a. Linguistic: specificity, definiteness, animacy, verb

b. Extralinguistic: age, language dominance, language use, age of onset of Spanish

To answer the research questions, data from 27^{2,3} adult Catalan-Spanish bilinguals were born and raised in Osona in central Catalonia, an area outside Barcelona, were analyzed. Thus, they were speakers of Central Catalan. Participants completed 3 tasks in total, one on demographics and two experimental (see below). The demographic measure employed was the *Bilingual Language Profile* (BLP; Birdsong et al. 2012), a multi-measure questionnaire that collects self-reported demographic information and produces a gradient language dominance score based on composite responses to 19 questions. These questions pertain to language history, use, proficiency, and attitudes, factors known to affect language dominance, including age of acquisition/exposure, years of schooling (in the languages), frequency of use, domain of use, attitudes towards the languages, proficiency, and processing capacity. Participants' demographics and language dominance score at the time of testing are shown in Table 2.

Table 2. Self-reported participant demographics and composite language dominance score

	n=27
Sex	F (16); M (13)
Age at Time of Testing	48.72 (14.25)
Age of Acquisition of Catalan (years)	2.55 (4.59)
Age of Acquisition of Spanish (years)	2.41 (3.22)
Reported Use of Catalan (maximum score =54.5)	48.71 (11.08)
Reported Use of Spanish (maximum score =54.5)	5.97 (11.11)
Self-reported Proficiency in Catalan (maximum score =54.5)	50.01 (7.59)
Self-reported Proficiency in Spanish (maximum score =54.5)	46.61 (6.05)
Language Dominance Score (positive scores indicate Catalan-dominance; scale -218—+218)	80.44 (58.21)

3.2. Experimental Tasks

The two experimental tasks, described in detail below, were each presented in within Gorilla Experiment Builder (Anwyl-Irvine et al. 2020), a web-based software for experimental testing. The tasks contained 48 tokens of interest divided equally across 4 conditions (n=12 each). Half of the tokens of interest were presented with DOM and half without. Examples of the four conditions are shown below in (1)–(4).

² Two of the original 29 participants were excluded from final analyses as they did not meet the accuracy threshold for the comprehension questions in the experimental tasks, a measure that was used to control for attention therewithin.

³ The current study received ethical clearance from the author's research ethics committees at the time of data collection (King's College London; Wake Forest University) with the following reference (MRA-23/24-40350; IRB00024926). All participants gave informed consent in accordance with the Declaration of Helsinki.

- (1) Proper Name
 La Dolors ha visitat (*a) la Nuria a la sortida del banc.
 The Dolors visited (*DOM) the Nuria at the exit of-the bank
 ‘Dolors visited with Nuria at the bank exit.’
- (2) Human (def) DP
 La Júlia ha trobat (*a) la secretària a l’entrada del despatx.
 The Julia found (*DOM) the secretary at the entrance of-the office
 ‘Julia found the secretary at the office entrance.’
- (3) Human (indef) DP
 La Raquel ha vist (*a) una cantant a la barra del restaurant.
 The Raquel saw (*DOM) a singer at the bar of-the restaurant
 ‘Raquel saw a singer at the restaurant bar.’
- (4) Inanimate (indef) DP
 En Joan ha buscat (*a) una carta a una casa de la cantonada.
 The Joan looked (*DOM) a letter at a house from the corner
 ‘Joan looked for a letter at the corner house.’

An additional 48 distractor tokens manipulating agreement or word order were included, of which half were grammatical, half ungrammatical. Examples are shown below in (5)–(7).


- (5) Grammatical Distractor Token
 En Xavier ha comprat una llibreta a la botiga del poble.
 The Xavier bought a notebook at the shop of-the town
 ‘Xavier bought a notebook at the town shop.’
- (6) Ungrammatical (agreement) Distractor Token
 L’Ismael ha begut una cafè al bar del carrer.
 The Ismael drank a coffee at-the bar of-the office
 ‘Ismael drank a coffee at the office bar.’
- (7) Ungrammatical (word order) Distractor Token
 L’Isidre ha netejat sala una per la trobada de pares.
 The Isidre cleaned room one for the meeting of parents
 ‘Isidre cleaner a room for the parents’ meeting.’

3.2.1. Acceptability Judgment Task

The offline Acceptability Judgment Task (AJT) measured participants’ judgments of individual tokens in Catalan via a sliding bar to increase response gradience, which may be particularly illustrative with bilingual participants. Participants simply read each token and used the sliding bar to rate each token from “sounds bad” on the left to “sounds very good” on the right. Each response is automatically converted into a scale from 1 to 100. The task started with 4 practice tokens followed by all experimental tokens. All experimental tokens were randomized automatically for each participant.

Figure 1. Acceptability Judgment Task example

La Carlota ha buscat una jugadora per l'equip de futbol.

Sona malament  Sona molt bé

Assegura't que has triat una resposta.

Continuar

3.2.2. Self-Paced Reading Task

The online Self-Paced Reading task (SPR; Just et al. 1982) measured participants' RTs to stimuli, which can reveal what their grammar accepts/rejects. The same tokens presented above were employed in the SPR. Each token was divided into 5 regions according to syntactic segments as shown in example (8) and were presented in moving-windows.

(8) Proper Name

Subject	Verb	Direct Object	Prepositional Phrase	Prepositional Phrase
Region 1	Region 2	Critical Region	Spillover Region	Wrap-up Region
L'Helena	ha vist	una treballadora	a la porta	de l'avió.
The Helena	has seen	an employee	at the door	of the plane
Helena saw an employee at the plane door.				

Participants clicked through region-by-region until reaching the conclusion of the token. From there, they were randomly presented with a true-false comprehension question on 1/3 of the tokens (e.g. En Joan ha comprat un cotxe 'Joan bought a car'). As with the AJT, each participant was presented with a different order of tokens automatically produced via Gorilla Experiment Builder (Anwyl-Irvine et al. 2020).

Participants first completed the SPR, then the BLP, and finally the AJT. Each task was fully administered in Catalan and took participants between 25-60 minutes. Prescriptive accounts of the distribution of DOM in Catalan would predict high rejection of DOM in the four conditions examined in the AJT as well as slower RTs to the presence of DOM in the SPR. Nonetheless, given that Spanish employs DOM for 3 of the 4 conditions (Proper Name, Human (def) DP, and Human (indef) DP⁴), CLI would predict a higher rate of acceptance and faster processing times in these conditions. The results are presented next.

⁴ DOM is required in most dialects of Spanish when the DO is [+animate;+specific]. However, in our task, specificity was not manipulated, which may render this condition ambiguous for participants. We return to this point in the Discussion.

4. Results and Analysis

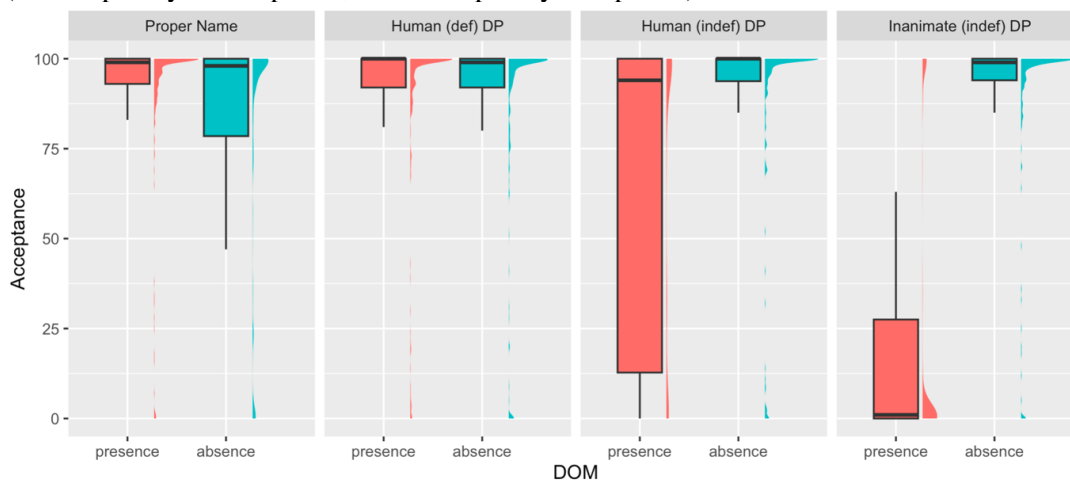
4.1. Acceptability Judgment Task

We first examined responses to grammatical and ungrammatical distractors to ensure that (a) participants paid attention and (b) the experimental design captured sensitivity to grammaticality. Overall, participants gave high ratings of acceptance in the grammatical distractor condition ($M=86.23$, $SD=29.75$) and low ratings of acceptance in the ungrammatical distractor condition ($M=17.38$, $SD=35.07$). We interpret this as evidence that participants paid attention and that the tasks effectively captured sensitivity to grammaticality. We then examined the ratings across all experimental conditions (see Table 3 and Figure 2 for all descriptive statistics). Results for the Proper Name condition show a slight preference for the presence of DOM indicating some degree of optionality with a preference for the presence of DOM. For the Human (def) DP condition, presence vs. absence ratings are very similar, indicating optionality. In the Human (indef) condition, participants gave higher ratings to tokens without DOM. The same is seen, though to a larger degree, in the Inanimate (indef) DP condition.

Table 3. Mean and SD of acceptance scores (0 to 100) in the AJT

Condition	marker	Prescriptive Acceptability	Mean (SD)
Proper Name	Presence	Unacceptable	90.38 (22.49)
	Absence	Acceptable	79.47 (34.59)
Human (def) DP	Presence	Unacceptable	87.91 (26.20)
	Absence	Acceptable	86.39 (28.39)
Human (indef) DP	Presence	Unacceptable	65.09 (42.14)
	Absence	Acceptable	87.41 (28.06)
Inanimate (indef) DP	Presence	Unacceptable	23.89 (40.11)
	Absence	Acceptable	89.41 (25.37)

Figure 2. Boxplots with acceptance scores across conditions and absence/presence of DOM (0=Completely unacceptable; 100=Completely acceptable)



A linear mixed-effects model was fitted in the R environment (R Core Team 2020) using the lme4 package (Bates et al. 2015) to examine the effects of condition

(Proper Name, Human (def) DP, Human (indef) DP, Inanimate (indef) DP), marker (presence or absence), and dominanceScore (a continuous variable ranging from -218 [Highly Spanish dominant] to +218 [Highly Catalan dominant]) on the acceptance score (1 to 100). We also included random effects for item and participants. Table 4 contains the output of the main model, and we explored all possible relevant comparisons.

Table 4. Outcome of MODEL 1

	estimate	SE	p-value
(Intercept) ⁵	88.20	6.23	< .001
conditionHuman (def) DP	1.04	8.12	= .911
conditionHuman (indef) DP	-22.50	8.12	< .001
conditionInanimate (indef) DP	-72.84	8.12	< .001
markerabsence	-2.90	8.12	= .721
dominanceScore	.02	.04	= .721
conditionHuman (def) DP:markerabsence	2.34	11.48	= .842
conditionHuman (indef) DP:markerabsence	21.62	11.48	< .001
conditionInanimate (indef) DP:markerabsence	76.92	11.48	> .001
conditionHuman (def) DP:dominanceScore	-.05	.05	= .384
conditionHuman (indef) DP:dominanceScore	-.04	.05	= .484
conditionInanimate (indef) DP:dominanceScore	.08	.05	= .112
markerabsence:dominanceScore	-.10	.05	< .05
conditionHuman (def) DP:markerabsence:dominanceScore	.09	.07	= .223
conditionHuman (indef) DP:markerabsence:dominanceScore	.15	.07	< .05
conditionInanimate (indef) DP:markerabsence:dominanceScore	-.01	.07	= .932

As seen in the main model, there are multiple significant effects and interactions. We first explored the planned comparisons using the emmeans package (Lenth et al. 2018) between the levels with (presence of marker) and without (absence of marker) for each of the conditions to determine whether participants preferred DOM presence or absence. Table 5 contains these comparisons, with significant differences in acceptance within tokens from the same condition, with and without DOM, highlighted in grey. Regarding the Proper Name and Human (def) DP conditions, there are no differences between tokens with and without DOM, indicating that speakers allow for both its presence and absence. In the Human (indef) DP condition, participants rate tokens without DOM significantly higher, indicating a preference for the absence of DOM in this condition. However, it is important to highlight that although there is a significant difference, tokens with DOM are still rated fairly highly on the scale ($M=65.09$; $sd=42.12$) in terms of acceptance. Therefore, while participants prefer absence of DOM, they still accept its presence somewhat. Lastly, a significant difference obtained within the Inanimate (indef) DP condition, indicating that participants have a low acceptance of the presence of DOM and a high acceptance of its absence in this condition.

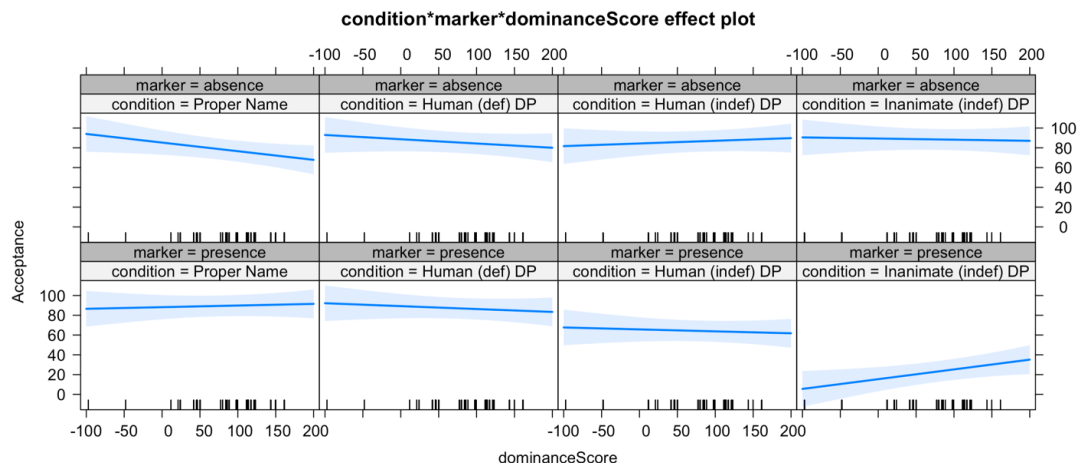
⁵ Reference levels for the model were “Proper Name” for condition and “absence” for DOM.

Table 5. Contrasts of the interaction between condition and marker for each condition

contrast	estimate	SE	t.ratio	p.value
Proper Name: presence vs. absence	10.90	7.08	1.54	=.78
Human (def) DP: presence vs. absence	1.64	7.08	0.23	=1.00
Human (indef): DP presence vs. absence	-24.32	7.08	-3.43	=.03
Inanimate (indef) DP: presence vs. absence	-65.52	7.08	-9.25	=.00

Finally, we explored the three-way interaction of condition, marker, and dominance, as plotted in Figure 3, to determine whether dominance further modulated the acceptance of DOM by condition and by presence/absence of DOM. As shown in the figure, dominance appears to modulate the acceptance score of tokens with DOM in the Proper Name condition, where higher dominance in Spanish corresponds to higher acceptance for that condition. Recall that this is the grammatical condition in Spanish and expected to be ungrammatical in Catalan. Unexpectedly, we also observed an effect of dominance in the Inanimate (indef) DP condition, where higher dominance in Catalan leads to slightly higher acceptance of tokens with DOM. This is unexpected, a point to which we return in the discussion.

Figure 3. Effect plot of main model showing three-way interaction of condition*marker*dominance (the dominance score goes from -218 [=Spanish dominant] to 218 [=Catala dominant]; the figure represents the range of dominance of the participants)



4.2. Self-Paced Reading Task

For the SPR data, we first examined the accuracy of the comprehension questions to ensure participants paid attention throughout the task ($M=92.86$, $SD=12.54$). We established a predetermined threshold of 75% accuracy for inclusion, and no participants were excluded. Prior to data analysis, we performed outlier trimming following Keating and Jegerski (2015). The low cut-off point was fixed at 100ms, with any value below this being replaced by 100ms. The high cut-off point was variable: the mean plus two standard deviations. In total, this applied to 3.45% of the data. Once completed, we analyzed the raw RTs for the Critical Region (CR) as well as the spillover region (SO) across conditions (Proper Name, Human (def) DP, Human (indef) DP, Inanimate (indef) DP) with and without DOM. Table 6 contains the descriptive data.

Table 6. Descriptive data for the raw RTs in CR and SO regions across conditions (mean and SDs)

Condition	Critical Region			Spillover Region	
	Marker	mean	SD	mean	SD
Proper Name	Presence	1144.82	675.26	937.08	566.73
	Absence	1144.71	758.43	1020.18	649.55
Human (def) DP	Presence	1281.64	667.59	1145.74	722.12
	Absence	1065.56	649.98	1048.06	700.85
Human (indef) DP	Presence	1361.78	725.75	1147.14	746.11
	Absence	1000.78	585.18	958.32	618.12
Inanimate (indef) DP	Presence	1480.60	883.11	1194.73	779.01
	Absence	1042.91	637.58	948.9474	580.7306

We again fitted a linear mixed-effects model in the R environment (R Core Team 2024) using the lme4 package (Bates et al. 2015) to examine the effects of condition (Proper Name, Human (def) DP, Human (indef) DP, Inanimate (indef) DP), marker (presence or absence), and dominanceScore (a continuous variable ranging from -218 [Highly Spanish dominant] to +218 [Highly Catalan dominant]) on raw RT. We also included random effects for item and participants. Table 7 contains the output of the model.

Table 7. Outcome of MODEL 2

	estimate	std.error	p.value
(Intercept)	995.07	106.29	< .001
conditionHuman (def) DP	79.01	97.55	= .420
conditionHuman (indef) DP	155.40	97.55	= .114
conditionInanimate (indef) DP	499.09	97.55	< .001
markerabsence	174.97	97.55	= .075
dominanceScore	0.41	0.83	= .621
conditionHuman (def) DP:markerabsence	-237.73	137.96	= .088
conditionHuman (indef) DP:markerabsence	-261.31	137.96	= .061
conditionInanimate (indef) DP:markerabsence	-688.20	137.96	< .001
conditionHuman (def) DP:dominanceScore	1.20	.80	= .136
conditionHuman (indef) DP:dominanceScore	.74	.80	= .355
conditionInanimate (indef) DP:dominanceScore	-2.59	.80	< .001
markerabsence:dominanceScore	-1.71	.80	= .034
conditionHuman (def) DP:markerabsence:dominanceScore	.50	1.14	= .658
conditionHuman (indef) DP:markerabsence:dominanceScore	-0.70	1.14	= .536
conditionInanimate (indef) DP:markerabsence:dominanceScore	3.90	1.14	< .001

Importantly, we conducted further comparisons with emmeans to determine whether participants were, in fact, slower in either of the levels (with and without DOM) for each of the conditions. Table 8 contains the contrasts for each of the conditions. As can be appreciated, three out of four contrasts are significant, indicating that participants are slower with the Human (def) DP, Human (indef) DP, and

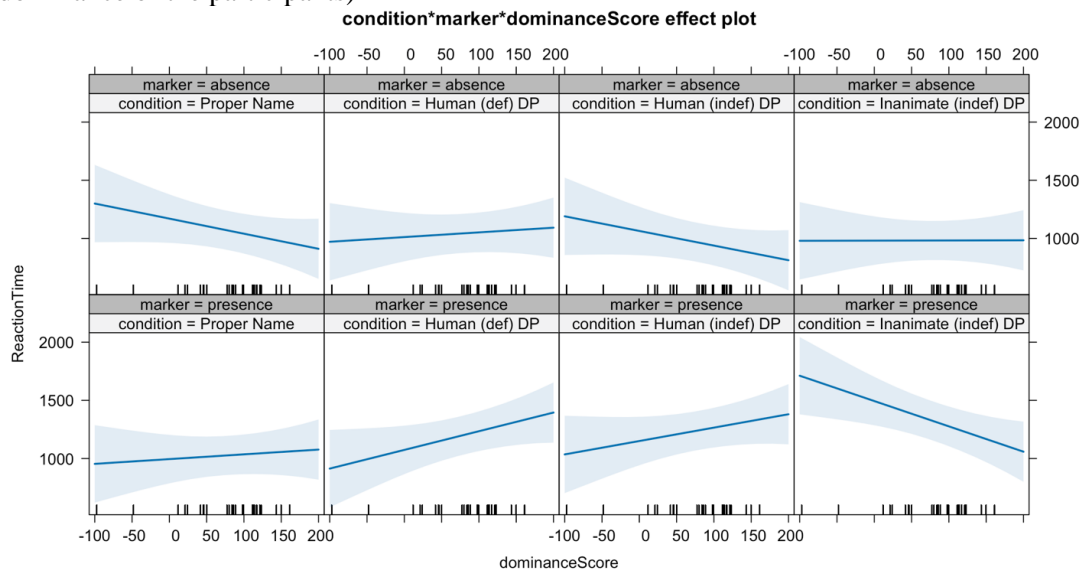
Inanimate (indef) DP conditions, shaded in grey in the table. We interpret this as suggesting that participants only show DOM processing optionality at the higher end of the animacy/definiteness scale (i.e., with Proper Names) and that for the other DOs, DOM is not allowed.

Table 8. Outcome of MODEL 2

contrast	estimate	SE	t.ratio	p.value
Proper Name: presence vs. absence	-41.50	74.60	-0.56	= .999
Human (def) DP: presence vs. absence	156.88	74.60	3.13	= .047
Human (indef) DP: presence vs. absence	274.90	74.60	3.69	= .014
Inanimate (indef) DP: presence vs. absence	341.74	74.60	4.58	< .001

Finally, we explored the three-way interactions as some were significant (Figure 4). The analysis revealed that, for the Human (indef) DP condition, the more Catalan-dominant the speakers were, the quicker they responded to tokens without DOM. Conversely, the more Catalan-dominant they were, the slower they responded to tokens with DOM. For the Inanimate (indef) DP condition, the more Spanish-dominant participants were, the slower they responded to tokens with DOM. This was unexpected as we hypothesized that all participants would treat these tokens as equally ungrammatical. As Figure 4 shows, we also observe a trend whereby language dominance modulates the absence of DOM in the Proper Name condition and for the presence of DOM in the Human (Def) condition. We return to this point in the discussion.

Figure 4. Effects plot of the three-way interaction in the model (the dominance score goes from -218 [=Spanish dominant] to 218 [=Catala dominant]; the figure represents the range of dominance of the participants)



4.3. Summary across Tasks

Results from both tasks indicate a fair amount of variation based on condition, language dominance and task, suggesting a combined effect of these factors with

regards to both offline and online sensitivity to DOM in Catalan. Table 9 provides a quick summary of the outcomes across tasks and conditions.

Table 9. Table summarizing the results of both tasks across conditions

Condition	AJT	SPR
Proper Name	Optionality*	Optionality*
Human (def) DP	Optionality	Quicker** RTs for absence of DOM
Human (indef) DP	Optionality	Quicker RTs for absence of DOM
Inanimate (indef) DP	Absence of DOM > Presence of DOM*	Quicker RTs for absence of DOM

*Effect of Language Dominance observed

**Quicker RTs indicate that participants' grammars allow for the absence of DOM with these DOs

5. Discussion

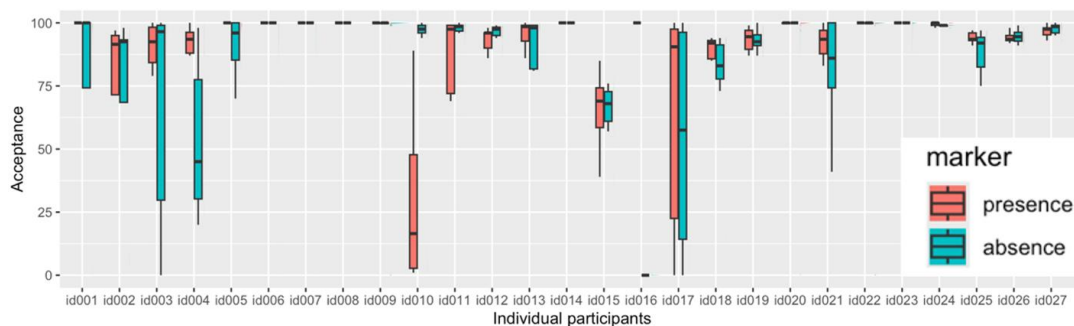
With the data and analyses in mind, we return to the research questions. Recall that our first research question was descriptive in nature, inquiring about the actual distribution of DOM in Central Catalan, specifically, the variety spoken in Osona, outside of the metropolitan area of Barcelona. Our second question asked to what extent the distribution observed in RQ1 is modulated by the linguistic factors (definiteness, animacy, verb) and extralinguistic factors (age, language dominance, language use, age of onset of Catalan/Spanish) we controlled for. We answer these questions by first discussing the AJT results, then the SPR results, and finally bringing them together.

The data reveal that DOM distribution in this variety of Catalan is not straightforward in that we cannot classify it as either requiring DOM across the DOs tested herein, nor disallowing its presence entirely. Recently, the Grammar of the Catalan Language (GIEC 2016) reported that DOM is in fact used with certain DOs. Importantly, although the GIEC claims that the DOs under investigation in our study would/should not be marked, our results show that the grammar of the participants tested herein differs from this prescriptive Catalan grammar. Furthermore, our results show some degree of alignment with existing empirical literature on the acceptability of DOM in Catalan (Benito 2023, Puig-Mayenco et al. 2017, 2018, Zeugin 2021), as well as recent work on Galician in contact with Spanish (Delicado Cantero and Parafita Couto 2024), whereby their data shows that although there is a tendency for reduced DOM, there is no generalized rejection in any of the contexts examined. Our AJT results show a similar pattern in that participants accept presence of DOM in three of the four conditions. This might suggest that the grammars of some Catalan-Spanish bilinguals *require* DOM. However, our study reveals that participants also accepted the absence of DOM in each condition, suggesting that DOM is not *required* but rather *optional*, at least in these three conditions. In relation to the fourth condition and similar to Zeugin (2021), Inanimate (indef) DP, participants have categorical ratings: low acceptance of the presence of DOM and high acceptance of the absence of DOM. This indicates, at the very least, that participants do not accept presence of DOM with this type of DO. This finding aligns with our initial hypothesis, which was based on

two premises: first, neither language is purported to mark inanimate DOs, so there is little reason to expect CLI from Spanish to Catalan. Second, these DOs would fall on the lower end of the animacy/definiteness scale (Aissen 2003), making this condition the least likely to have DOM. It is worth mentioning that Pineda (2023) reports some presence of DOM with inanimate DOs in production and acceptability data, though these results might be biased by the type of DOs employed in the experimental design (e.g., political party, geographical area), as it is well known that such DOs facilitate animate interpretations by virtue of metonymic readings. Therefore, we contend that inanimacy alone is not a factor that conditions the presence of DOM in Catalan.

Consequently, we argue that there is apparent optionality in the three animate conditions in terms of DOM acceptance. A further question is whether this group-level optionality is driven by intra- or inter-speaker variation. In other words, do participants accept both the presence and absence of DOM within the same condition, or do some participants only accept the presence of DOM while others only accept the absence of DOM? To answer this, we examined the acceptance scores of the two conditions with high scores for tokens with and without DOM (Proper Name and Human (def) DP). As illustrated in Figure 5, the majority of participants had equally high ratings for tokens with and without DOM, indicating a degree of intra-speaker optionality whereby both are accepted. In fact, there are only two cases where participants descriptively make a distinction: participant “id004” shows a preference for the presence of DOM, and participant “id010” shows a preference for the absence of DOM. Participant “id003” shows a wider range of acceptance for sentences with the absence of DOM. Finally, one participant, “id017”, shows split acceptance and rejection of both presence of and absence of DOM, resulting in the large distribution of their responses seen in the boxplot.

Figure 5. Boxplot with acceptance scores with Proper Name and Human (def) DP and presence/ absence of DOM (0=Completely unacceptable; 100=Completely acceptable)



We now discuss the SPR results and relate them to those of the AJT. The SPR results are perhaps more straightforward. Thus, we observe some asymmetries across the tasks, where the AJT results do not replicate in the SPR task. This is not surprising, considering that asymmetries across task type and data types have been found across non-monolingual language acquisition research (from the heritage speaker literature, see for example, Arechabaleta Regulez 2020, Bhatia and Montrul 2020, Jegerski and Sekerina 2020, Montrul, Bhatt and Bhatia 2012, Montrul, Bhatt and Girju 2015). In fact, amongst experimental studies on Catalan DOM, some report asymmetries whereby the acceptability data exhibits higher degrees of optionality than the processing data (Puig-Mayenco et al. 2018) and production data (Benito 2023).

The results for the Proper Name condition show that participants do not have significantly different RTs for tokens with and without DOM, indicating that their grammars process both token types equally quickly, an indicator of optionality at this level. Recall that in the Proper Name condition, the AJT also revealed optionality. We initially hypothesized that if participants' grammars allow DOM in Catalan, they would most likely show it in this condition since (a) Spanish requires it, and (b) these DOs are highest on the animacy/definiteness scale. For the second condition, the Human (def) DP, participants' grammars also accepted both presence and absence of DOM in the AJT. However, in the SPR, participants showed a significant slow-down effect with DOM, indicating that they parse these tokens as ungrammatical. This suggests that at a more implicit level, as seen in processing data, these participants' grammars do not allow DOM with these DOs. A similar pattern is seen in the Human (indef) DP condition, where participants also show a slow-down effect, indicating that their grammars do not allow DOM. Still, the results of the AJT were less clear for this condition, as participants showed high degrees of variability regarding the presence of DOM. This could be attributed to the fact that in Spanish (and Catalan), these tokens are likely to be ambiguous, with the DO receiving either a [+specific] or [-specific] reading, though we acknowledge that such ambiguity could be affected by multiple other factors; we leave this as an open line of inquiry for future research. In Spanish, this tends to lead to either requiring or prohibiting DOM, respectively. Although these DOs are also ambiguous in Catalan, and neither [+specific] nor [-specific] DOs allow DOM according to standard grammar descriptions, one might expect uniformity in this condition. However, considering that the two DOs above this one on the animacy/definiteness scale show optionality, we could expect optionality in this condition as well. This is especially true since the experimental design did not narrow the interpretive options via manipulation of specificity, which could result in some participants accepting and some rejecting the presence of DOM depending on their own interpretation of the DO. Lastly, in the Inanimate (indef) DP condition, participants also showed a slow-down effect in tokens with DOM, indicating that their grammars do not allow DOM with inanimate DOs. This was also true in the AJT, which aligns with our expectations, as we anticipated that participants would not allow DOM with inanimate DOs.

One final point to discuss is the extent to which the extralinguistic factors we controlled for modulated the acceptability and processing of DOM in our study, as has been shown in the published experimental literature for acceptance, production, and processing of DOM (Benito 2023, Bel and Benito 2024, Puig-Mayenco et al. 2017, 2018, Perpiñán 2018, Pineda 2023, Zeugin 2021). Contrary to our initial hypothesis, extralinguistic factors had less of an impact than expected. Our results showed that language dominance, as operationalized by the BLP (Birdsong et al., 2012), only moderately explained some of the observed effects, and this effect did not hold across all conditions nor data/task types. This leads us to hypothesize that the wider distribution of DOM across conditions and tasks might not be attributed to a direct effect from Spanish onto Catalan within each participant. Instead, we might be seeing an effect occurring at the macro-level, whereby Catalan is undergoing linguistic changes prompted by centuries of contact with Spanish (Perpiñán 2018). An empirical question that arises directly from this is the extent to which optionality, at least for the Proper Name condition, is something that is acquired during childhood. In other words, do Catalan-speaking children acquire this optionality from the input itself? If this is

the case, then the effects we are observing are occurring at the macro-level, not the individual level. This is a question for future research.

6. Conclusions

This study has attempted to describe the distribution of DOM in Central Catalonia (Osona, outside the Barcelona metropolitan area) and to examine the extent to which various intra- and extralinguistic factors modulated the acceptability and processing of tokens with and without DOM. The results, in line with previous work on Catalan, indicate that Catalan cannot be classified as a language that neither strictly requires nor completely lacks DOM. In the Proper Name condition, results from both tasks aligned in showing that participants allow for both presence and absence of DOM. Additionally, the study shows that Catalan cannot be classified as a language that requires DOM because in tokens without DOM, participants accepted and processed them without difficulty across all conditions, suggesting that DOM is, in fact, optional in Catalan. The data also demonstrate a moderate effect of language dominance in some conditions, although this effect is less pronounced than we anticipated and contrary to what others have reported regarding DOM. Overall, our results suggest that what is observed with Catalan DOM goes beyond CLI effects at the individual level and that changes may be occurring at a macro-level, potentially leading to speakers starting to *acquire* DOM optionality. It is worth noting that Old Catalan was reported to exhibit varying degrees of DOM (Pineda 2020, see also Iranzo 2024). It might be the case that remnants of DOM in certain contexts have facilitated its reappearance in others. Importantly, our data do not allow us to estimate whether DOM is trending towards obligatory presence in Catalan as we see that our participants accept the absence of DOM and have quicker RTs in its absent in three of the four conditions.

Of course, the study has a few limitations. First, as regards the tokens, an ideal experiment would have manipulated further levels of animacy (as in Sagarra, Bel and Sánchez 2020, Zeugin 2021) and specificity, and have incorporated a wider range of DOs to be able to draw more generalizable conclusions. However, tasks of this magnitude carry the disadvantage of participant fatigue. Still, future work should examine DOs for which standard grammars of Catalan advise the use of DOM (e.g., personal pronouns, quantifiers), as well as DOs higher on the animacy/definiteness scale, and different types of animate and inanimate DOs lower on the scale. We also acknowledge that our third condition (Human (indef) DP) is ambiguous in terms of specificity, which modulates presence of DOM in Spanish. Future work would ideally explore the extent to which this ambiguity leads to differential degrees of acceptability and processing of tokens with and without DOM. Concerning the participants, the study focused on an older group. Having a wider range of ages from early adolescence to late adulthood would have allowed us to make more conclusive statements regarding the extent to which we are observing intragenerational change and whether age affects DOM distribution. Ongoing research (Judy and Puig-Mayenco, in preparation) is currently addressing this question. Future work should also extend beyond the specific geographical region investigated here. We prioritized a solitary geographical area to avoid effects of dialectal variation; however, if the goal is to understand how DOM surfaces in Catalan, we need to expand to various geographical regions, in line with the approach taken by Zeugin (2021), Pineda (2023), and Iranzo

(2024). Additionally, having such a restricted geographical area made it difficult to find more highly Spanish-dominant participants, as the target area is highly Catalan-dominant (Illamola 2015), a factor that might explain why the language dominance effect was only moderate and very restricted.

Despite these limitations, this study makes valuable contributions to the understanding of DOM in Catalan-Spanish bilinguals. First, the dataset is relatively novel both in terms of the participant profile and the property examined. Second, the experiment adds to the scant body of research examining (early) bilinguals' processing of DOM, considering equally both its presence and absence. Third, the few studies examining DOM in Catalan-Spanish bilinguals bridge an important gap between the comparatively extensive body of studies across L1, L2, and L3 acquisition, and heritage speakers that largely examine language pairings where only one or both languages evidence DOM. Thus, these studies can answer questions regarding true acquisition of a new property, or feature reassembly in the latter scenario. Though Catalan and Spanish both evidence DOM that is predicated on the same features (animacy and specificity), distribution differs between them as well as amongst the many varieties of Catalan spoken in Catalonia, and perhaps beyond. Finally, this study comprises a necessary step toward further understanding how DOM occurs in Catalan. We hope future work addresses some (if not all) of the aforementioned limitations and builds upon the strengths of this study. If anything, the current study along with previously published experimental research, shows that the distribution of DOM in Catalan is complex, dynamic, and in need of continued investigation.

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