# Beyond Crosslinguistic Influence: Mandarin Speakers with Exposure to Null-subject Languages Nonetheless Use Fewer Null Pronouns in Mandarin

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## Abstract

We explore the impact of crosslinguistic influence in first language (L1) attrition, changes in an individual's L1 due to exposure to additional languages. We report an experiment examining reference production in Mandarin in a picture description task by native Chinese speakers residing in Italy or Spain. Mandarin allows null subjects, where subjects can be expressed with a null or overt pronoun; previous work shows that L1 Mandarin speakers exposed to English use more overt pronouns in Mandarin than their more-monolingual peers. In the study reported here, despite exposure to two languages (Italian and Spanish) that, unlike English, allow null subjects, our multilingual speakers used fewer null pronouns and more overt pronouns than their more-monolingual Chinese peers. These findings contribute to attrition research by disentangling the impact of crosslinguistic influence in L1 attrition, and provide insights into the effect of bi- and multilingualism on linguistic systems.

**Keywords:** crosslinguistic influence; reference production; L1 attrition; Mandarin Chinese

## Introduction

Previous studies have shown that the two or more languages in a bilingual or multilingual speaker's mind can influence each other, a phenomenon known as Crosslinguistic Influence (Jarvis and Pavlenko, 2010). This influence can occur at various linguistic levels and is often argued to exhibit a unidirectional pattern, i.e. from one language to another language but not vice versa (Kaltsa et al., 2015). Traditionally, research on crosslinguistic influence has primarily focused on the transfer effects of the first language (L1) on a second language (L2), where the stabilized native language affects the development of a newly-learned language. In contrast, the reverse transfer effects of L2 on L1 has received less attention. Nevertheless, understanding the influence of L2 on L1 provides insights into how bilingual experience recalibrates an already stabilized language, shedding light on the dynamic nature of linguistic systems and how our minds accommodate evolving language experiences.

The influence of L2 on L1 is often considered to play a significant role in the process of L1 attrition, which refers to changes that occur in one's native language due to continuous immersion in an L2 environment (Gürel, 2003). Attrition can be selective; one area particularly susceptible to change is the syntax-pragmatics interface, particularly with pronominals (e.g., null and overt pronouns) in languages that allow subject drop, such as Italian and Spanish (Sorace, 2011). Individuals undergoing L1 attrition often demonstrate greater explicitness in both their interpretation and production of overt pronouns (Tsimpli et al., 2004; Chamorro et al., 2016; Martín-Villena, 2023). Specifically, they are more likely to interpret an overt pronoun as coreferential with the subject referent of the preceding sentence, whereas their monolingual peers would prefer to interpret the overt pronoun as referring to the non-subject referent. Similarly, they tend to produce more overt pronouns than their monolingual peers. This tendency has been reported in other bilingual groups, including L2 learners（Belletti et al., 2007）, heritage speakers (Montrul, 2004) and child bilinguals (Argyri and Sorace, 2007).

Many attrition studies on pronominals focus on bilingual speakers whose L1 is a pro-drop language (e.g., Italian, Spanish, Greek) and whose L2 is a non-pro-drop language (e.g., English, Swedish). In such cases, the overextension and overuse of overt pronouns are often attributed to the influence of the non-pro-drop L2, which only provides overt pronouns. However, a few studies have examined bilinguals whose two languages both allow subject drop, and have also observed an overuse of overt pronouns (Sorace et al., 2009: child bilinguals of Italian-Spanish; Margaza and Bel, 2006: L1 Greek learners of L2 Spanish). This suggests that bilingual overexplicitness in reference may not be simply a by-product of crosslinguistic influence.

Mandarin Chinese is a radical pro-drop language that permits both subject and object drop, is typologically distinct from Indo-European languages which are typically studied in attrition research, and is itself understudied in the literature on attrition. The most relevant research we are aware of is Liu, Sorace, and Smith (under review), which examined reference production in spoken Mandarin among bilinguals of L1 Chinese and L2 English using a picture description task. In common with studies looking at attrition in Indo-European languages, this study also revealed a tendency towards overexplicitness in these speakers, likely influenced by the English pronominal system. Building on these findings, the current study investigates native Chinese speakers living in Italy or Spain with varying amounts of Italian or Spanish exposure, to explore whether the overexplicitness in reference in their L1 still persists when

their exposure to their L2 (i.e. English) is limited and they are exposed to an L3 which allows pro-drop.

## Crosslinguistic differences in reference

Mandarin, Italian, and Spanish are pro-drop languages that share a similar inventory of pronouns (i.e., null and overt pronouns), but the licensing conditions and distributions of these forms vary. Italian and Spanish primarily permit subject omission, while object omission is more restricted. Their rich morphological systems enable the tracking of omitted referents through verb inflection, which conveys information such as person, number, and gender. In contrast, Mandarin Chinese has a relatively limited morphological system, and in spoken Mandarin, the third singular person pronouns (她 'she' and 他 'he') are phonetically identical and thus gender-neutral. Mandarin allows both subject and object omission more flexibly, relying heavily on discourse to recover omitted elements.

The distribution of pronouns also varies across these languages. In Mandarin Chinese, both null and overt pronouns have a strong subject bias (i.e. they are interpreted as referring to the subject of the previous sentence) similar to English (Yang et al., 1999), with the bias stronger with null pronouns (Zhang and Kwon, 2022), as illustrated in example (1). Italian pronouns show a clearer division of labour, with null pronouns typically referring to subject antecedents, while overt pronouns refer to object antecedents, following the Position of Antecedent Strategy (Carminati, 2002). Spanish null pronouns favour subject antecedents, but unlike Italian, Spanish overt pronouns are roughly equally likely to refer to subject or object antecedents (Filiaci et al., 2014). As such, the scope of overt pronouns varies across these pro-drop languages.

1. Li Gang$_i$ gei Wang Qiang$_j$ da dianhua deshihou, $\emptyset_i$ / **ta**$_{i/j}$ haizai bangongshi.
   'When Li Gang called Wang Qiang, (he) was in the office.'

## L1 attrition at the interface structure

According to the Interface Hypothesis, structures that involve syntax and other cognitive domains, such as pragmatics, are more susceptible to change than those that do not (Sorace, 2011). Those structures require language users to integrate both syntactic knowledge with mapping conditions across interface components and principles governing the real-time integration of information from different domains (Sorace, 2011). When speakers fail to effectively integrate these interface properties, grammatical usage become less stable, often resulting in "emerging optionality" in L1 attrition (Sorace, 2011). As such, overt pronouns are particularly vulnerable to change due to their more flexible antecedent preferences compared to null pronouns. Furthermore, as noted earlier, variation among pro-drop languages primarily pertains to the constraints governing overt pronouns, while null pronouns consistently refer to subject or topic referents.

Liu, Sorace and Smith (under review) report an experiment investigating reference production in spoken Mandarin among two experimental groups of L1 Chinese L2 English speakers based in the UK and a third control group of more-monolingual speakers living in China. The two experimental groups differed in their English exposure: the Short-Term English Exposure group had been in the UK for up to 12 months, while the Long-Term English Exposure group had resided in the UK for 3 years and above. Participants completed a picture description task in Mandarin, where they referred to either the subject or the non-subject referent of a preceding sentence in the two-character condition, or re-referred to the single referent in the one-character condition. They found that speakers in the Long-Term English Exposure group used more overt pronouns, compared to control speakers, in both conditions. Similarly, speakers in the Short-Term English Exposure group also used more overt pronouns than control speakers in the two-character condition, but not in the one-character condition. They attribute these findings to the influence of English pronominal system on their participants' L1.

However, as reviewed above, a small number of studies suggest that bilingual speakers of multiple languages which allow pro-drop also show an overexplicitness preference in their L1; the results of Liu et al. might therefore be due to other linguistic and cognitive factors (e.g. heightened meta-linguistic awareness of ambiguity; response to increased cognitive load) rather than the "mere" influence of English as a non-pro-drop language. To disentangle the role of crosslinguistic influence from other factors, here we replicate and extends Liu et al. (under review) by investigating whether speakers with more exposure to two typologically different pro-drop languages (i.e. Mandarin Chinese and Italian/Spanish) exhibit increased usage of overt pronouns in their L1 Mandarin Chinese.

## The current study

We recruited three groups of participants: a control of more-monolingual speakers based in China, and two experimental groups of native Chinese speakers residing in Italy or Spain, with varying amounts of Italian or Spanish exposure. Our initial intention was to recruit participants with minimal exposure to English, whose primary L2 was Italian or Spanish; however, finding such participants proved impossible due to the pervasiveness of English experience in Chinese speakers living outside of China. Speakers in the experimental groups therefore have English as their L2 and Italian or Spanish as an L3; however, their exposure to English at the time of participation in our study was limited compared to their Italian or Spanish exposure. Further details about their language use will be discussed later. Our primary research question is: Do multilingual speakers exposed to Italian or Spanish (both pro-drop languages) tend to be more explicit in reference in their L1 Mandarin, as seen in L1 Mandarin L2 English speakers?

## Method

All speakers completed a picture description task as described in Liu et al. (under review). All speakers then

completed a questionnaire evaluating their use of and exposure to Chinese, English, Italian/Spanish.

**Participants** The control group was comprised of 48 mainland Chinese PhD researchers who had never travelled abroad, aged 22 to 32 years (Mean = 26.52, SD = 2.30). The first experimental group, referred to as the Short-Term Italian/Spanish Exposure Group, included 31 university students residing in Italy (13) or Spain (18), aged 18 to 31 years (M = 24.26, SD = 2.80). They had lived in these countries for up to 15 months (Mean = 7.02 months, SD = 3.17). The second experimental group, referred to as the Long-Term Italian/Spanish Group, consisted of 34 university students residing in Italy (19) or Spain (15), aged 20 to 40 years (Mean = 26.94 years, SD = 4.92). They had lived in these countries for 30 to 312 months (Mean = 66.38 months, SD = 50.39). All three groups were comparable in their age of English acquisition, with most participants beginning to learn English during primary school. The age of L3 acquisition ranged from 16 to 30 years old (M = 21.32 years, SD = 3.86) in the Short-Term Italian/Spanish Exposure Group, whereas it was from 12 to 36 years old (M = 19.71 years, SD = 4.95) for the Long-Term Group.

**Stimuli and procedure** The picture description task was built with jsPsych (De Leeuw et al., 2023). Two conditions were created to elicit reference production, with each trial consisting of a context image and a target image. The scenarios depicted four cartoon characters, including two girls (Xiaohong 'Little Red' and Xiaozi 'Little Purple') and two boys (Xiaolan 'Little Blue' and Xiaohuang 'Little Yellow'). In the two-character condition, the context image featured two referents (either of the same or different genders), with only one of them (either the subject or non-subject of the audio description of the context image) appearing in the target image (see Figure 1). In the one-character condition, a single subject referent appeared in both the context and target images.

During the task, participants were first shown a context image accompanied by an audio description of that picture. Then, the target image appeared with a prompt word above and a microphone icon below. Participants were asked to repeat the audio description of the context image and then continue to describe the target image using the prompt word. They initiated the recording by clicking the microphone icon and could stop the recording and proceed to the next trial by clicking the icon again. The entire experiment was conducted online. Participants were invited to join an online meeting via Zoom, Teams, or Tencent (a widely used online meeting platform in China). During the session, they were instructed to share their screen with a researcher to ensure that they followed the instructions while completing the tasks.



Figure 1: Examples of image stimuli from the two-character condition of the picture description task. In this example, the context image appears alongside an audio description that says "Xiaozi [Little purple] greeted Xiaohong [Little Red]". Then, participants are prompted to "Please repeat what you heard and then complete the story." A word above the target image, in this case meaning "picked up", is shown as a hint for participants on how to complete the description. In the continuity context, participants are expected to say in Mandarin "Xiaozi greeted Xiaohong, then null/she/Xiaozi [Little Purple] picked up the backpack." In the shift context, they are expected to say "Xiaozi greeted Xiaohong, then null/she/Xiaohong [Little Red] picked up the backpack."

## Predictions

As previously discussed, the overt pronoun is more susceptible to attrition and its scope varies across Mandarin, Italian, and Spanish. When two referents are present, the Mandarin overt pronoun shows a strong subject bias, Italian a strong object bias, and Spanish falls in between. When only one referent is present, both null and overt pronouns are acceptable in all 3 languages. Thus, if multilingual speakers are experiencing attrition in their native language (i.e. Mandarin) due to crosslinguistic influence from Italian or Spanish, they are expected to use more null pronouns when referring to subject referents in both conditions. Conversely, if their attrition is not driven by crosslinguistic influence, they are expected to use more overt pronouns when referring to subject referents in both conditions, as is seen for L1 Chinese L2 English speakers in Liu et al. (under review).

## Data analysis

Our analysis focused on three referential forms, namely, null pronouns, overt pronouns, and NPs (always proper names in our study) used in participants' first complete sentence mentioning the target referent. Around 9% of trials were excluded from analysis due to: empty responses; responses containing plural forms (e.g., "they") or possessive constructions (e.g., "Her mood"); responses where

participants reversed the order of the context and target images and described them accordingly (e.g., "Xiaohuang picked up a pen and explained the math problem"); responses where participants shifted the topic before describing the target referent in the topic-continuity context (e.g., "Xiaohuang waved Xiaolan. Xiaolan gave him a bouquet of flowers. He was holding the flower"); responses where participants did not continue their description with the target referent (e.g., "Xiaozi was painting Xiaolan a portrait, Xiaozi said put on your hat because you look more handsome that way," where Xiaolan was the target referent). Consequently, a total of 1694 trials in the two-character condition and a total of 1755 trials in the one-character condition were analysed using Bayesian ordinal logistic regression, specifically the adjacent category model, with the brms package (Bürkner, 2017) in R (R Core Team, 2023). The three referential forms demonstrate increasing levels of explicitness; the adjacent category model allows us to measure differences between adjacent categories (i.e. null to overt pronouns, overt pronouns to NPs).

## Results

In this section, we first present a summary of the participants' questionnaire responses about their language proficiency and use. Then, we report the statistical results on reference production in two conditions and compare them between groups.

**Language proficiency and use**[1] Figure 2 illustrates the mean self-reported proficiency of Italian or Spanish, English, and, Mandarin in four skills (listening, speaking, reading, and writing) on a scale of 0-10. Mandarin proficiency is consistently high among all groups, with the multilingual groups slightly exceeding the Control group. English proficiency is relatively similar across all three groups, although the Long-Term Italian/Spanish Exposure group reported slightly higher scores than the Short-Term group, particularly in listening and speaking. Figure 3 illustrates language use in the four skills. The three groups show similar levels of English use. In contrast, the two multilingual groups reported greater use of Italian/Spanish compared to English. Control speakers rely more heavily on Mandarin than multilingual speakers. Despite the multilingual groups' increased use of Italian/Spanish, Mandarin continues to be used more frequently overall.
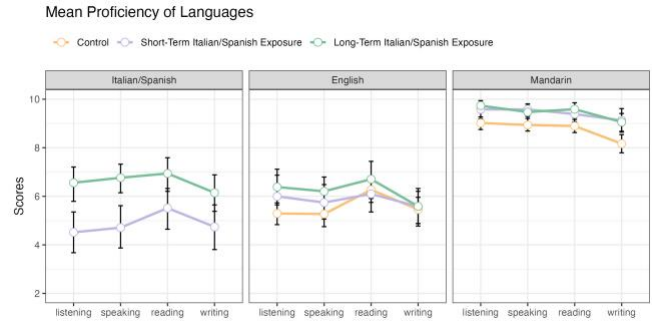


Figure 2: The mean proficiency scores of Italian/Spanish, English, and Mandarin in four skills (listening, speaking, reading, and writing) for the Control, Short-Term Italian/Spanish Exposure, and Long-Term Italian/Spanish Exposure groups. Error bars indicate bootstrapped 95% confidence intervals of the mean.
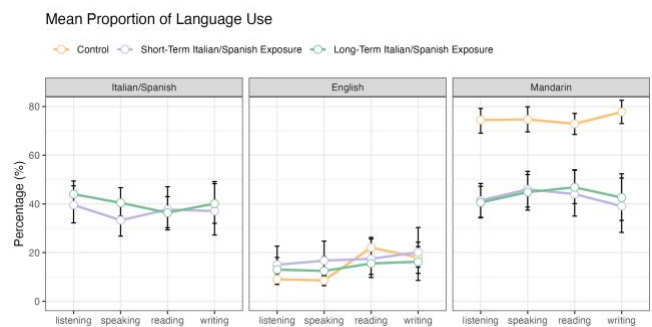


Figure 3: The mean percentage of language use of Italian/Spanish, English, and Mandarin in four skills for three groups. Error bars denotes bootstrapped 95% confidence intervals of the mean.

**Reference production** Figure 4 and 5 shows the distribution of three referential forms of three groups in the two-character and one-character conditions, respectively. The red diamonds represent the estimated means, and the error bars indicate 95% credible intervals, both derived from Bayesian models. Our analysis of reference production in the two-character condition included fixed effects of referent role (subject or non-subject of the context sentence), group (Control, Short-Term Italian/Spanish Exposure, Long-Term Italian/Spanish Exposure), and their interaction. By-participant and by-item random intercepts and slopes for referent role were included. We set the subject role and the control group as the reference level, respectively. Default treatment contrast for Group was applied, leading to two Group fixed effects: (1) Short-Term Italian/Spanish Exposure versus Control; and (2) Long-Term Italian/Spanish Exposure versus Control.

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[1] In the questionnaire, we also asked all participants to assess their language use in specific daily life contexts. Their responses show that English was used the least in all three groups. Consistent with their self-reported language use in the four skills, speakers in the multilingual groups used Mandarin and Italian/Spanish frequently.

But the contexts of use varied, with Mandarin being used more frequently in contexts such as "with roommates", "with friends", "social events", "activities", "on social media", and "watching shows". Italian/Spanish was primarily used in settings such as "school", "with neighbors", "shopping", and "emails".

**Figure 4**: The percentage distribution of three referential forms across three groups in the two-character condition. Each dot represents the data of one participant. The red diamond represents the estimated mean, and error bars indicate the 95% credible intervals, both derived from the Bayesian model.
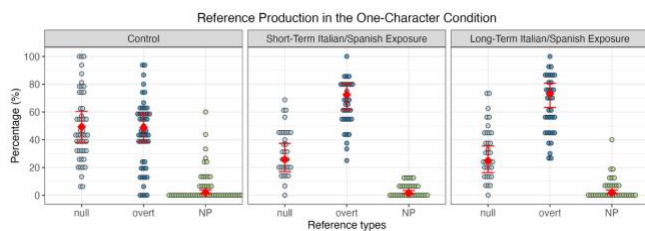


Figure 5: The percentage distribution of three referential forms in the one-character condition. Plotting conventions as in Figure 4.

In the two-character condition, the results indicate that speakers in the Control group showed no clear preference between null and overt pronouns (b = -0.01, CrI = [-0.52, 0.50], pd = 50%) but used fewer overt pronouns than NPs (b = -1.45, CrI = [-1.91, -1.01], pd = 100%). No difference was found in the use of null versus overt pronouns when referring to non-subject referents compared to subject referents (b = 0.06, CrI = [-1.11, 1.28], pd = 54%); however, NPs were predominantly used when referents were non-subject (b = 3.56, CrI = [2.65, 4.53], pd = 100%).

Speakers in the Short-Term Italian/Spanish Exposure group used more overt pronouns than null pronouns compared to the Control group (b = 1.49, CrI = [0.80, 2.18], pd = 100%); however, there was no difference between the two groups when comparing overt pronouns with NPs. Similarly, the Long-Term Italian/Spanish Exposure group used more overt pronouns than the Control speakers (b = 1.38, CrI = [0.72, 2.05], pd = 100%); compared to their usage of over pronouns, the Long-Term Italian/Spanish Exposure speakers used fewer NPs than the Control Speakers (b = -0.76, CrI = [-1.34, -0.20], pd = 100%). No interaction

between role and group was observed across two referential contrasts.

In the one-character condition, the results indicate no clear preference between null and overt pronouns in the Control group (b = 0.01, CrI = [-0.43, 0.45], pd = 52%); however, they preferred overt pronouns over NPs (b = 3.20, CrI = [2.66, 3.75], pd = 100%). Both Short-Term and Long-Term Italian/Spanish Exposure groups used more overt pronouns than null pronouns compared to the Control group (Short-Term vs Control: b = 1.04, CrI = [0.49, 1.57], pd = 100%; Long-Term vs Control: b = 1.09, CrI = [0.56, 1.62], pd = 100%). No robust differences were found between groups when comparing overt pronouns with NPs.

Separate analyses were conducted to directly compare the Short-Term and Long-Term Italian/Spanish Exposure groups across two referential contrasts in both conditions (the same statistical model with the Short-Term Exposure group set as the reference level). The results did not reveal any reliable differences between the two multilingual groups for overt versus null pronouns (b = -0.01, CrI = [-0.75, 0.72], pd = 51%) or NPs versus overt pronouns (b = -0.33, CrI = [-0.89, 0.24], pd = 88%) in the two-character condition. Similarly, no robust differences were observed between the two groups in the one-character condition: overt versus null pronouns (b = 0.05, CrI = [-0.54, 0.63], pd = 56%); NPs versus overt pronouns (b = -0.00, CrI = [-0.80, 0.81], pd = 50%).

## Discussion

We examined reference production in native Chinese speakers with varying amounts of L2 and/or L3 exposures, to explore the role of crosslinguistic influence in L1 attrition and to disentangle its impact from other cognitive and linguistic factors.

Our results are consistent with Liu et al. (under review), despite the difference in L2/L3 exposure. In the Control group, there was a no clear preference between null and overt pronouns in either condition, indicating a strong subject bias for both null and overt pronouns. In contrast, the multilingual speakers of both groups reliably preferred overt pronouns in both conditions; this result is actually clearer than the finding in Liu et al. (under review), where their bilingual speakers' preference for overt pronouns in the two-character condition was not statistically robust.

In line with the Interface Hypothesis predictions and the findings of Liu et al. (under review), our study reveals an overuse of overt pronouns among multilingual speakers of both the Short-Term and Long-Term Italian/Spanish Exposure groups in both the two-character and one-character conditions, compared to the Control speakers. The two multilingual groups do not differ in the strength of this preference, either suggesting that this attrition effect is rapid or (more likely) due to their comparable levels of language experience, as shown by their self-reported language proficiency and usage.

In our study, multilingual speakers primarily used and were exposed to their L1 (Mandarin Chinese) and L3 (Italian/Spanish), with limited use of English. Moreover,

Chinese, Italian, and Spanish all permit subject omission. As such, the overuse of overt pronouns observed in the multilingual speakers, indicating potential attrition in their L1, supports the hypothesis that this preference for overt pronouns is not driven by the details of the pronominal system in their L3. Thus, crosslinguistic influence is not a primary factor driving preference in attriting speakers for more explicit referential forms. Similarly, this preference cannot be attributed to ambiguity avoidance. In the one-character condition, where there is no ambiguity as to reference, and null and overt pronouns are equally acceptable in Mandarin (as demonstrated by the Control group), multilingual speakers still preferred overt pronouns.

What underlying factors could contribute to the attrition effects that result in the specific pattern of reference use seen here? As discussed earlier, the Interface Hypothesis proposes that attrition at the interface structure arises from insufficient integration of syntactic and pragmatic information in real-time. Bi- and multilingual speakers constantly manage more than one language system in their mind. These experiences may influence their cognitive capacity, leading to either fewer available cognitive resources (e.g. memory, attention: Gürel, 2019; Sorace, 2016) or misallocation of these resources (Sorace, 2011; Wilson, 2009). Consequently, their ability to effectively process syntactic and pragmatic information in real-time in reference tracking may be compromised, prompting them to select the less cognitively demanding option (i.e. overt pronouns). However, previous research on bilingualism has shown that bilinguals perform as well as or even better than monolinguals on certain executive function tasks (e.g., inhibiting irrelevant information: Bialystok et al. 2004 and references therein). At the same time, they may perform worse on tasks that involve the reactivation of previously suppressed information, such as negative priming tasks, where disengaging from the inhibition process requires additional cognitive effort (Treccani et al. 2009). These findings highlight the multifaceted nature of "cognitive load" in bilingualism and underscore the importance of mapping reference tasks onto specific cognitive processes to pinpoint which mechanisms may drive the observed patterns of reference use in bi- and multilingual speakers.

## Conclusion

This study explores the role of crosslinguistic influence in L1 attrition in Mandarin Chinese, focusing on reference use in spoken Mandarin among two groups of multilingual speakers with exposure to pro-drop languages. Consistent with previous attrition studies on L1 Chinese L2 English speakers, our multilingual speakers tend to be more explicit in their use of referring expressions, showing a preference for overt pronouns compared to their more-monolingual peers. These findings suggest that crosslinguistic influence may not be the primary factor resulting in attrition-related changes and this preference for explicitness. Further research is needed to explore alternative explanations, such as the impact of cognitive load.

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