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Anaphoric demonstratives occur with fewer and different pointing gestures than exophoric demonstratives

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This study investigates the co-organization of place-referring demonstratives (e.g. *here/there*) and pointing gestures by speakers of Ticuna. Ticuna is an Indigenous Amazonian language with a six-term demonstrative system which lexically distinguishes exophoric demonstratives (equivalent to *there far from me*) from anaphoric demonstratives (equivalent to *there where I mentioned*). This lexical contrast overlaps with, but is distinct from, the pragmatic contrast between new and previously mentioned referents. Drawing on a dataset of 742 demonstrative place references, I examine how both contrasts affect the rate and form of pointing gestures accompanying demonstratives. Pointing gestures were ubiquitous, occurring with 66.5% of demonstrative tokens. Ticuna participants pointed more often with exophoric demonstratives and with demonstratives that introduced new referents, but still pointed with a substantial minority of anaphoric demonstratives. Participants were also more likely to use index-finger handshapes with exophoric demonstratives, and to use full arm extension with demonstratives introducing new referents. These findings indicate that both lexical and information-structural factors affect the co-organization of pointing and demonstratives.

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1 Introduction

Demonstrative words, such as *this/that* and *here/there*, have an exceptional relationship with pointing gestures. For example, children combine demonstrative words with pointing before they combine words with each other (Capirci et al. 1996; Iverson & Goldin-Meadow 2005). Adults “co-organize” (Cooperrider 2016) their production of demonstrative words and pointing, varying their demonstrative choice with the presence and precision of pointing (Peeters & Özyürek 2016). And signed languages often employ pointing signs as demonstratives (see Cooperrider & Mesh 2022 for a review).

All of these statements apply to demonstratives in *exophoric* uses, where they pick out referents in the physical surroundings of the discourse. But many demonstratives also have *anaphoric* uses, where they pick out referents from the discourse itself. While demonstratives overall are associated with high gesture rates, anaphora and givenness are associated with low gesture rates and reduction of gesture form (Permiss & Özyürek 2015; Azar & Backus & Özyürek 2019; Debreslioska & Gullberg 2019; Holler et al. 2022). This raises questions about the relationship between anaphoric demonstratives and gesture. Do anaphoric demonstratives behave like other demonstratives, occurring with many gestures? Or do they behave like other anaphoric devices, occurring with fewer, articulatorily reduced gestures?

In response to these questions, I empirically investigate the effects of demonstratives’ *phoric type*, or exophoric vs. anaphoric status, on co-occurring pointing gestures. Specifically, I examine 742 demonstrative place references by speakers of Ticuna, an Indigenous Amazonian language. Ticuna has a large demonstrative system with a total of six place-referring terms. **Table 1** introduces the paradigm of demonstratives, which is discussed further in §3.

Demonstrative	Paraphrase	Form (Allative Case)
Speaker-Proximal	‘here near me’	nu ⁵ a ²
Dyad-Proximal	‘here between us’	ŋe ⁵ a ²
Speaker-Distal	‘there far from me’	je ⁵ a ²
Regional	‘here around me’	nu ⁵ ma ²
Anaphoric	‘there, anaphoric’	ŋe ⁵ ma ²
Past Anaphoric	‘there, anaphoric’	je ⁵ ma ²

Table 1: The place-referring demonstratives of Ticuna.

As shown in **Table 1**, the Ticuna demonstrative system lexically contrasts anaphoric demonstratives with exophoric (e.g. speaker-proximal, speaker-distal) ones. This makes it possible to identify the phoric type of demonstratives more precisely than is possible in languages with

smaller systems. It also allows us to distinguish between the phoric type of a demonstrative and the information status (new vs. previously mentioned) of its referent.

To preview the findings, I show that – while Ticuna speakers pointed *less* with anaphoric demonstratives than with exophoric ones – they used much more pointing with anaphoric references than the literature on demonstratives predicts. Additionally, speakers pointed less with demonstratives that indexed previously mentioned locations – whether they were exophoric or anaphoric – than with demonstratives that introduced discourse-new locations. Furthermore, across both points occurring with anaphoric demonstratives and points indexing previously mentioned referents, speakers displayed articulatory reduction in pointing form.

2 Background on demonstratives and co-demonstrative gestures

2.1 Demonstrative semantics and phoric type

Demonstratives are traditionally divided into two main categories: exophoric and anaphoric (see e.g. Diessel 1999; Levinson 2018; Peeters & Krahmer & Maes 2021). A demonstrative's status as exophoric or anaphoric is its *phoric type* (Botley & McEnery 2001). In some demonstrative systems, phoric type is exclusively contextual. For instance, in English, each demonstrative (*this/that, here/there*) displays both exophoric uses (*Stand over **there***) and anaphoric ones (*When Angel came into the room, Victoria was already **there***). This means that the phoric type of a given demonstrative token – whether it picks out a referent from the physical surroundings vs. from the discourse – must be inferred from context.

But in many other languages, including Korean (Ahn 2017: 41–42), Romanian (Ahn 2022), Yucatec Maya (Hanks 1990: 448–455), Tzeltal Maya (Brown & Levinson 2018), and several unrelated Amazonian languages (Guirardello-Damian 2018; Herrmann 2018; Meira 2018; Skilton 2019), phoric type is lexical. In these systems, some demonstratives are exclusively exophoric, always requiring a particular spatial relationship between the discourse participants and referent. Other demonstratives are exclusively anaphoric. They convey nothing about the spatial relationship between the participants and referent, only that the referent has been previously mentioned.

The Yucatec Maya discourse in (1), reproduced from Hanks (1990: 451), illustrates the alternation between lexically exophoric and anaphoric demonstratives over a discourse. In (1a), the speaker uses the exophoric demonstrative circumclitic *té?el...a?* 'here/there (exophoric immediate)' to refer to his motion goal, a cave in the surroundings. In (1b), he refers to the same location again with the anaphoric demonstrative *tí?...i?*.

- (1) a. *té? aáktun kén impul le b'á?al a?*
 'There (where I'm going) in a cave will I dispose of this thing,'
 b. *tí? kint'anjk i?*
 'There (anaphoric) is where I address it.'

The Ticuna discourse in (2), from this study's dataset, shows a parallel example of shift from lexically exophoric to anaphoric demonstratives. In (2a), the speaker uses the exophoric demonstrative je^5a^2 'there (distal),' in a syntactic focus (cleft) construction, to introduce a new referent. In (2b), she refers to the same referent again. This time, instead of exophoric je^5a^2 'there (distal),' she uses the anaphoric demonstrative ne^5ma^2 'there (anaphoric),' again in a cleft.¹

- (2) Context: 'Yesterday, because we didn't have the running water turned on yet...'
- a. $je^5a^2\tilde{a}^4ma^4$ $Ki^3\eta tji^3tu^1tji^5\tilde{r}^1wa^5$ $ni^{41}\tilde{r}^4$ $tja^1jau^1\eta tji^5ru^2?$
 $je^5a^2 = \tilde{a}^4ma^4$ $Ki^3\eta tji^3tu^1 = tji^5\tilde{r}^1 = wa^5$ $ni^{41}\tilde{r}^4$
 DEM:DISTAL = toward Cushillococha = liquid = ALL FOC
 $tja^1 = jau^1? = \eta tji^5ru^2 = ?$
 1SG.SC = wash = clothes = SUB
 'It was **THERE (far from me)**, in the Cushillococha lake, that I washed clothes.'
- b. $tja^1ri^3\eta i^3e^2\tilde{r}^4$, $ti^3re^1wa^5$, ne^5ma^2 $ni^{41}\tilde{r}^4$ $ta^1jau^1\eta tji^5ru^2gi^5?$
 $tja^1ri^3? = i^3e^2 = \tilde{r}^4$ $ti^3re^1 = wa^5$ ne^5ma^2 $ni^{41}\tilde{r}^4$
 1SG.SUB = go.toward.water = SUB port = ALL DEM:ANAPHOR FOC
 $ta^1 = jau^1? = \eta tji^5ru^2 = gi^5 = ?$
 1EXCL.SUB = wash = clothes = PL = SUB
 'I went down to the port; it was **THERE (anaphoric)** that we washed clothes.'
 (LGC, [CLA 2015-06.069](#), [tca_20180705_lgc_ahs_haldi_archive.mp4](#), 17:05)

As the translations of (1) and (2) illustrate, the English demonstrative system does not make the distinction in phoric type that Ticuna and Yucatec do, instead using *there* for both distal exophoric functions and anaphoric ones. Thus, in English and other languages where phoric type is contextual, it is often ambiguous whether a given demonstrative token makes exophoric (especially distal) vs. anaphoric reference (Botley & McEnery 2001). But in demonstrative systems where phoric type is lexical, there is no such ambiguity. These systems therefore offer an ideal environment for analyzing the effects of phoric type on other properties of demonstrative reference.

2.2 Phoric type vs. information status

In demonstrative systems where phoric type is lexical, it is essential to distinguish the phoric type of a demonstrative from the *information status* of the demonstrative's referent. In these languages, information status constrains the inventory of possible demonstratives for every reference, since lexically anaphoric demonstratives cannot index new referents. But this does not mean that information status deterministically *controls* demonstrative choice. All anaphoric demonstratives

¹ All Ticuna examples use the IPA and are from video recordings publicly available online in the California Language Archive via collection 2015-06 (Skilton 2015-). Citations below examples give the participant's initials, followed by folder and file references which can be used to locate the recording in the archive. The folder references are stable hyperlinks.

have previously mentioned referents, but exophoric demonstratives can have either discourse-new or previously mentioned referents.

The Ticuna example in (3) illustrates this. In line (3a), the speaker uses the lexically exophoric demonstrative nu^5a^2 ‘here (near me)’ to make the first mention of the referent location. In (3b), she uses the same demonstrative again, this time in a cleft, for the same referent.

(3) Context: ‘Where do you go to wash clothes?’

a. $nu^5a^2ta^2\tilde{a}^4$, pa^2 $t\{au^1e^3ja^1$

$nu^5a^2 = ta^2\tilde{a}^4$ pa^2 $t\{au^1 = e^3ja^1$

DEM:PROXIMAL = exactly VOC 1SG = sister

‘Right **here**, sister (pointing to an outdoor tap),’

b. $nu^5a^2ta^2\tilde{a}^4$ $ni^{41}\tilde{r}^4$ $t\{a^1ja^1\}t\{i^5ru^2\}$

$nu^5a^2 = ta^2\tilde{a}^4$ $ni^{41}\tilde{r}^4$ $t\{a^1 = ja^1\} = t\{i^5ru^2 = ?$

DEM:PROXIMAL = exactly FOC 1SG.SUB = wash = clothes = SUB

‘RIGHT **HERE** is where I wash clothes.’

(LGC, [CLA 2015-06.069](#), [tca_20180705_lgc_ahs_haldi_archive.mp4](#), 17:00)

The token of the speaker-proximal nu^5a^2 ‘here near me’ in (3a) introduces a new referent and the token in (3b) refers to an old one, but in both cases the referent is picked out from the surroundings rather than the discourse – that is, the demonstrative is exophoric, not anaphoric. Although the authors do not highlight the contrast between phoric type and information status, similar examples of multiple successive references with exophoric demonstratives also occur in Yucatec (Hanks 1990: 419) and Tzeltal (Brown & Levinson 2018: 167). Another example is the English translation of (3). In (3b), *here* has a discourse-old referent, but it is still exophoric: this discourse would be infelicitous in English if the referent was not near the speaker and did not meet the spatial requirements of *here*.

2.3 Co-demonstrative gesture

Following McNeill (1992), gesture researchers classify co-speech gestures into five main categories: pointing gestures, iconics, metaphorics, emblems, and beats. Pointing gestures identify a referent by projecting a vector from the speaker’s body to the referent. Many pointing gestures occur with demonstratives. I refer to these as *co-demonstrative* pointing gestures (Cooperrider 2023), and I refer to the combination of a pointing gesture and a demonstrative as a demonstrative *composite utterance* (Enfield 2009). To define the other types, iconic gestures depict the appearance of a referent; metaphorics represent an abstract concept by depicting an associated referent; emblems are conventional forms such as shaking the head for negation; and beats are non-referential gestures aligned with prosodic boundaries. These other gesture types are not completely mutually exclusive with pointing. For example, pointing gestures can have iconic handshapes (Cooperrider & Mesh 2022).

2.3.1 Gesture and phoric type

Research on demonstratives proposes a close relationship between the phoric type of a demonstrative and the use of co-demonstrative pointing gestures. For example, in a well-known typological study, Diessel (1999) – focusing on languages where phoric type is contextual – argues that the exophoric use of demonstratives represents “the only use that is commonly accompanied by a pointing gesture” (p. 111). Elsewhere, he asserts the opposite about anaphoric uses: they “are usually not accompanied by a pointing gesture” (Diessel 2006: 476). Diessel’s arguments on this point do not distinguish between nominal or entity-referring demonstratives (e.g. *this*, *that*) and locative or place-referring ones (e.g. *here*, *there*).²

Researchers in formal semantics make less explicit claims than Diessel, but their analyses still suggest a close link between phoric type and gesture. For example, Roberts (2002) posits that the English nominal demonstratives *this* and *that* – in both anaphoric and exophoric use – presuppose that the speaker produces an accompanying *demonstration* of the referent (cf. Kaplan 1989). Exophoric uses of these demonstratives presuppose only that the speaker produces *some* demonstration, though in Roberts’ examples the demonstration is always a pointing gesture or other visible behavior. In contrast, anaphoric uses of the nominal demonstratives specifically presuppose a demonstration that is part of the spoken discourse. As a result of this presupposition, Roberts’ semantics for anaphoric nominal demonstratives includes no component which would allow for visible demonstrations to contribute to anaphoric reference (Roberts 2002: 119–123). Thus, Roberts’ analysis suggests, but does not state outright, that anaphoric reference and pointing are mutually exclusive. Other discussions of demonstratives in formal semantics (e.g., King 2001; Wolter 2006; Nowak 2021) are similar: they analyze the relationship between pointing and exophoric demonstratives in detail, but say nothing about pointing with anaphoric demonstratives.

Ahn (2022), on the other hand, does make explicit claims about the relationship between pointing and phoric type. In her analysis of English and Korean nominal demonstratives, Ahn first distinguishes between languages where phoric type is contextual, like English, and those where it is lexical, like Korean. English demonstratives, she argues, contain a reference argument which can be saturated by either a pointing gesture or an anaphoric index. Korean demonstratives have the same argument structure, but include lexical restrictions on the reference argument. The exophoric terms require a pointing gesture as the reference argument, while the anaphoric ones require an anaphoric index (Ahn 2022: 1389). Since this analysis treats anaphoric indices and gestures as occurring in the same argument position, it predicts that they will be mutually exclusive. Ahn accepts that prediction, though not in its strongest form: she writes that pointing

² *Here/there* and their equivalents are also called “demonstrative adverbs.” I avoid this term for two reasons: (a) it is ambiguous between place-referring demonstratives and manner adverbs such as *thus*, and (b) in Ticuna the *here/there* equivalents are syntactically nouns, not adverbs.

is incompatible with anaphoric uses if it *overlaps* with the demonstrative, but may be acceptable if the gesture is made “in a casual manner” and after the demonstrative (Ahn 2022: 1365).

To summarize, within linguistic research on demonstratives, both formal and functional-typological works suggest that pointing gestures occur only with exophoric uses of demonstratives, not anaphoric ones. Some authors, such as Diessel and Ahn, make this claim explicitly. Others, including Roberts, make it implicitly – by assigning exophoric uses, but not anaphoric ones, a semantics where pointing can contribute to reference. Because Roberts (2002) and Ahn (2022) are interested primarily in comparing demonstratives to definite articles, their analyses focus on nominal demonstratives; however, Diessel’s (1999; 2006) claims include both nominal and locative demonstratives.

2.3.2 Gesture and information status

Information status has pervasive effects on all types of referential co-speech gesture, affecting both gesture rate and gesture form. The literature on co-speech gesture has documented these effects in detail, though not specifically for demonstratives. First, when speakers describe or index previously mentioned referents, they gesture less often than with new referents. This effect is seen in rates of all gesture types in German (Debreslioska & Gullberg 2022); in iconic gesture rates in English, Georgian, German, and Dutch (McNeill & Levy 1993; Gullberg 2006; Foraker 2011; Debreslioska & Gullberg 2019); and in pointing gesture rates in Turkish (Azar et al. 2019).

Pointing signs are not entirely comparable to co-speech pointing gestures (Perniss & Özyürek 2015; Fenlon et al. 2019; Cooperrider et al. 2021). However, Auslan signers employ fewer pointing signs with previously mentioned referents (Hodge & Ferrara & Anible 2019). For DGS signers, though, information-status differences among previously mentioned referents have no effect on the frequency of pointing signs (Perniss & Özyürek 2015). Furthermore, pointing signs often function as both pronouns and modifiers, and the effect of information status on frequency can differ between these functions (Grosso 2017).

Turning to gesture form, when speakers point at previously mentioned referents, or referents which their addressees can identify independent of the gesture, their points display articulatory reduction. In pointing gestures with “insecure reference” (e.g., previously mentioned referents), Lao speakers are less likely to fully extend the elbow or orient their head toward the pointing target (Enfield & Kita & De Ruiter 2007). Similarly, when English speakers and ASL signers produce pointing signs and gestures, they are less likely to fully extend the arm if the point is not “load-bearing” – that is, if the utterance also contains other information about the referent’s location (Cooperrider et al. 2021). Reduction also affects gesture duration. Dutch speakers (Peeters et al. 2015) and ASL signers (Cooperrider et al. 2021) use shorter stroke durations in pointing when their addressees can identify the target independently of gesture. Taking extension and duration

as dimensions of a broader concept of visual salience, these findings indicate that increases in shared knowledge about pointing referents are associated with decreases in the visual salience of pointing gestures. This same pattern holds in both entity reference (Peeters et al. 2015) and place reference (Enfield et al. 2007).

Givenness and other information-structural factors may also affect handshape in pointing. Speakers of Arrernte (Pama-Nyungan) more often use “canonical index-finger pointing” for emphatic reference and on first mentions of referents that continue to be important. By contrast, for “anaphoric” (i.e., subsequent) mentions or mentions of less important entities, they more often point with the entire hand (Wilkins 2003: 193). This relationship between whole-hand points and subsequent mention also holds for British English speakers when pointing at invisible referents (Flack & Naylor & Leavens 2018). Likewise, Kendon and Versante (2003: 129, 134) echo Wilkins’ association between index-finger pointing and emphatic reference. They write that Neapolitan speaker-gesturers use index pointing when a “precise location is foregrounded,” but use whole-hand pointing when the referent is the backgrounded source of other information, activity, or properties under discussion.

Both Wilkins (2003: 192) and Kendon and Versante (2003: 126) are explicit that these handshape patterns hold in both entity and place reference. In place reference specifically, pointing handshapes are also affected by the contrast between reference to locations (*it’s here*) and reference to directions (*it’s this way*). Across many unrelated speech and gestural communities (Haviland 2003; Levinson 2003; Orié 2009; Streeck 2009; Mesh 2017), it is reported that people use the index finger to point at locations, but use the entire hand to point at directions or at entities distributed in space. Some authors argue that this pattern is iconic (Levinson 2003); others, that it arises from the relationship between index pointing and emphasis or foregrounding (Mesh 2017).

3 Language background

Against this background, I investigated the effects of phoric type and information status on the co-organization of demonstratives and pointing. My data comes from speakers of Ticuna. Ticuna is an Indigenous language isolate spoken by at least 48,580 people (Eberhard & Simons & Fennig 2023) living along the Amazon River in Brazil, Colombia and Peru.

As described in Skilton (2019), Ticuna displays two sets of demonstratives: six nominal (entity-referring) demonstratives, equivalent to English *this/that*, and six locative (place-referring) demonstratives, equivalent to English *here/there*. For reasons discussed in §5.2, this study analyzes only locative demonstratives. **Table 2** (repeated from **Table 1**) displays the citation forms of the six locative demonstratives, along with glosses and paraphrases for each form.

I now summarize the characteristics of the locative demonstratives in **Table 2**, following Skilton (2019). The first four demonstratives here – the speaker-proximal, dyad-proximal, speaker-distal, and regional forms – are always exophoric. They require a particular spatial relation between the

Demonstrative	Paraphrase	Form (Allative Case)
Speaker-Proximal	‘here near me’	nu ⁵ a ²
Dyad-Proximal	‘here between us’	ŋe ⁵ a ²
Speaker-Distal	‘there far from me’	je ⁵ a ²
Regional	‘here around me’	nu ⁵ ma ²
Anaphoric	‘there, anaphoric’	ŋe ⁵ ma ²
Past Anaphoric	‘there, anaphoric’	je ⁵ ma ²

Table 2: The locative (place-referring) demonstratives of Ticuna.

speaker and the referent location: near speaker (speaker-proximal), enclosing speaker (regional), between speaker and addressee (dyad-proximal), or far from speaker (speaker-distal). Following these, the next form in **Table 1**, anaphoric ηe^5ma^2 , appears both in anaphoric place reference and as an exophoric demonstrative indexing places near the addressee (addressee-centered) (Skilton 2019: Chapter 4). Since no addressee-centered uses appeared in the data discussed here, I treat ηe^5ma^2 as lexically anaphoric. Past anaphoric je^5ma^2 is identical to anaphoric ηe^5ma^2 , except that it (a) occurs only in clauses with past temporal reference (Soares 2017) and (b) does not have addressee-centered or other exophoric uses. Both anaphoric ηe^5ma and past anaphoric je^5ma^2 can be coreferential with any exophoric demonstrative, showing that they have no spatial deictic content (Skilton 2019: Chapter 7). All of the demonstratives – both exophoric and anaphoric – can appear in emphatic and/or contrastive location focus, such as (2) and (3) above.

As in many languages (Diessel 1999), the Ticuna demonstratives have certain grammaticalized uses unrelated to place reference. Regional nu^5ma^2 can be used, together with an iconic gesture, to convey the size of an object (compare English *this* in *this big*). Both of the anaphoric items, ηe^5ma^2 and je^5ma^2 , can function as relative pronouns and temporal connectives as well as demonstratives. As relative pronouns, the anaphoric demonstratives introduce location relative clauses which lack a nominal head, like English relative *where*. As temporal connectives, they convey temporal sequence of clauses, like *and then*. (4) gives an example of the relative pronoun use; (5) shows the temporal sequence use.

(4) Context: ‘We lived right here [in this part of the compound]...’

ŋu¹?ma⁵ ta³¹ŋu³¹ ga⁴ na⁴ je²?ma⁴ ta¹a³pe⁴³gi⁵?i⁴

ŋu¹?ma⁵ ta³¹=ŋu³¹ ga⁴ na⁴ je²?ma⁴

until 1EXCL.SBJ > 3OBJ = finish PST.COMP DEM:PST.ANAPHOR

ta¹ = a³ = pe⁴³ = gi⁵ = ?i⁴

1EXCL.SBJ.SUB = go.and = sleep = PL = SUB

‘Until we finished (the building) **where** we go in to sleep.’

(HCG, [CLA 2015-06.058](#), tca_20180714_hcg_ahs_video_haldi_archive.mp4, 12:40)

- (5) Context: ‘My grandmother and grandfather died.’
 ma³ je²?ma⁴ na⁴ri³?o² ga⁴ gu⁵?i⁴ma³ ga⁴ ta²?ki⁴.
 ma³ je²?ma⁴ na⁴ri³?=o² ga⁴ gu⁵?i⁴ma³ ga⁴ ta²?ki⁴
 PERF DEM:PST.ANAPHOR 3SBJ=quit PST.DET all PST.DET INDEF
 ‘And then absolutely everything (that I had planned) became futile.’
 (SSG, [CLA 2015-06.045](#), tca_20170826_ssg_ahs_elicited_video_002_archive.mp4, 2:17)

Relative pronoun, temporal connective, and size-related uses of locative demonstratives are distinct from true demonstrative uses because they do not index places.

4 Predictions

Combined with the language-specific facts above, the theories discussed in §2 yield two sets of predictions about the co-organization of pointing and demonstratives in Ticuna.

4.1 Predictions about gesture rate

Semantics and pragmatics research on demonstratives argues that gesture contributes to reference for exophoric demonstratives, but not for anaphoric ones. As a result, authors in this literature argue, anaphoric demonstratives “do not usually occur” or do not overlap with pointing, while exophoric demonstratives do (Diessel 1999; 2006; Ahn 2022). Thus, this claim predicts that Ticuna speakers will point less often when using the anaphoric demonstratives *je⁵ma²* and *je⁵ma²* than when using any of the four exophoric demonstratives (Prediction 1.1). Additionally, while Diessel and Ahn’s claims are not expressed in quantitative terms, they suggest that the gesture rate with anaphoric demonstratives will approach zero (Prediction 1.2). While Ahn’s claims specifically concern entity-referring demonstratives, Diessel’s claims do not distinguish between entity and location reference; therefore, these predictions apply to both types of reference.

Gesture studies research on information status also offers predictions about gesture rate. This literature indicates that familiar and/or discourse-old referents are associated with lower gesture rates, whether we consider iconic gestures (Debreslioska & Gullberg 2019), object-referring pointing gestures (Azar et al. 2019), or all gesture types together (Debreslioska & Gullberg 2022). These studies are specific to entity reference rather than place reference. However, if place reference patterns the same, these findings predict that referent information status will affect the co-organization of demonstratives and pointing: people will be more likely to point when introducing discourse-new referents than when referring back to previously mentioned ones (Prediction 1.3). This is a prediction about information status, not (only) about phoric type. It therefore requires us to distinguish between demonstratives with new vs. previously mentioned referents.

4.2 Predictions about gesture form

Gesture studies literature shows that, when people point at objects or places that are previously mentioned and/or otherwise identifiable to the addressee, they reduce the visual salience of their pointing gestures (Enfield et al. 2007; Peeters et al. 2015; Cooperrider et al. 2021). This reduction – perhaps the behavior that Ahn (2022) describes as pointing “in a casual manner” – affects many different articulatory features, including stroke duration, head orientation, and arm extension. For methodological reasons, I analyze only arm extension. For this variable, I predict, following Enfield et al. (2007) and Cooperrider et al. (2021), that speakers will be less likely to extend the arm when pointing at previously mentioned referents (Prediction 2.1).

While the reduction studies just cited are all quantitative, qualitative research also makes predictions about the relationship between information status and gesture form, specifically handshape. Ethnographers of pointing have argued that when people point at previously mentioned referents or make “anaphoric” mentions, they are less likely to use index-finger handshapes (Kendon & Versante 2003; Wilkins 2003); Flack and colleagues’ (2018) quantitative study shares this conclusion. In a possibly related pattern, people are also less likely to use index handshapes when pointing out directions vs. when pointing at locations (e.g., Haviland 2003). Thus, I predict that Ticuna speakers will be less likely to use index-finger pointing handshapes (a) when pointing at previously mentioned referents (Prediction 2.2) and (b) when pointing indexes a direction, rather than a location (Prediction 2.3). While I express the first of these predictions in terms of information status, Wilkins’ (2003) description actually contrasts “anaphoric” mentions with “first” mentions, meaning that it can also be understood as a prediction about phoric type.

5 Methods

5.1 Participants and procedure

Six Ticuna speakers from the town of Cushillococha, Peru, aged 35 to 72 years, participated in 30-minute monolingual interviews about the town’s landscape. Three participants – Sotil Suárez González (SSG), Deoclesio Guerrero Gómez (DGG), and Angel Bittancourt Serra (ABS) – were male. The other three – Ortencia Coello Guerrero (HCG), Lucinda Gómez Cordero (LGC), and Yaneth Cándido Guerrero (YCG) – were female. All of them were hearing, had no exposure to sign language, and spoke Ticuna as their sole first language. SSG, DGG, ABS and YCG spoke Spanish as sequential bilinguals. HCG and LGC understood some Spanish but did not speak it.

Interview questions were adapted from Kita’s (2001) landscape description task. Acting as a research assistant as well as a participant, Angel Bittancourt Serra translated the interview guide into Ticuna and assisted me in adapting it for the area. The interview questions prompted participants to describe the current and historical locations of landmarks; describe locations where they had lived; give route directions; and provide eyewitness accounts of a flood.

I interviewed all six participants in Ticuna, which I speak well as a second language. I conducted the interviews, rather than a native-speaker interviewer, because many of the Kita locality description questions would be pragmatically odd if asked by a person from the same location as the interviewee. To avoid priming effects, prior to debrief I did not inform participants that the study concerned pointing gestures; however, all of the participants were aware of my interest in demonstratives. Interviews took place in 2017 and 2018 in Cushillococha or the neighboring town of Caballococha. They were held outdoors, or in spaces with half-walls, in and near participants' homes. Interviews were recorded in HD with one camera (2017: Sony PJR540, 2018: Canon XA30).

5.2 Speech coding

Angel Bittancourt Serra and Lilia Witancort Guerrero (also an L1 Ticuna speaker) worked with me to transcribe all speech in the interviews and translate it into Spanish. The first five minutes of each interview were transcribed, but treated as a warmup period and excluded from all further analysis.

I identified all locative demonstrative tokens in the transcripts and coded each token for phoric type, information status, and referent type (location vs. direction), all treated as binary. Speaker-proximal, dyad-proximal, speaker-distal, and regional demonstratives were coded as exophoric; anaphoric and past anaphoric demonstratives were coded as anaphoric. To code information status and referent type, I identified the referent of each demonstrative, then determined (a) whether it had been mentioned previously in the interview and (b) whether it was a location (point or region) vs. a direction (path or bearing). The discourse in (6) includes demonstratives of each phoric type, information status, and referent type.

- (6) Context: 'After we moved out of our old house...'
- a. **nu**⁵**a**²**ta**²**ã**⁴ **a**³**ri**¹
nu⁵**a**² = **ta**²**ã**⁴ **a**³**ri**¹
DEM:PROXIMAL = exactly INFO
 '(We came) **right here** (speaker-proximal, first mention, location),'
- b. **je**²**?ma**⁴ **ta**⁴**?ã**³**tji**⁵**ĩ**¹**gi**⁴,
je²**?ma**⁴ **ta**⁴ = **ã**³ = **tji**⁵**ĩ**¹ = **gi**⁴
DEM:PST.ANAPHOR 1EXCL.SBJ = have = house = PL
 'We moved into a new house **there** (past anaphoric; previously mentioned – same as 6a; location),'
- c. **je**²**?a**⁴**ma**⁴
je²**?a**⁴ = **ã**⁴**ma**⁴
DEM:DISTAL = towards
 '(It was) **that way** (speaker-distal; previously mentioned – same as 6a; direction).'
 (HCG, [CLA 2015-06.058](#), tca_20180714_hcg_ahs_video_haldi_archive.mp4, 13:21)

I analyze only locative demonstratives (equivalent to *here/there*), not nominal demonstratives (*this/that*). This is because the nominal and locative demonstrative tokens were not comparable in count, distribution, or referent type. First, the transcripts contained many more locative demonstratives (724 tokens) than nominal ones (395 tokens). Second, while most locative demonstratives in the transcripts were exophoric (**Table 5**), most nominals were anaphoric (64.5%, 256 of 395 tokens). Third, a large fraction of the anaphoric nominal demonstratives had abstract referents such as time periods (*that year*) or propositions (*they liked that*). These kinds of referents are not comparable to places or concrete objects because they do not have locations in space. I also did not analyze non-deictic location references, which generally employed absolute or intrinsic frames of reference.

5.3 Gesture coding

Seven US-based research assistants coded the manual gestures in the footage. The coders were aware of the study hypotheses, but did not understand Ticuna and were not provided with translations of the audio. Coders identified all manual gestures in the footage. They were also trained to identify non-manual gestures, such as lip pointing. Coders did not identify any exclusively non-manual gestures. They did identify head and lip movements occurring with manual gestures, but these were not analyzed for reasons of interrater reliability (discussed later in this section).

Based on visual criteria, each manual gesture was coded for handshape, arm extension, and orientation of the speaker’s head relative to the pointing vector. Handshapes were coded according to a controlled vocabulary with seven possible values, shown in **Table 3**.

Code	Description
Index	Only the index finger is extended
Index + 1	The index finger and one other finger are extended
Index + 2	The index finger and two other fingers are extended
Flat	Four fingers extended in parallel, regardless of action of thumb (like ASL B)
Open	All fingers, including thumb, are extended and spread (like ASL 5)
Thumb	Only the thumb is extended
Other	Any other handshape

Table 3: Handshape codes used in gesture annotation.

For arm extension, gestures were coded as displaying full arm extension if the participant’s forearm attained a 180° angle with their upper arm during the movement. Gestures where the elbow was already fully extended at the beginning of the movement were *not* coded as including

full arm extension. As a proxy for eye gaze, coders also annotated the orientation of the speaker's head as toward vs. away from the pointing target at the gesture peak. Arm extension and head orientation were treated as binary. All speech and gesture coding was performed in ELAN using Transcription Mode (Wittenburg et al. 2006; Dingemanse et al. 2012).

To assess reliability, a secondary coder re-coded the footage for 25% of the primary coder's annotations, blinded to their codes. Primary and secondary codes were compared in R 4.3.1 (R Core Team 2023) using the *irr* package (Gamer et al. 2019). For handshape, the research questions were concerned mostly with the contrast between index and non-index pointing. I therefore transformed the handshape codes from **Table 3** into a binary variable which contrasted handshapes with an extended index finger (index, index+1 and index+2) with all other handshapes. Inter-rater agreement on the binary handshape variable was 93.1% ($\kappa = 0.831$), indicating *almost perfect* agreement. For arm extension, inter-rater agreement was 92.9% ($\kappa = 0.734$), indicating *substantial* agreement, which I considered sufficient. For head orientation, inter-rater agreement was 77.8% ($\kappa = 0.535$), indicating only *moderate* agreement. Due to this low level of agreement, head orientation/eye gaze data was not further analyzed. Only primary coders' results were used in the analyses.

Following gesture coding, I combined the speech and gesture transcripts using the *fuzzyjoin* and *tidyverse* packages (Wickham et al. 2019; Robinson 2020) and identified all demonstrative tokens that overlapped with gestures for >100ms. I reviewed the video of each gesture which overlapped with a demonstrative and coded the gesture type, taking into account both the gesture's form and the co-occurring speech. The interview questionnaire, fully coded speech transcripts, fully coded gesture transcripts, and analysis code are included as Supplementary Materials.

6 Results

6.1 Speech

Participants produced 742 total locative demonstrative tokens. As described in §3, the Ticuna Regional, Anaphoric, and Past Anaphoric demonstratives can appear in non-demonstrative functions, for example as relative pronouns. All tokens of these types were reviewed to identify any non-demonstrative uses. Twenty-two demonstrative tokens (3.0%) were used in non-demonstrative functions: 12 were temporal connectives, eight were relative pronouns, and two indexed the size of a referent. All 22 non-demonstrative tokens were excluded from further analyses.

After this, 720 demonstrative tokens remained in the dataset. **Table 4** shows the number of tokens of each lexical item there. **Table 5**, grouping together all exophoric and all anaphoric forms, shows the number of tokens of each demonstrative lexical item which occurred with new vs. previously mentioned referents.

Demonstrative	Mean (SD) Count of Tokens per Participant	Total Count of Tokens
Speaker-Proximal	49.8 (18.6)	299
Speaker-Distal	28 (14.3)	168
Dyad-Proximal	5.2 (3.3)	31
Regional	2.5 (1.7)	10
Anaphoric	25.7 (5.8)	154
Past Anaphoric	14.5 (7.1)	58

Table 4: Demonstrative tokens by lexical item.

Demonstrative	Information Status	Mean (SD) Tokens per Participant	Total Count of Tokens
Speaker-Proximal	New	10.8 (4.0)	65
	Mentioned	39.0 (15.3)	234
Speaker-Distal	New	14.2 (7.9)	85
	Mentioned	13.8 (7.4)	83
Dyad-Proximal	New	2.7 (2.3)	16
	Mentioned	2.5 (1.1)	15
Regional	New	0.7 (1.0)	4
	Mentioned	1.0 (0.9)	6
Anaphoric	New	0.2 (0.4)	1
	Mentioned	25.5 (6.1)	153
Past Anaphoric	New	0.2 (0.4)	1
	Mentioned	9.5 (9.1)	57
Exophoric Total	New	28.3 (13.1)	170
	Mentioned	56.3 (23.7)	338
Anaphoric Total	New	0.3 (0.5)	2
	Mentioned	35.0 (10.3)	210

Table 5: Demonstrative tokens by lexical item and information status.

As **Table 4** indicates, the majority of all exophoric demonstratives in the data were Speaker-Proximals and the majority of anaphoric demonstratives were the temporally unmarked Anaphoric item. Further, as the Exophoric Total rows of **Table 5** show, exophoric demonstratives both introduced new referents and indexed previously mentioned referents, in line with the theoretical predictions from §2.2. In particular, the Speaker-Proximal exophoric demonstrative indexed

previously mentioned referents more than three times as often as it indexed new referents. The other exophoric demonstratives were about equally likely to index new or previously mentioned referents.

While I predicted above that anaphoric demonstratives would index only previously mentioned referents, the Anaphoric Total rows in **Table 5** show that two tokens of anaphoric demonstratives actually introduced new referents. (7) shows one of the two new-referent anaphoric tokens. This example is biclausal. In the first clause, the speaker describes an event; in the second clause, he refers to the location of the event with the past anaphor *je⁵ma²*.

- (7) ri¹ ŋe⁴ʔgu²ma³ no⁵¹ri³ avión nu⁵a² ɲa⁴³ʔgu² ri¹, pa³¹ʔa²ma³ĩ¹ki² je⁵ma² tʃa³ɲa⁴³
 ri¹ ŋe⁴ʔgu²ma³ no⁵¹ri³ avión nu⁵a² ɲa⁴³=ʔgu² ri¹
 TOP CONN 3POSS SP:airplane DEM:PROX run = SUB TOP
 pa³¹ʔa²ma³=ĩ¹ki² je⁵ma² tʃa³=ɲa⁴³
 quickly = INFO DEM:PST.ANA 1SG = run
 ‘Whenever their airplane landed here (i.e., in town), I quickly ran **there (anaphoric)**
 (i.e., up to it).’
 (SSG, [CLA 2015-06.045](#), tca_20170826_ssg_ahs_elicit_video_001_archive.mp4, 5:12)

The token of *je⁵ma²* in the second clause of (7) can be seen as introducing a new referent, since it is not coreferential with any noun phrase in the subordinate clause or earlier in the discourse. On the other hand, this location can also be seen as previously mentioned, since it is the location of a previously mentioned event (the landing) and referent (the airplane). The other new-referent token of an anaphoric demonstrative in the dataset involves a similar bridging use, indexing the location of a previously mentioned event. As the data included only two anaphoric tokens which displayed this type of ambiguous information status, I excluded them from all analyses, leaving 718 demonstratives in the dataset.

Finally, turning to referent type, **Table 6** reports the total number of demonstratives which indexed locations vs. directions, by phoric type and information status.

Phoric Type	Information Status	Referent Type	Mean (SD) Count of Tokens per Participant	Total Count of Tokens
Anaphoric	Previously mentioned	Location	33.7 (10.8)	202
		Direction	1.3 (2.0)	8
Exophoric	New	Location	10.7 (7.0)	64
		Direction	17.7 (8.8)	106
Exophoric	Previously mentioned	Location	44.2 (18.4)	265
Exophoric		Direction	12.1 (7.8)	73

Table 6: Demonstrative tokens by phoric type and referent type.

As **Table 6** shows, almost all demonstratives indexing directions – 179 of 187 (95.7%) – were exophoric. This reflects that participants frequently indexed the direction of a place using an exophoric demonstrative, then referred back to the place itself with an anaphoric term. (8) is an example of this structure. In (8a), the participant describes the direction in which the town of Erené lies, relative to another town that she has already mentioned, Bellavista. Her direction reference uses the speaker-distal exophoric demonstrative. In (8b), she states that her brother lives in Erené. This is a location reference, not a direction one (the man lives *in* Erené, not in its direction); it uses an anaphoric demonstrative.

(8) Context: ‘Where is Erené?’

- a. E³re³ne⁵, na⁴ηe²?ma⁴ i⁴ Bellavista = a¹ri³ je⁵a²ã⁴ma⁴?ra¹ma³.
 E³re³ne⁵ na⁴=ηe²?ma⁴ i⁴ Bellavista = a¹ri³ je⁵a²=ã⁴ma⁴=?ra¹=ma³
 Erené 3SBJ=located DET Bellavista=POSS **DEM:DISTAL**=toward = a.little = INFO
 ‘Erené is located **a little farther in that direction** (speaker-distal, first mention, direction) from Bellavista.’
- b. ηe⁵ma² ni⁴¹?i⁴ na¹ηe²?ma⁵?i⁴
 ηe⁵ma² ni⁴¹?i⁴ na¹=ηe²?ma⁵=?i⁴
DEM:ANAPHOR FOC 3SBJ.SUB=located = SUB
 ‘He lives **THERE** (anaphoric, previously mentioned, location).’
 (YCG, [CLA 2015-06.046](#), tca_20170829_ycg_ahs_elicit_video_002_archive.mp4, 2:04)

6.2 Gesture

Of the 718 demonstrative tokens analyzed, 512 co-occurred with gestures. In 475 of these composite utterances, the gesture was classified – based on its form and the content of the co-occurring speech – as a pointing gesture coreferential with the demonstrative. In the other 37, the gesture either was not a point or was not coreferential with the demonstrative. **Table 7** classifies all of the co-demonstrative gestures in the data.

Gesture Type	Total Count of Tokens
Pointing, coreferential with demonstrative	475
Iconic	13
Beat	12
Emblem	8
Pointing, not coreferential with demonstrative (all were points at speaker or addressee)	4

Table 7: Classification of all co-demonstrative gestures.

Since the 33 iconic, beat, and emblem gestures do not index places, they are not comparable to the place-referring pointing gestures that occurred with other demonstratives. The points at the speaker or addressee may index places (e.g. on their bodies), but are not comparable to points that index places and are reinforced with a coreferential demonstrative. These composite utterances were therefore excluded from all analyses, leaving 475 demonstrative composite utterances and 681 total demonstrative tokens in the dataset.

7 Analyses

To analyze the effects of information status and phoric type on gesture rate and form, I constructed a series of mixed-effects logistic regression models using the *lme4* and *lmerTest* R packages (Bates et al. 2015). All models were initially fit with random intercepts for participants and by-participant random slopes for every predictor. In some analyses, these maximal models did not converge or produced a singular fit, indicating overfitting. I describe how convergence issues were resolved for each model in detail in the Supplementary Materials.

7.1 Gesture rate

On average, participants pointed with 66.5% (range: 30.0–87.7%) of all demonstrative tokens. Specifically, pointing occurred with 88.8% (range: 61.1%–100%) of exophoric demonstratives indexing new referents, 70.2% (range: 33.3%–89.9%) of exophoric demonstratives indexing previously mentioned referents, and 43.3% (range: 4.0%–62.5%) of anaphoric demonstratives indexing previously mentioned referents. **Figure 1** displays the proportion of exophoric vs. anaphoric demonstratives, with new vs. previously mentioned referents, occurring with pointing gestures for each participant. **Figures 2** and **3** provide video still examples of two pointing gestures occurring with exophoric (**Figure 2**) and anaphoric (**Figure 3**) demonstratives.

Figure 1 visually suggests that both phoric type and information status affected participants' rate of pointing. However, because the dataset contains no anaphoric demonstratives with new referents, only three of the four possible cells of the phoric type by information status interaction are defined. This makes it impossible to construct models which include both of these fixed effects and their interaction. Instead, I analyzed the effects of phoric type and information status by dividing the data into two subsets and fitting a separate model to each subset, as described in detail in the following paragraphs.³ Because referent type (location vs. direction) is only relevant to my predictions for handshape, not for gesture rate, I did not include it in these models.

³ The alternative would have been to collapse the phoric type and information status variables into a single three-level categorical variable (Exophoric New vs. Exophoric Previously Mentioned vs. Anaphoric), then dummy-code the variable with Exophoric Previously Mentioned as the reference level. This would make it possible to construct a single model for each outcome (i.e., rate, arm extension, and handshape). However, considering how dummy-coded categorical variables are treated in regression, constructing a single model with a three-level, dummy-coded

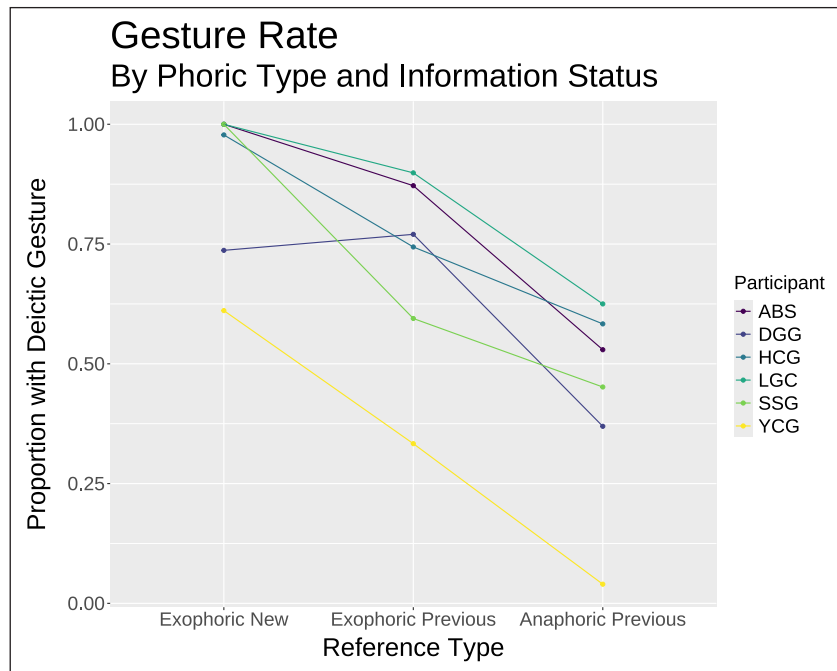


Figure 1: Proportion of demonstratives occurring with a pointing gesture, by phoric type of the demonstrative and information status of the referent.



Figure 2: Pointing gesture accompanying $nu^5a^2ta^2\tilde{a}^4$ ‘right here (near me; exophoric).’ (ABS, [CLA 2015-06.039](#), [tca_20170825_abs_ahs_licit_video_002_archive.mp4](#), 2:09).



Figure 3: Pointing gesture accompanying $je^5ma^2ta^2\tilde{a}^4$ ‘right there (where I mentioned; anaphoric).’ (ABS, CLA 2015-06.039, tca_20170825_abs_ahs_licit_video_001_archive.mp4, 9:55).

First, in order to investigate differences in gesture rate motivated by phoric type, I constructed a subset of the data which included all and only the demonstratives – exophoric or anaphoric – with previously mentioned referents ($n = 512$). This subsetting holds information status constant, allowing us to isolate the effect of phoric type. Using mixed-effects logistic regression, I modelled the outcome of the presence of a pointing gesture with phoric type as the sole predictor variable; random intercepts for participants; and by-participant random slopes for phoric type. In this and all subsequent models, phoric type was coded as binary with exophoric as the reference level. I observed a significant effect of phoric type on the presence of co-demonstrative pointing gestures. When participants indexed previously mentioned referents, they were less likely to point if they used anaphoric demonstratives than if they used exophoric ones ($\beta = -1.37$, $SE = 0.23$, $p < 0.001$).

predictor is not meaningfully different from constructing two separate models with subsetted data, binary predictors, and the same reference level, as I have done here.

Fitting a single model per outcome on non-subsetted data would not change any of the findings – I demonstrate this in detail in the Supplementary Materials. However, fitting a single model *would* mean that anaphoric demonstratives would always be present in the dataset. When anaphorics are present, it is not possible to include spatial deictic content as a predictor because it is undefined for them. Therefore, in order to include the spatial predictor, I chose to fit two models over subsetted data. Subsetting means that spatial deictic content can be included in the model of information status, although it still cannot be included in the model of phoric type.

Next, to investigate the effect of information status on gesture rate, I constructed a subset of the data which included all and only the exophoric demonstratives ($n = 497$) – whether they indexed new or previously mentioned referents. As in the previous analysis, this subsetting holds phoric type constant, allowing us to isolate the effect of information status. Using mixed-effects logistic regression over this subset of the data, the binary outcome of the presence of a pointing gesture was modelled with information status, spatial deictic content, and their interaction as predictors, and random intercepts for participants.⁴ Since this model includes random intercepts but not random slopes, it assumes that participants vary in baseline gesture rate, but not in the effects of information status or spatial deictic content on gesture rate. To create the spatial deictic content variable, Speaker-Proximal and Regional demonstratives were coded as proximal, Dyad-Proximal demonstratives were coded as medial, and Speaker-Distal demonstratives were coded as distal. The variable was dummy-coded with proximal as the reference level. Information status was coded as binary with new as the reference level. This model observed a significant effect of information status. When participants used exophoric demonstratives, they were less likely to point if the referent was previously mentioned than if it was new ($\beta = -1.22$, $SE = 0.40$, $p = 0.002$). For exophoric demonstratives, there was no evidence for an effect on gesture rate from use of medial or distal demonstratives, or from interactions between medial/distal demonstrative use and information status (all p -values > 0.1).

7.2 Gesture form: arm extension

Next, I analyzed the relationship between gesture form, demonstrative phoric type, and referent information status in the 475 demonstrative composite utterances. My first form analysis concerned arm extension. On average, participants extended the arm completely in 46.2% (range: 27.3%–75.7%) of gestures occurring with exophoric demonstratives indexing new referents; 25.7% (range: 9.1%–56.5%) of gestures with exophoric demonstratives indexing previously mentioned referents; and 16.8% (range: 0%–35.3%) of gestures with anaphoric demonstratives indexing previously mentioned referents.

Figure 4 displays the proportion of co-exophoric vs. co-anaphoric gestures, with new vs. previously mentioned referents, occurring with full arm extension for each participant. **Figures 5 and 6** show two example gestures with vs. without full arm extension, both occurring with (different tokens of) the exophoric, speaker-distal demonstrative *je⁵a²*.

My first analysis of this data examined phoric type. To control for the effects of information status in this analysis, I subsetting the data to include only composite utterances with previously mentioned referents ($n = 324$). I then modelled the outcome of the presence of full arm extension

⁴ The model did not include random slopes because models with random slopes did not converge regardless of the fixed effects and random effects structure. See the Supplementary Materials for further detail.

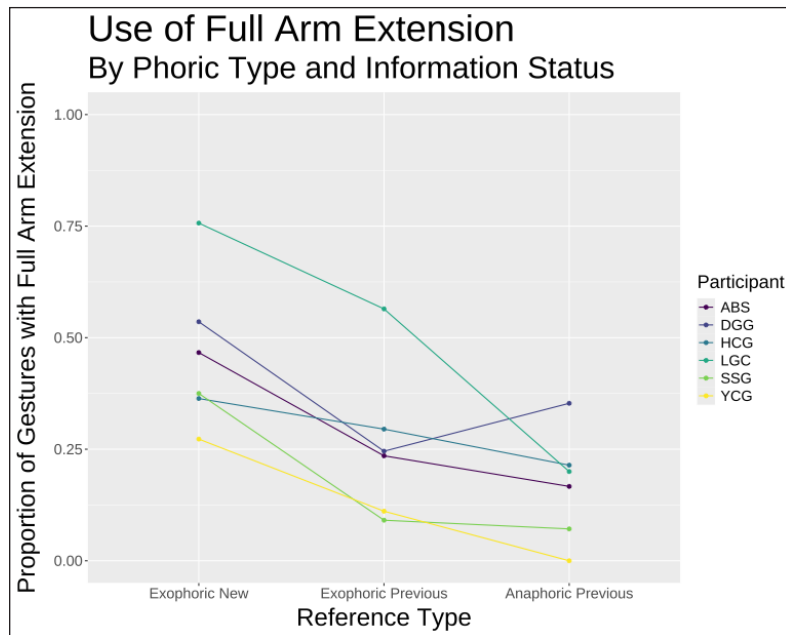


Figure 4: Proportion of co-demonstrative pointing gestures with full arm extension, by phoric type of the demonstrative and information status of the referent.



Figure 5: Pointing gesture *with* full arm extension, accompanying $je^5a^2\tilde{a}^4ma^4ma^3$ ‘toward there (far away; exophoric).’ (ABS, [CLA 2015-06.039](#), tca_20170825_abs_ahs_licit_video_001_archive.mp4, 6:44).



Figure 6: Pointing gesture *without* full arm extension, also accompanying $\text{je}^5\text{a}^2\tilde{\text{a}}^4\text{ma}^4\text{ma}^3$ ‘toward there (far away; exophoric).’ (ABS, [CLA 2015-06.039](#), [tca_20170825_abs_ahs_elicit_video_001_archive.mp4](#), 7:49).

with phoric type as the sole predictor variable and random intercepts for participants, but no random slopes.⁵ The model indicated no significant effect of phoric type on the presence of full arm extension ($\beta = -0.52$, $SE = 0.32$, $p = 0.11$).

My next analysis considered the impact of information status on arm extension. To control for the effects of phoric type, I subsetted the data to include only observations with exophoric demonstratives ($n = 396$). I then modelled the outcome of full arm extension with information status, spatial deictic content, and their interaction as predictors, and random intercepts for participants.⁶ This model indicated a significant effect of information status on the presence of full arm extension. When participants produced an exophoric demonstrative and pointed, they were less likely to extend their arm completely if the referent was previously mentioned than if it was new ($\beta = -0.94$, $SE = 0.33$, $p = 0.005$). There was no significant effect of using medial or distal demonstratives, or of the interactions between medial/distal demonstrative use and information status (all p -values > 0.6), on the presence of full arm extension with exophoric terms.

⁵ Models with random slopes did not converge. See the Supplementary Materials for further detail.

⁶ Models with random slopes again did not converge. See the Supplementary Materials.

7.3 Gesture form: index handshape

The second form analysis examined participants' use of index-finger pointing handshapes. On average, participants pointed with the index finger in 43.2% (range: 18.2%–59.5%) of gestures accompanying exophoric demonstratives with new referents; also 43.2% (range: 27.3%–59.6%) of gestures accompanying exophoric demonstratives with previously mentioned referents; and 23.3% (range: 0.0%–47.1%) of gestures accompanying anaphoric demonstratives. **Figure 7** summarizes participants' use of index handshapes by phoric type and information status.

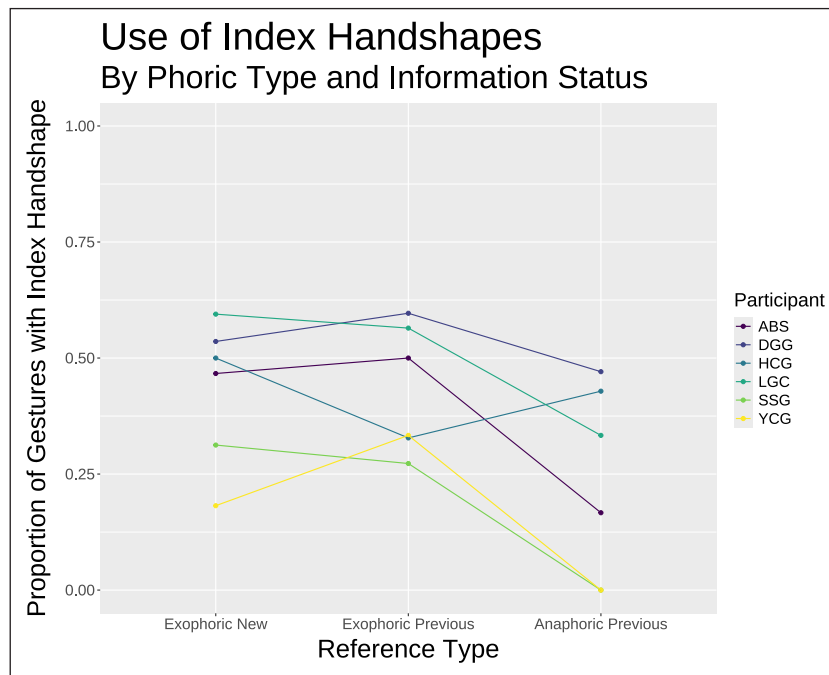


Figure 7: Proportion of co-demonstrative pointing gestures with index handshape, by phoric type of the demonstrative and information status of the referent.

As **Figure 7** shows, these Ticuna participants do not share Western speakers' (Cooperrider & Slotta & Núñez 2018; Flack & Naylor & Leavens 2018) strong preference for pointing with the index finger. Overall, only 210 (44.2%) of the 475 co-demonstrative pointing gestures used an index handshape. Because of reliability issues (§5.3), I did not conduct detailed analyses of the different non-index handshapes. However, based on the primary coders' annotations, the most common non-index pointing handshapes in the dataset involve the entire hand: they are the flat (ASL B-like) and open (ASL 5-like) handshapes. **Figures 8** and **9** provide examples of these handshapes occurring with exophoric (**Figure 8**) and anaphoric (**Figure 9**) demonstratives.



Figure 8: Pointing gesture with flat handshape, accompanying nu^5a^2 ‘here (near me; exophoric).’ (LGC, [CLA 2015-06.069](#), tca_20180705_lgc_ahs_haldi_archive.mp4, 10:20).



Figure 9: Pointing gesture with open handshape, accompanying ηe^5ma^2 ‘there (where I mentioned; anaphoric).’ (LGC, [CLA 2015-06.069](#), tca_20180705_lgc_ahs_haldi_archive.mp4, 6:19).

In light of the theorized relationship between referent type (direction vs. location) and handshape (§2.3.2), I also calculated the proportion of gestures using the index handshape for each referent type. These figures do not immediately suggest a difference between locations and directions: on average, participants used index handshapes in 38.3% (range: 13.2%–62.0%) of points at locations and 40.0% (range: 27.3%–54.2%) of points at directions.

My first analysis of the handshape data examined the effects of phoric type and referent type. As in the arm extension analysis, I controlled for information status by subsetting the data to consider only observations with previously mentioned referents ($n = 324$, per above). I then modelled the outcome of use of the index-finger handshape with phoric type and referent type as predictors, random slopes, and random intercepts for participants.⁷ Referent type was coded as binary with location as the reference level. The model indicated a significant effect of phoric type on participants' use of index-finger pointing handshapes: when participants used a demonstrative and a gesture to index a previously mentioned referent, the gesture was less likely to display an index handshape if the demonstrative was anaphoric than if it was exophoric ($\beta = -0.95$, $SE = 0.46$, $p = 0.040$). However, the model indicated no significant effect of referent type on handshape: for previously mentioned referents, participants were no less likely to use index handshapes when pointing at directions than when pointing at locations ($\beta = -0.01$, $SE = 0.48$, $p = 0.98$).

My second analysis of the index-finger pointing data considered information status. Again as in the arm extension analysis, I controlled for the effect of phoric type by subsetting the data to include only observations with exophoric demonstratives ($n = 396$, per above). I then modelled the outcome of use of an index-finger handshape with information status, spatial deictic content, and referent type as predictors and random intercepts for participants.⁸ The model indicated no significant effect of information status ($\beta = -0.14$, $SE = 0.24$, $p = 0.55$), referent type ($\beta = -0.37$, $SE = 0.24$, $p = 0.12$), or use of a medial demonstrative ($\beta = -0.09$, $SE = 0.44$, $p = 0.84$) on the use of index-finger pointing handshapes with exophoric terms. However, there was a significant effect of the use of distal demonstratives: people used index handshapes more often with distals ($\beta = 0.54$, $SE = 0.23$, $p = 0.02$) than with proximals.

8 Discussion

This study investigated the co-organization of demonstratives and pointing gestures by speakers of Ticuna, an Indigenous Amazonian language with a large, semantically complex demonstrative system. I video-recorded six Ticuna speakers describing the locations of landmarks in their community, then analyzed the participants' use of demonstratives and co-occurring, coreferential pointing gestures. Specifically, I analyzed how the phoric type (exophoric vs. anaphoric status) of

⁷ Models which included interactions as predictors did not converge. See the Supplementary Materials.

⁸ Models which included interactions as predictors and/or included random slopes did not converge. See the Supplementary Materials.

demonstratives and the information status (new vs. previously mentioned) of referents affected participants' rate and form of pointing. The literature supports the same theoretical predictions for both entity-referring and place-referring demonstratives. However, due to the distribution of place vs. entity references in this dataset, I analyze only place-referring demonstratives and gestures.

To summarize, the phoric type of demonstratives affected both the rate and the form of co-demonstrative gestures. When people used anaphoric demonstratives, they were less likely to point, though their gesture rates remained well above zero. Additionally, when participants did point with anaphoric demonstratives, their gestures were less likely to display an index-finger handshape. Information status also affected both rate and form. When participants used exophoric demonstratives to refer to previously mentioned locations, they were less likely to point than when they used them to introduce discourse-new locations. Furthermore, when participants did point when indexing a previously mentioned referent, their gestures were less likely to include full extension of the arm. **Figure 10** provides a visual summary of these effects. The contrast between proximal, medial, and distal exophoric demonstratives did not affect gesture rate or arm extension, but it did affect handshape: people used index-finger handshapes more often with distal than with proximal demonstratives.

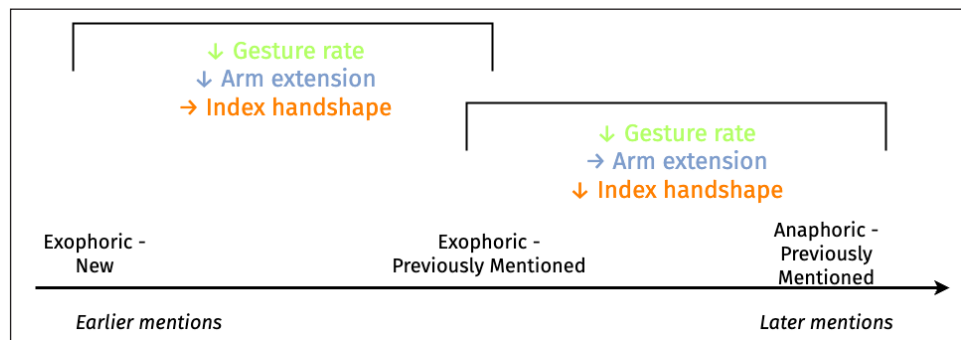


Figure 10: Visual summary of differences between demonstrative tokens differing in phoric type and information status.

8.1 Both phoric type and information status affect gesture rate

I considered two sets of predictions about the relationship between the phoric type of demonstratives, the information status of demonstrative referents, and the frequency of co-demonstrative pointing gestures. First, linguistic research on demonstratives claims that anaphoric demonstratives rarely or never occur with pointing, while exophoric demonstratives often do (Diessel 1999; 2006; Ahn 2022). For this dataset, this claim predicts that phoric type will influence the rate at which pointing gestures co-occur with demonstratives, and more specifically, that the gesture rate with anaphoric demonstratives will be near zero. In line with this prediction (Prediction 1.1), I do observe effects of phoric type on gesture rate: participants point

less with anaphoric demonstratives than with exophoric demonstratives. Contrary to the stronger claims in this literature, however, the effect of phoric type is not categorical (Prediction 1.2). Numerically, participants pointed relatively often with anaphoric demonstratives, and they quite often omitted pointing with exophoric demonstratives, especially when they indexed previously mentioned referents (**Figure 1**). Second, gesture studies research – by Azar and colleagues (2019), Debreslioska and Gullberg (2019; 2022), and many others – has shown that references to previously mentioned entities occur with fewer gestures than references to discourse-new entities. This predicts that people will point less with demonstratives indexing previously mentioned referents (Prediction 1.3). The results fell exactly in line with this prediction. Participants pointed more with demonstratives used for new referents than for previously mentioned referents, even when only exophoric terms were considered.

Thus, this analysis partly confirms the theoretical position that deixis and anaphora have different relationships with gesture, and partly challenges it. Because we observe an effect of phoric type, these findings do support the core argument of the literature on demonstratives and gesture – that gesture is more important to fixing reference for exophoric demonstratives than anaphoric ones (Ahn 2022). However, these findings empirically disprove the claim that anaphoric demonstratives do not occur, only rarely occur, or do not overlap with pointing (Diessel 1999; 2006; Ahn 2022).

Some readers may ask why participants so often pointed with anaphoric demonstratives, since the point in this type of composite utterance is redundant (i.e., repeats location information that was already present in earlier references). I offer two responses to this question. First, the locality description interview questions require participants to constantly introduce new locations into the discourse, as well as referring back to many previously introduced ones. Thus, location references in this task – whether exophoric or anaphoric – are highly ambiguous. This may lead participants to increase their rate of pointing in order to disambiguate between multiple recently mentioned referents (cf. Azar et al. 2019). For the same reason, location reference in this task is very often contrastive. Thus, many demonstrative tokens in the data appear in syntactic focus (cleft) constructions (e.g., 2a,b; 3b; 8b). Contrastive focus (as a semantic category) and/or clefting could conceivably also elevate gesture rates with anaphoric demonstratives.

Second, I offer a more general response to the idea that producing the same information multiple times in a discourse or utterance is redundant. If this is true, so-called redundancy is a core feature of both grammar and co-speech gesture. For instance, morphological agreement between a verb and an overt argument is arguably redundant. Similarly, the literature on iconic gesture observes that – while people sometimes express entirely different information in gesture and speech – they also sometimes express overlapping information in the two channels (Goldin-Meadow 2003: Chapter 7; Alibali et al. 2009). There is no reason to predict that demonstratives, or the gestures that accompany them, will be less redundant than other speech and gesture.

For gesture studies research, on the other hand, this study makes two contributions. First, it replicates in a less-studied language the finding that new referents are associated with higher gesture rates than previously mentioned referents (Foraker 2011; Debreslioska & Gullberg 2019; 2022, among others). Second, it shows that referring expressions can belong to the same syntactic category, but still be associated with different gesture rates. This finding has precedent in results showing that speakers of Turkish (Azar et al. 2019) and German (Debreslioska & Gullberg 2022) gesture more with noun phrases than with pronouns. Azar and colleagues, as well as Debreslioska and Gullberg, interpret this result as showing that gesture rate is sensitive to the semantic richness of the co-occurring speech. They argue that NPs are associated with higher gesture rates because they are “richer” – i.e., convey more information about the referent – than pronouns. In contrast, my findings about the association between exophoric demonstratives and higher gesture rates cannot be explained by the richness (i.e., informativity) of the co-occurring speech. Exophoric demonstratives and anaphoric demonstratives convey equal *amounts*, but different *types*, of information about their referents: exophoric demonstratives convey the referent’s location in space, while anaphoric demonstratives convey its information status. As such, these findings support the conclusion that gesture rate is sensitive not only to the quantity of information that the co-occurring speech conveys, but also to whether this information is spatial. Speakers gesture more when they produce referring expressions that convey spatial information – that is, exophoric demonstratives – than when they produce equally informative expressions, of the same syntactic category, which convey non-spatial information – that is, anaphoric demonstratives.

8.2 Information status, but not phoric type, affects arm extension

In addition to my analysis of gesture rate, I also tested predictions about the effect of phoric type and information status on gesture form. Gesture studies literature (e.g., Enfield et al. 2007) has shown that when more information about a referent is in the common ground, people point at the referent using reduced, or less visually salient, gestures. Using arm extension as a measure of articulatory reduction, I predicted that Ticuna speakers would extend the arm less often when pointing to previously mentioned referents than when pointing to new ones (Prediction 2.1).

My results upheld this prediction: when speakers used a demonstrative and pointed, their pointing gesture was less likely to include full arm extension if the referent was previously mentioned. This effect strongly resembles Enfield and colleagues’ findings (2007) about arm extension for Lao speakers, as well as Cooperrider and colleagues’ (2021) results on arm extension for English speakers and ASL signers. The difference between these results and theirs concerns the content of the co-occurring speech. Previous authors compare composite utterances where the speech contains more vs. less location information, whether this is described in terms of focus (Enfield et al. 2007) or as sharing the informational load with the gesture (Cooperrider et al. 2021). In contrast, all composite utterances in my information status analysis contained

exophoric demonstratives. Thus, all of these utterances include the same minimum degree of location information, showing – much as in the rate analysis – that reduction in gesture form can occur even in the absence of total reduction in the semantic richness of speech (e.g. in the zero location anaphora examined by Enfield and colleagues). In contrast to information status, phoric type had no effect on participants' arm extension. This is conceptually in line with Mesh's (2017) finding that, in co-demonstrative pointing gestures by speakers of San Juan Quiahije Chatino (Oto-Manguan; Mexico), there is no relationship between elbow height (a correlate of arm extension) and (exophoric) demonstrative lexical item.

My analysis of arm extension has the methodological limitation that arm extension was coded visually and as a binary variable. In reality, arm extension is continuous. Analyzing it as such, for example using computer vision (Pouw & Trujillo & Dixon 2020), could have produced different results. Another limitation is that I did not analyze non-deictic location information, such as place names or location descriptions, that occurred in the speech accompanying gestures. Future work should explore how the presence and content of other location information affects arm extension (Cooperrider et al. 2021).

8.3 Phoric type, but not information status or referent type, affects handshape

As a second dimension of gesture form, I also analyzed handshape. Wilkins (2003) and Kendon and Versante (2003) have suggested that people are more likely to use index-finger handshapes (compared to whole-hand handshapes) on first mention of a referent (cf. Flack & Naylor & Leavens 2018), for more important referents, and for emphasis. With this background, I predicted that Ticuna speakers would be more likely to use index handshapes when pointing at new referents (Prediction 2.2). Additionally, given the many observations in the literature about the relationship between index-finger pointing and location (vs. direction) reference, I predicted that speakers would be more likely to use index handshapes when pointing at locations (Prediction 2.3).

The results were not consistent with either Prediction 2.2 or 2.3. There was no effect of either information status or referent type (direction vs. location) on the use of index-finger pointing gestures accompanying demonstratives. There *was*, however, an effect of phoric type. Points that accompanied exophoric demonstratives were more likely to display index handshapes than points that accompanied anaphoric demonstratives. This finding cannot be readily explained in terms of articulatory reduction, since the flat and open handshapes that predominate in this data are not necessarily less effortful or visually salient than the index handshape. There was also an effect of spatial deictic content: among co-exophoric points, people were more likely to use index handshapes with distal demonstratives than with proximals. These findings on phoric type and spatial deictic content are surprising, because other research on pointing has not suggested associations between index handshapes and specific demonstrative lexical items. For example, Mesh (2017: 99–100) observed no effect of the contrast between demonstratives

and other referring expression types, and no effect of any individual demonstrative, on Chatino speakers' use of index vs. open pointing handshapes. Likewise, despite an extensive discussion of handshape, Wilkins (2003: 193) describes no influence of demonstrative lexical item on handshape for Arrernte speakers.

The finding that there was no effect of referent type on handshape also departs from many observations in the literature, as well as from my own previous qualitative impressions (and many individually clear video examples) of Ticuna speakers' handshape use. One possible explanation is that other properties of the referents in this dataset, such as size or distance (Mesh 2017), favor the use of non-index handshapes so strongly that they overshadow effects of the location vs. direction contrast. For instance, unpublished data on child-caregiver interaction which I collected in 2019 shows that when pointing at objects in their immediate surroundings, Ticuna adults use > 90% index handshapes. This suggests possible relationships between handshape and distance, or between handshape and the contrast between object and place reference. Future research should pursue these possibilities further. Last, and more general, these handshape results provide further evidence that whole-hand pointing is cross-culturally commonplace (cf. Wilkins 2003; Mesh 2017; Flack & Naylor & Leavens 2018; Fenlon et al. 2019). Researchers should therefore avoid excluding whole-hand gestures from analysis in studies of pointing (Enfield et al. 2007: 1725).

9 Conclusion

This study investigated the effects of two pragmatic contrasts – the contrast between exophoric and anaphoric demonstratives, and the contrast between first and subsequent mentions – on co-speech pointing gestures by Ticuna speakers. Pointing was ubiquitous with demonstratives: on average, speakers accompanied almost two-thirds of their demonstrative uses with pointing. In line with the linguistic literature on demonstratives, speakers were more likely to point with exophoric demonstratives, which I argue reflects that exophoric (but not anaphoric) demonstratives convey spatial information. In contrast to this literature, however, speakers still routinely pointed with anaphoric items. Additionally, in line with the findings of gesture studies research, there were also effects of information status. Demonstratives used to introduce new referents were more likely to occur with points, and points indexing new referents were more likely to involve complete extension of the arm.

These results indicate the co-organization of demonstratives and pointing gestures is influenced by both lexical factors, such as the phoric type of the demonstrative, and information-structural ones, such as the information status of the referent. Some properties of co-demonstrative gestures, such as rate, respond to both lexical and information-structural factors; others, such as arm extension, are affected only by information structure. Together, these results underline the importance of studying deictic language and gesture as an integrated system.

Abbreviations

Glossed examples use the Leipzig Glossing Rules.

Data availability statement

The interview questionnaire, fully coded speech transcripts, fully coded gesture transcripts, and analysis code are included as Supplementary Materials. Original interview videos are available in the California Language Archive in collection CLA 2015-06 (DOI: [10.7297/X29P2ZPJ](https://doi.org/10.7297/X29P2ZPJ)), in folders 2015-06.039, 2015-06.040, 2015-06.045, 2015-06.046, 2015-06.058, and 2015-06.069.

Ethics and consent

Participants provided informed consent to interviews and the archiving of the videos. The study was approved by the Committee for the Protection of Human Subjects at the University of California, Berkeley (approval 2017-08-10232).

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Competing interests

The author has no competing interests to declare.

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