The role of gesture in ʔayʔaǰuθəm determiners and demonstratives[1]

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Abstract. This paper examines the contribution of co-speech gesture with determiners and demonstratives in ʔayʔaǰuθəm (ISO 639-3: coo), an endangered Salish language spoken in British Columbia, Canada. Using a small experiment designed after similar work by Ebert et al. (2020) on German, we show that gestural content is not-at-issue accompanying ʔayʔaǰuθəm determiners but shifts to the at-issue dimension with at least one class of demonstratives, the so-called "gesture demonstratives". The experiment also confirms Ebert et al.'s observation that co-speech gesture makes different contributions with indefinite-like versus definite-like determiners. Overall, the findings suggest that speech-accompanying gestures are interpreted similarly even in unrelated languages with quite different systems of determiners and demonstratives.

Keywords: ʔayʔaǰuθəm, determiners, demonstratives, co-speech gesture, at-issueness

1. Introduction

In this paper, we explore the interaction of co-speech gesture with determiners and demonstratives in ʔayʔaǰuθəm (a.k.a. Comox-Sliammon; ISO 639-3: coo), a Salish language traditionally spoken by the Tla'amin, Homalco, Klahoose, and K'ómoks communities in British Columbia, Canada. According to the most recent census, only 78 speakers report as fluent (FPCC 2023), though there is a growing community of language learners.

Just like other languages in the Salish family (e.g., Klallam, cf. Montler 2007; Squamish, cf. Gillon 2006), ʔayʔaǰuθəm boasts a remarkably rich inventory of determiners and demonstratives. So far, at least five distinct determiners and 17 distinct demonstratives have been attested in the language, amounting to a total of 22 distinct D elements (cf. Huijsmans et al. 2020; Reisinger et al. 2021; Reisinger & Huijsmans 2021; Huijsmans & Reisinger 2022a, 2022b). These elements encode a variety of dimensions, such as evidentiality, deixis, gender, and number. Recently, Huijsmans and Reisinger (2022a) proposed that the use of co-speech gesture might be a further dimension of variation, leading to a split in the demonstrative system. More specifically, they argue that the "gesture demonstratives" (GDEMs) require the use of co-speech gesture, while the "salience demonstratives" (SDEMs) do not.

This claim forms the starting point for the current investigation. Beyond the observations in Huijsmans and Reisinger (2022a), the interpretation of co-speech gesture with ʔayʔaǰuθəm D elements has not been explored. In general, little is known about the role of gesture in Salish languages, apart from Webb's pioneering work on viewpoint gestures in Halkomelem (cf. Webb 2021, 2022).

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In this paper, we build on Ebert et al.'s (2020) work, which explores what co-speech gesture contributes when it accompanies German demonstratives and determiners. Based on native-speaker judgements and two experiments, they argue that gesture conveys not-at-issue content by default but changes to at-issue content when accompanying demonstratives. They also find that co-speech gesture contributes differently with definite and indefinite determiners.

Inspired by Ebert et al.'s (2020) work, we designed a small experiment to test whether their hypotheses also map over to ʔayʔaǰuθəm. Based on this investigation, we argue that gesture contributes at-issue content when accompanying GDEMs, whereas it is not-at-issue when it co-occurs with other D elements, thus providing cross-linguistic support for Ebert et al.'s observation that demonstratives act as "dimension shifters". Second, we provide evidence that co-speech gesture evokes a similarity reading with indefinite-like determiners and an identity reading with definite-like determiners, again confirming another one of Ebert et al.'s findings from their work on German. Third, we propose that, at least for some speakers, GDEMs require the use of co-speech gesture, which is not the case for other D elements. And fourth, we find that iconic gestures are vaguer than pointing gestures and, thus, more easily accommodated by speakers.

Particularly the first two findings suggest that Ebert et al.'s (2020) core observations about the semantics of co-speech gesture accompanying D elements hold beyond Indo-European languages. This is especially interesting since the organization of the system of D elements in ʔayʔaǰuθəm shows important differences with English and German, as will be discussed below. The findings also partially confirm Huijsmans and Reisinger's (2022a) claim that GDEMs require co-speech gesture to establish reference, contributing to core semantic content.

The paper is structured as follows: Section 2 introduces Ebert et al.'s (2020) framework for analyzing co-speech gesture, while Section 3 provides an abridged overview of ʔayʔaǰuθəm demonstratives and determiners. In Section 4, we present the experiment that we used to answer some open questions on the interaction between co-speech gesture and D elements in the language. Following a brief discussion of the SDEMs in Section 5, we then attempt to formalize the different contributions of co-speech gesture for some of the D elements in Section 6. A summary of our main findings and their implications concludes this paper in Section 7.

2. Background

With the recent rise of "super semantics" (cf. Schlenker 2018b), the study of co-speech gesture has received increased attention among semanticists and pragmaticians (e.g., Lascarides & Stone 2009; Lücking 2013; Ebert & Ebert 2014; Schlenker 2018a; Tieu et al. 2018, 2019; Ebert et al. 2020; Barnes & Ebert 2023; Walter 2023). In this section, we provide a brief overview of some key insights emerging from this research.

As already noted by Neill (1992), co-speech gesture is not a monolithic phenomenon. Rather, gestures may come in many different shapes or forms. In this paper, we will be particularly concerned with two of the most common types of co-speech gesture, namely pointing gestures and iconic gestures (see Figures 1 and 2). While the former directly identify the target object, usually by the use of the index finger, but occasionally also via gazes or head movements, the

latter involve some kind of demonstration by the speaker to represent a property of the target object, such as its shape or size (cf. Umbach & König 2018).

Figure 1: A pointing gesture

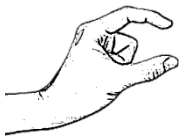

Figure 2: An iconic gesture

Both pointing and iconic gestures behave similarly in that they introduce a gesture referent into the discourse (cf. Ebert et al. 2020). For pointing gestures, this gesture referent is always the object that the speaker points to. For iconic gestures, on the other hand, the gesture referent will be an abstract object that the speaker creates *through* the gesture.

Yet, what exactly is the contribution of co-speech gesture? Ebert et al. (2020) propose that co-speech gestures typically add not-at-issue meaning to an utterance, making their contribution analogous to appositives. Consider, for instance, the examples in (1) and (2). In both cases, the utterance itself conveys at-issue information (i.e., 'the speaker brought a bottle to the talk'), while the accompanying gesture imposes an additional piece of not-at-issue content. In (1), the iconic gesture conveys that 'the bottle is big' and, in (2), the pointing gesture conveys that 'the bottle is the entity pointed to'. Crucially, these pieces of not-at-issue information cannot be denied or challenged, highlighting that they behave similarly to appositives.

(1) I brought [a bottle of water] to the talk. (Ebert et al. 2020:163)
BIG

(2) I brought [the bottle of water] to the talk. (adapted from Ebert et al. 2020)
POINTING TO BOTTLE

Yet, as Ebert et al. (2020:168) propose, the interpretation of co-speech gestures also depends on what exactly they are accompanying. More specifically, they argue that gestures accompanying an indefinite determiner express a similarity reading, while gestures that co-occur with a definite determiner evoke an identity reading. This is illustrated by examples (3) and (4). While (3) conveys that the gesture referent is similar to the DP referent (and could be used, e.g., upon seeing someone else with a bottle of water: *I brought a bottle of water to the talk too*), (4) indicates that the gesture referent is identical to the DP referent. Regardless of these differences, the gesture contribution remains not-at-issue in both cases.

(3) I brought [**a** bottle of water] to the talk.
POINTING TO BOTTLE

(4) I brought [**the** bottle of water] to the talk.
POINTING TO BOTTLE

Last, when co-speech gestures accompany a demonstrative, their interpretation will change yet again. In this case, Ebert et al. (2020:163–164) claim, the contribution of the gesture shifts from not-at-issue information to at-issue information. This domain shift is shown in (5) and (6). For the utterance in (5), which involves the definite determiner *the*, the contribution of the pointing gesture (i.e., 'the bottle is the entity pointed to') is not-at-issue and, consequently, cannot be targeted by negation. However, if we replace the definite determiner with a demonstrative, as in (6), the gesture contribution suddenly becomes at-issue and, thus, can be negated. Due to this behaviour, Ebert and Ebert (2014) describe demonstratives as "dimension shifters".

(5) I didn't bring [**the** bottle of water]. #I brought a different one.
POINTING TO BOTTLE

(6) I didn't bring [**that** bottle of water]. I brought a different one.
POINTING TO BOTTLE

With this theoretical background in place, we can now begin to explore the contribution of co-speech gesture for determiners and demonstratives in ʔayʔaǰuθəm.

3. Forms

As mentioned in the introduction, ʔayʔaǰuθəm has at least 22 distinct determiners and demonstratives. This richness in D elements is driven by the fact that many of these forms encode multiple pieces of information, such as evidentiality, deictic distance, gender, and number (cf. Reisinger et al. 2021; Reisinger & Huijsmans 2021). For the purposes of this investigation, we will only focus on an illustrative subset of forms — specifically, the demonstratives *təy̓ta* and *tan̓*, the definite-like determiner *tə,* and the indefinite-like determiner *kʷ*. We set aside their evidential and deictic contributions here for reasons of space, referring the reader to Reisinger et al. (2021), Reisinger and Huijsmans (2021), and Huijsmans and Reisinger (2022a) for details.

The form *təy̓ta* is a GDEM, used to introduce a new referent into the discourse via gesture, as in (7).[2]

(7) *Context: Marianne and Daniel just arrived at Gloria's place. Gloria is in the kitchen getting them something to drink, and Marianne admires the flowers she has on her table in the living room. Daniel hasn't noticed them, so Marianne* ***points*** *at them and says:*

ʔu,	k̓ʷə[n]-t=gi	{**təy̓ta** / #tan̓}	qʷasəm.	hihiw	ʔaǰ-umiš-mut.
oh	see-CTR=DPRT	{GDEM / SDEM}	flower	really	good-appearance-INT

'Oh, look at those flowers. They're really beautiful.'

[2] The first line of each example is a phonemic representation in the North American Phonetic Alphabet (NAPA) showing morpheme breaks, the second line provides a gloss, and the third line gives the translation. Infelicitous examples are marked with a hash (#), and marginal uses are marked with a question mark (?). The abbreviations used in this paper follow the Leipzig Glossing Rules, with the following additions: ACT = active, CLF = cleft, CONJ = conjunction, CTR = control transitivizer, DIM = diminutive, DPRT = discourse particle, GDEM = gesture demonstrative, INT = intensifier, PRT = particle, NCTR = non-control transitivizer, RPT = reportative, SDEM = salience demonstrative, STAT = stative. A hyphen (-) is used to mark an affix, an equal sign (=) a clitic, a tilde (~) a reduplicant, and angle brackets (< >) an infixation into the root.

The form *taṅ̓*, an SDEM, is not felicitous in this context. Instead, the demonstrative *taṅ̓* is used to refer to a referent that is already salient in the discourse. In (8), for instance, the referent is salient because the picture is held by the addressee and is in the joint attention of both discourse participants. Here, use of the GDEM *təẏ̓ta* would be infelicitous.

(8) *Context: I see you examining a picture of a young man, and I'm curious who it is.*

gat=ga {#təẏ̓ta / **taṅ̓**}?
who=DPRT {GDEM / SDEM}
'Who is that?'

Unlike the GDEMs, SDEMs do not require gesture. They are therefore compatible with non-exophoric referents (i.e., abstract referents not located in the external world, such as pieces of discourse). In (9), for example, the speaker refers to what she has explained earlier with *taṅ̓*.

(9) *Context: From a narrative on traditional teachings.*

hiɬ=ga ʔə=xʷ=nəm̓=s **taṅ̓** tə=θ=θu
COP=DPRT CLF.PRT=OBL.NMLZ=be.like=3POSS SDEM DET=2SG.POSS=go
su~suh-uθut paya ʔ.
PROG~do.traditional.ritual-CTR.REFL always
'That's why you always do your morning ritual.' (Watanabe 2014:090)

The determiner *tə* heads referential DPs but, unlike English *the*, does not require familiarity, as shown in (10). This is consistent with the observation that Salish languages lack common ground restrictions (cf. Matthewson 2006, 2008; Davis & Matthewson 2009; Reisinger et al. 2021).

(10) *Context: From a traditional narrative about the character qayx̣ (= the Mink). He is in trouble with his community, who are trying to catch him to punish him. His grandmother, the knothole who saves him here, has not been introduced previously in the story.*

ʔəwk̓ʷ gat ǰəƛ̓~ǰəƛ̓ x̣aƛ̓-s kʷ=s=ƛ̓əkʷ-t=it.
all who PL~run want-3POSS DET=NMLZ=catch-CTR=3PL.POSS
xʷaʔ čəm̓ məʔ-nu-m. ʔu, niʔ=k̓ʷa **tə**=t̓ᶿəstaya. hiɬ=k̓ʷa
NEG what.is.with get-NCTR-PASS oh be.there=RPT DET=knothole COP=RPT
pipaʔa č<ič>iya<ʔ>-s qayx̣ taṅ̓, tə=knothole.
one.person grandmother<DIM>-POSS Mink SDEM DET =knothole
'Everyone was chasing him, trying to grab him. They couldn't catch him. Oh, there was a knothole. It was one of Mink's grandmothers there, the knothole.'

The determiner *tə* usually refers to a unique/maximal entity in the context but does not impose maximality as a common ground requirement.[3] Instead, maximality is calculated relative to a

[3] The demonstratives seem to carry an oppositive requirement of non-uniqueness. Rather than treating this as part of the presupposed or at-issue content of the demonstratives, we propose that this arises through competition between forms, following Ahn (to appear). Demonstratives involve more content to identify the referent than determiners and so should be chosen over determiners only when this additional content is necessary (building on Schlenker's (2005) 'Minimize Restrictors!').

situation salient to the speaker. This is illustrated in (11), where the speaker first refers to one salient set of toys using *tə qaqsim* 'the toys' and then introduces more toys in the second conjunct. Use of *tə* in the first conjunct does not require that the toys are maximal relative to the situation salient to the addressee, unlike with English *the*. Thus, no awkwardness arises here.

(11) *Context: My niece comes over to play. She asks where the toys are. Most are in a box, and a few are on the shelf. Pointing to the toys in the room, I tell her:*

niʔ	nəp-ít	tə=k̓^{w}ax^{w}a	**tə**=qaqsim	ʔiy	niʔ
be.there	put.in-STAT	DET=box	DET=toys	CONJ	be.there
	ṫu<ṫ>ɬ-ít	ʔə=taʔa	**tə**=sq^{w}aq.		
	put.on<PL>-STAT	OBL=GDEM	DET=some/rest		

'? The toys are in the box, and the rest are there.'

Lastly, the determiner *k^{w}* is the closest of all D elements in ʔayʔaǰuθəm to an indefinite determiner. In contrast to the other forms, it is used where there is no reference to a specific individual, as exemplified by (12).

(12) *Context: At a ring shop, I walk up to a display case with the type of thing I want and tell the salesperson:*

ʔət^{θ}=χaƛ̓	t^{θ}=yəq-ʔəm	ʔə={#tə / **k^{w}**}=ṫ^{θ}agatiq^{w}uǰatən.
1SG.POSS=desire	1SG.POSS=buy-ACT.INTR	OBL={DET / DE**T**}=ring

'I want to buy a ring.'

The determiner *k^{w}* is also used when asserting that there are no entities matching the NP description, as in (13). The use of the *tə* determiner is not felicitous in such cases.

(13) *Context: Marianne is about to start weaving a basket with Betty, but she doesn't have an awl. She tells Betty:*

x^{w}uk^{w}t	{#tə / **k^{w}**}=ət^{θ}=χ^{w}uχ^{w}ṗ.
not.exist	{DET / DET}=1SG.POSS=awl

'I don't have an awl.'

4. Experiment

To gain a better understanding about how the elements described in the preceding section interact with co-speech gesture, we designed a small experiment — loosely modelled after Ebert et al.'s (2020) experimental work — and tested a series of proposals on how co-speech gesture is used in the language. In particular, we sought to validate the following hypotheses:

Hypothesis 1:
Co-speech gesture is at-issue for ʔayʔaǰuθəm GDEMs, but not at-issue for ʔayʔaǰuθəm determiners (cf. Ebert et al. 2020 for similar claims, based on German).

Hypothesis 2:
Co-speech gesture encodes identity when it accompanies the definite-like determiner *tə*, but similarity when it co-occurs with the indefinite-like determiner *kʷ* (cf. Ebert et al. 2020 for similar claims, based on German).

Hypothesis 3:
GDEMs obligatorily require co-speech gesture (cf. Reisinger & Huijsmans 2021:328 for this claim).

Hypothesis 4:
Iconic gestures cannot perfectly represent the targeted property and are consequently more easily accommodated than pointing gestures.

In the following sections, we will present the experiment and discuss its results.

4.1. Method

Participants: Three female elders, all above the age of 70, took part in the experiment — this represents roughly 3.85 percent of the fluent population. Two of the participants speak the Tla'amin dialect, the other one the Homalco dialect.

Materials: The experiment encompassed 85 test items in which we paired a video clip with a picture. In the videos, Marianne would ask a yes/no question about some object in ʔayʔaǰuθəm. Each of her questions included a determiner or demonstrative and, in some cases, also a co-speech gesture to identify the target object. The accompanying picture would show someone interacting with an object.

The test items represented four conditions, which will be described in more detail below.

(14) *Experiment conditions*:

a. matching condition (30 items)
b. mismatch condition (30 items)
c. adjective condition (10 items)
d. no-gesture condition (15 items)

In the matching condition, the object targeted by Marianne in the video and the object shown in the accompanying picture were identical (e.g., Marianne asks in the video whether Daniel reads *təy̓ta pukʷ* 'that book' while *pointing at the yellow book* on the table in front of her, and the picture shows Daniel reading the *yellow book*).

Conversely, in the mismatch condition, Marianne's target object did not match the object shown in the picture (e.g., Marianne asks in the video whether Daniel reads *təy̓ta pukʷ* 'that book' while *pointing at the yellow book* on the table in front of her, but the picture shows Daniel reading the *red book*.). Such a mismatch scenario is exemplified in Figure 3.

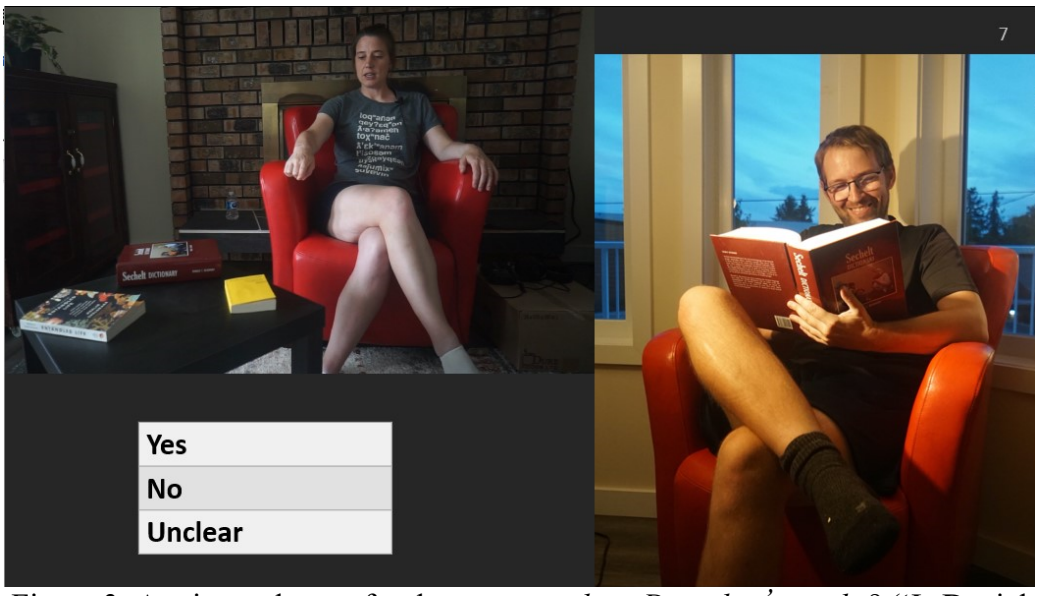

Figure 3: A mismatch case for the prompt *tałusa Daniel təy̓ta puk*^{w}*?* (‘Is Daniel reading that book?’). The video on the left shows Marianne asking the question and using a pointing gesture to pick out the yellow book. The picture on the right shows Daniel reading the red book.

As a control, the experiment also included an adjective condition, where Marianne would pick out the target object by using an adjectival modifier in her yes/no question (e.g., *tałusa Daniel k*^{w} ***t̓at̓*$^{\theta}$*im*** *puk*^{w}*?* ‘Is Daniel reading a **red** book?’) instead of a co-speech gesture. Since adjectives contribute at-issue content, the test items belonging to this condition would serve as a good baseline for evaluating the degree of at-issueness of co-speech gesture in the other conditions.

Finally, to test whether the use of co-speech gesture is *obligatory* or *optional* for the different determiner and demonstrative forms, we also included a small set of test items in which Marianne uses neither an adjective nor a gesture to pick out a target object (e.g., Marianne asks whether Daniel reads *təy̓ta puk*^{w} ‘that book’, but does not gesture to any of the three books on the table in front of her).

Within the conditions mentioned above, the test items further varied along some other dimensions. First, to test our hypotheses concerning the contribution of co-speech gesture with different types of D elements, Marianne’s yes/no questions obviously had to include forms representing the different types of determiners and demonstratives that have been attested in the language. For this purpose, we used the gesture demonstrative *təy̓ta*, the definite-like determiner *tə*, and the indefinite-like determiner *k*^{w}, all described in the previous section. We did not include salience demonstratives as their saliency requirement would have necessitated a different experimental set-up (see Section 5 for further discussion). Secondly, to determine whether and how the type of co-speech gesture may affect the results, Marianne sometimes employed pointing gestures and sometimes iconic gestures accompanying the determiners and demonstratives. And, finally, to make the experiment less repetitive for the participants, we also decided to vary the target objects in the videos and pictures (i.e., books vs. bottles vs. cups vs. knives vs. papers).

The test items were complemented by 14 filler items, which showed some kind of artwork (e.g., Caspar David Friedrich's »Wanderer above the Sea of Fog«, Sandro Botticelli's »Primavera«, Vincent van Gogh's »Sorrowing Old Man«, etc.) and contained an audio prompt in ʔayʔaǰuθəm that asked the participants to describe what they are seeing.

Once we had created all the materials, we put the 85 test items into a slideshow and ran a PowerPoint macro to randomize their order. Subsequently, we interspersed the 14 filler items in regular intervals.

Procedure: At the beginning of the experiment, we explained to each of the participants that we are interested in how speakers talk about objects. Then, we instructed them to answer the questions that Marianne asks in the videos, using a three-point rating scale (i.e., *ʔiʔ* 'yes' | *xʷaʔ* 'no' | *xʷač təx̣ʷníxʷən* 'unclear').[4] To keep the participants as unbiased as possible, we did not tell them that we were examining the role of gesture. One of the researchers then presented them the slideshow, while the other researcher kept track of the participants' answers by entering them into a spreadsheet. Each of the sessions was also audio recorded.

After we had run the experiment with our participants, the data filtering process began. Of the 255 judgments we had gathered (85 items * 3 speakers), 46 items had to be discarded. For one participant, we had to exclude four judgments as she did not use the provided three-point rating scale to answer the questions, but instead offered ambiguous paraphrases. For another participant, we had to discard 42 judgments because she did not pay attention to the videos at first, until we instructed her again around the halfway point of the experiment. In the end, we were thus left with a total of 209 judgments.

4.2. Results and discussion

In this section, we summarize the results for the different conditions and discuss what they can tell us about the interaction of co-speech gestures and D elements in ʔayʔaǰuθəm.

In Hypotheses 1, we surmised that co-speech gesture contributes at-issue information when it accompanies a demonstrative, but not-at-issue information when it accompanies determiners. Consequently, we predict that, if gesture is indeed at-issue for the demonstratives, the GDEM *təẏta* should exhibit a significantly stronger mismatch effect in the experiment than the determiners. By mismatch effect, we mean the number of *xʷaʔ* 'no' answers when the entity indicated by gesture in the video and the entity in the accompanying picture do not match.

As for the determiners, Hypothesis 2 assumed that co-speech gesture gives rise to an identity interpretation with definite-like forms, whereas it evokes a similarity reading with indefinite-like forms. If this is the case, then the definite-like determiner *tə* should display a stronger mismatch effect than the indefinite-like determiner *kʷ*.

[4] We opted for this three-point rating scale instead of the Likert scale that Ebert et al. (2020) used in their experiment on German demonstratives, as we hoped it would be more intuitive for the participants we worked with. Also, as the reader may have noticed in Figure 3, the scale on the slides is given in English. This is because two of the three participants do not read (or write) in ʔayʔaǰuθəm. They were instructed to respond in ʔayʔaǰuθəm (which they did), but we provided the scale on the slides to remind the participants to give polar responses or flag a question as unclear.

The experiment confirms both of these assumptions. As shown in Figure 4, we found that the mismatch effect was strongest for the GDEM *təy̓ta* (83.33 percent), slightly weaker for the definite-like determiner *tə* (72.00 percent), and weakest for the indefinite-like determiner *kʷ* (40.00 percent).

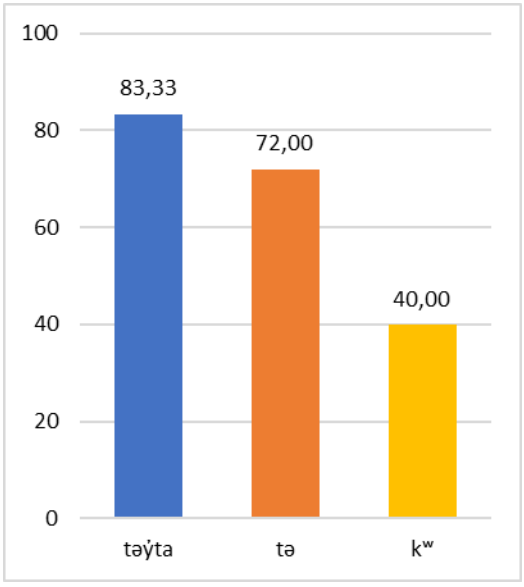

Figure 4: Mismatch effects for the three forms in percent
(= 'no' answers when the object indicated by gesture in the video
and the object shown in the picture did not match).

While we observed some minor inter-speaker variation for individual test items in this condition, the overall trend seemed to be robust across all speakers. As illustrated by Figure 5, the results for each speaker exhibit the same cline from gesture demonstrative to definite-like determiner to indefinite-like determiner.

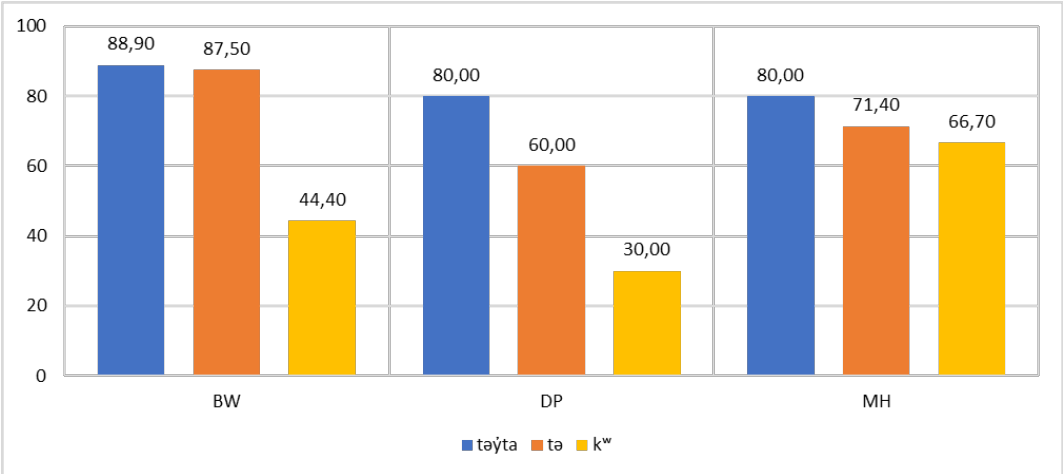

Figure 5: Mismatch effects for the three forms in percent by individual participants
(= 'no' answers when the object indicated by gesture in the video and the object
shown in the picture did not match).

On the one hand, the remarkably strong mismatch effects for *təy̓ta* suggest that co-speech gesture is at-issue when it accompanies a GDEM. Indeed, the effect is comparable to the mismatch effects that can be observed for mismatches in the adjective condition (92.86 percent). On the other hand, the fact that mismatch effects are higher for the definite-like determiner *tə* than for the indefinite-like determiner *kʷ* also confirms our hypothesis that the former encodes an identity relation between the gesture referent and the DP referent, while the latter encodes a similarity relation.

In Hypothesis 3, we speculated that the use of co-speech gesture is *obligatory* for GDEMs, but only *optional* for the determiners. Consequently, we predicted that the participants would be more willing to accept gestureless uses of *tə* and *kʷ* as 'matches', whereas gestureless uses of *təy̓ta* would be infelicitous and trigger an 'unclear' judgment in the matching task.

The results of the no-gesture condition only partially confirm these assumptions (Figure 6). On the one hand, just as expected, speakers did not treat gestureless uses of the determiners as problematic, but instead willingly accepted them as 'matches'. While the indefinite-like determiner *kʷ* reached a perfect matching score of 100.00 percent, the definite-like determiner *tə* exhibited a matching effect of 91.67 percent. This confirms that co-speech gesture is optional, and not required for the determiners.

On the other hand, the results for the GDEM *təy̓ta* did not fully confirm our initial assumptions. While this form showcased — with 54.85 percent — a considerably weaker matching effect than the determiners, this value was still much higher than we expected, given our hypothesis. This raises the question whether co-speech gesture actually is obligatory for the gesture demonstratives.

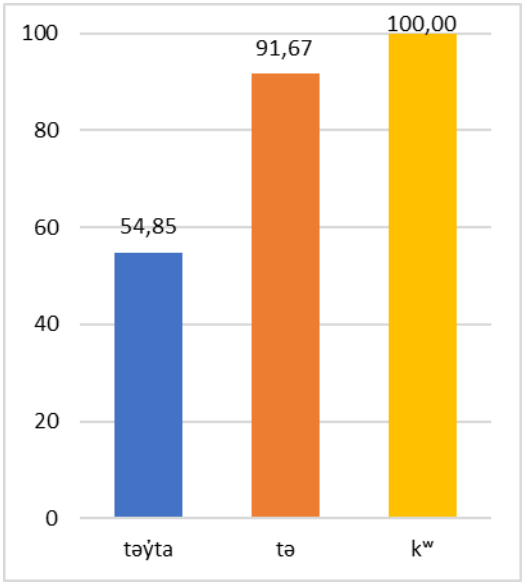

Figure 6: Match effects for the three forms in percent
(= 'yes' answers when there was no gesture to an object in the video).

While we can only speculate, it is worth noting that the high matching score for the GDEM in this condition reflects some striking inter-speaker variations. Only one of the participants treated the gestureless uses of *təy̓ta* as 'unclear' (as predicted) and would offer some

explanations for her judgments (e.g., [comments translated from ʔayʔaǰuθəm:] “I don’t really know which cup you are looking at. You didn’t say.” or “I’m not sure what knife you said, it’s the big one she’s using.”). The other two participants, on the other hand, consistently accepted the gesture demonstrative without gesture (not as expected). One potential explanation for this discrepancy could be that these two participants might have accommodated the missing gesture, perhaps by wrongly assuming that Marianne must have made some subtle gesture (such as a quick gaze) towards the correct target object in the video. If this is the case, a different experimental set-up (e.g., one where Marianne is blindfolded or not facing the objects on the table) could remedy this issue.

Last, in Hypothesis 4, we conjectured that iconic gestures are inherently less precise than pointing gestures and, consequently, tend to be more easily accommodated. Considering this, we predicted that mismatch effects for pointing gestures should be higher than mismatch effects for iconic gestures.

As highlighted by Figure 7, the experiment corroborates this hypothesis. For each of the three forms, the items involving pointing gesture showcased a stronger mismatch effect than the items involving iconic gestures. Using the results for *təy̓ta* as an example, participants judged mismatches more strictly when a pointing gesture was used (mismatch effect: 91.67 percent) and, conversely, were more forgiving when an iconic gesture was used (mismatch effect: 75.00 percent). Since the same pattern also holds for the two determiner forms, it is reasonable to assume that iconic gestures come with an inherent vagueness and are, thus, more easily accommodated.

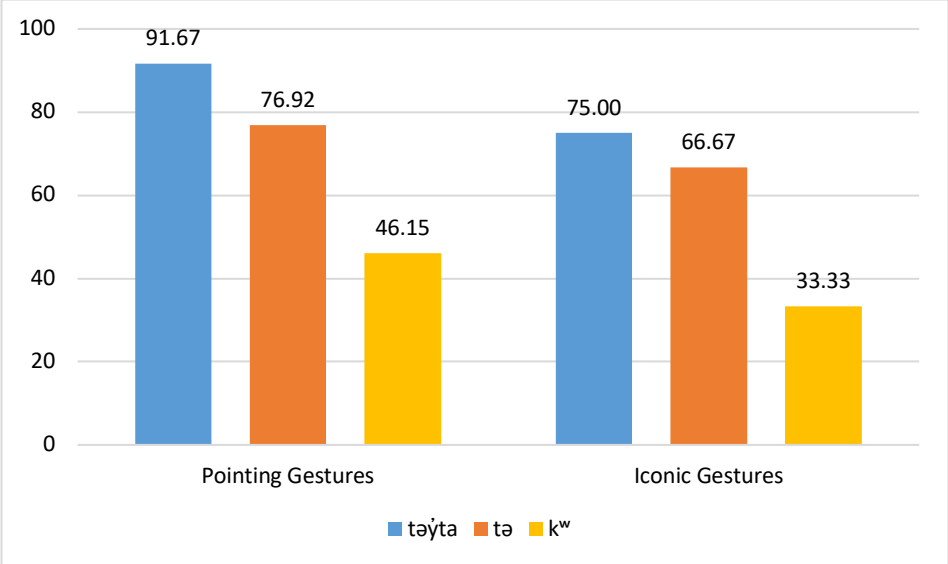

Figure 7: Mismatch effects for the three forms in percent by gesture type (= ‘no’ answers when the object indicated by gesture in the video and the object shown in the picture did not match).

5. SDEMs

As mentioned in Section 4.1, we did not include any SDEMs in the experiment. This is because in the videos for the experiment, Marianne introduces an entity into the discourse via gesture,

a context that supports the use of GDEMs but not SDEMs, which require reference to an individual already salient in the context. Because SDEMs did not fit the experimental context, we have not yet discussed what gesture adds with them.

As mentioned in Section 3, SDEMs identify an individual that is uniquely salient in the context. This is exemplified in (15).

(15) *We've been at a bazaar, and I bought a mirror from one gentleman. He keeps it at the stand for me, so I don't have to carry it until I'm ready to go. When we walk back to collect it, he doesn't remember which mirror I bought since he had a few. He holds one up to give me.*

xʷa hiy=əs {**taṉ** / #tə} məmḵayustən ʔə=yəq-t-an-uɬ.
NEG COP=3SBJV {SDEM / DET} window CLF.PRT=buy-CTR-1SG.ERG-PST
hiɬ tə=tituḵ šuʔ-ut-an-uɬ.
COP DET=small choose-CTR-1SG.ERG-PST
'I didn't buy {that / #the} mirror. I bought a smaller one.'

Though SDEMs do not require gesture, we have come across examples in our fieldwork where they are compatible with it, as for instance in (16).

(16) *Context: Daniel and I are on a ferry approaching an island in an area with many islands. We're both on the deck gazing at it. I* ***point*** *to it and tell Daniel:*

hiɬ **taṉ** məƛnač.
COP SDEM məƛnač
'That is məƛnač (island).'

Since gesture here only adds optional information, we propose that it makes a not-at-issue, appositive-like contribution (just like it does for the determiners). In future work, we hope to confirm this with a similar experiment.

6. Analysis

To capture the contribution of co-speech gesture accompanying ʔayʔaǰuθəm D elements, we adapt the analysis in Ebert et al. (2020), where both pointing and iconic gestures establish a gesture referent. This gesture referent is a rigid designator, symbolized as: ⌜ ☛ *I* ⌝. Just like Ebert and her colleagues, we analyze gesture as contributing not-at-issue content by default, analogous to appositives. This not-at-issue content is silently imposed on the common ground, whereas at-issue content is proposed as an update to the common ground (Farkas & Bruce 2010). The addressee may accept a proposed update (the default case) or reject it, while a not-at-issue imposition enters the common ground automatically.

For their analysis, Ebert et al. (2020) adopt and extend a unidimensional, dynamic system first proposed by Anderbois et al. (2013). In this system, not-at-issue content is computed together with at-issue content, allowing reference to be established across these dimensions. At-issue and not-at-issue content are interpreted relative to two propositional variables:

p – proposed as an update to the common ground
*p** – imposed on the common ground

The content of an utterance is relativized to these two variables so that the at-issue and not-at-issue contributions can be computed in parallel. This will be illustrated through some examples below.

The GDEM *təy̓ta* accompanied by co-speech gesture (17a) is interpreted as in (17b). The demonstrative introduces a discourse referent *x* claimed to have the NP property, and the obligatory co-speech gesture introduces a discourse referent *z* that is equivalent to the gesture referent ⌜ ☛ *I* ⌝. To derive the desired identity interpretation, the discourse referents *x* and *z* are equated. Last, there is also a not-at-issue imposition such that *z* has the NP property, just as *x* does. As mentioned earlier, the selected forms also encode other information, such as evidentiality and deixis (see Section 3). As we have set these components aside for the purposes of this paper, we also do not include them in the denotations here.

(17) a. ⟦ *təy̓ta* NP ⟧^{w,g}
POINTING TO ⌜ ☛ *I* ⌝

b. $\exists z \wedge z =$ ⌜ ☛ *I* ⌝ $\wedge \exists x \wedge \mathrm{NP}_p(x) \wedge x =_p z \wedge \mathrm{NP}_{p^*}(z)$
Presupposition: There is a unique entity matching the NP description and equivalent to the gesture referent.

Importantly, here, the gestural contribution is at-issue and integral to identifying the referent of the GDEM.

For the formalization of SDEMs, we require a slightly different toolkit. Adapting Schwarz's (2009) analysis of German strong-article definites, we propose that these demonstratives come with a null index argument *i*. The utterance of the SDEM *tan̓* with co-speech gesture (18a) will then be interpreted as in (18b). The index *i* is associated with a discourse referent established through prior mention or through contextual salience (Roberts 2002) and equated with the discourse referent *x*, as introduced by the demonstrative. The optional co-speech gesture introduces the discourse referent *z* for the gesture referent and makes a not-at-issue contribution such that *x* is also equivalent with *z* (and *z* has the NP property).

(18) a. ⟦ *i tan̓* NP ⟧^{w,g}
POINTING TO ⌜ ☛ *I* ⌝

b. $\exists z \wedge z =$ ⌜ ☛ *I* ⌝ $\wedge \exists x \wedge \mathrm{NP}_p(x) \wedge x =_p i \wedge x =_{p^*} z \wedge \mathrm{NP}_{p^*}(z)$
Presupposition: There is a uniquely salient discourse referent i *in the domain of familiar discourse referents and* i *matches the NP description.* (adapted from Roberts 2002:23)

The determiner *tə* is used to refer to the unique individual with the NP property in the context.[5] It optionally co-occurs with gesture, which introduces the discourse referent *z* for the gesture referent. Again, the gesture contributes not-at-issue content such that *x* is equivalent to *z* (and *z* has the NP property). Thus, we can formalize the determiner *tə* accompanied by co-speech gesture (19a) as in (19b).

(19) a. ⟦ *tə* NP ⟧^{g,w}
POINTING TO ⌜ ☛ *I* ⌝

b. $\exists z \wedge z =$ ⌜ ☛ *I* ⌝ $\wedge \exists x \wedge \mathrm{NP}_p(x) \wedge x =_{p^*} z \wedge \mathrm{NP}_{p^*}(z)$
Presupposition: There is a unique entity matching the NP description in the context.

Finally, the utterance of the determiner *k*^{w} with a speech-accompanying gesture (20a) can be interpreted as in (20b). We propose that the determiner *k*^{w} simply introduces the variable *x* with the NP property, while an optional co-speech gesture may additionally establish a discourse referent *z* for the gesture referent. In this scenario, the not-at-issue contribution of the gesture is that *x* and *z* are similar (and *z* has the NP property).[6]

(20) a. ⟦ *k*^{w} NP ⟧
POINTING TO ⌜ ☛ *I* ⌝

b. $\exists z \wedge z =$ ⌜ ☛ *I* ⌝ $\wedge \exists x \wedge \mathrm{NP}_p(x) \wedge \mathrm{SIM}_{p^*}(x)(z) \wedge \mathrm{NP}_{p^*}(z)$

One final note is in order. As seen in (17) to (19), the GDEM *təy̓ta*, the SDEM *tan̓*, and the determiner *tə* all come with existence presuppositions. This is important as these D elements are referential, even under negation. However, as we alluded to in Section 3, presuppositions for Salish languages are generally treated as preconditions, without placing common ground restrictions (cf. Matthewson 2006, 2008; Davis & Matthewson 2009; Reisinger et al. 2021). This does not fit the current model, as adopted from Anderbois et al. (2013), where presuppositions instead act as checks on the common ground. Perhaps, contributions we have previously called 'presuppositions' are better modelled as appositive-like. This, however, will be a topic for future work.

7. Conclusion

Overall, the findings of our experiment support the key claims made by Ebert et al. (2020) for German determiners and demonstratives, particularly regarding how co-speech gestures may be interpreted differently with different types of D elements. In addition, we also found some support for our hypothesis that the use of co-speech gesture is obligatory with GDEMs in ʔayʔaǰuθəm, though the results were less clear in this regard.

To summarize, we established that gesture contributes at-issue content when accompanying GDEMs. This is supported by the fact that participants were as sensitive to mismatches between the gesture referent and the DP referent when a GDEM was used as they were to

[5] Where, as discussed in Section 3, the relevant context depends on what is salient to the speaker (and need not be shared with the addressee).

adjective mismatches. We also found some evidence that gesture is obligatory with this class of demonstratives, and that the absence of co-speech gesture leads to infelicity if not accommodated. However, given considerable inter-speaker variation with respect to this latter point, more work on this issue is needed.

Through the experiment, we were also able to show that gesture is optional and contributes not-at-issue content when accompanying determiners. Consequently, the absence of gesture did not lead to any infelicity with these forms. Moreover, we found that, while participants were certainly sensitive to mismatches involving the determiner *tə*, this sensitivity was less pronounced than when the GDEM *təy̓ta* was used.

Finally, our experiment also confirmed that the interpretation of co-speech gesture may vary, depending on whether it accompanies definite-like or indefinite-like determiners. With definite-like *tə*, the gesture referent is interpreted as equivalent to the DP referent. This meant that participants objected to mismatches with *tə* at similar (though slightly lower) levels as to mismatches with the GDEMs. In contrast, with indefinite-like *kʷ*, co-speech gesture establishes a similarity interpretation between the gesture referent and the DP referent. Since there are multiple dimensions on which items can be similar, participants objected to mismatches with *kʷ* considerably less often.

Overall, our findings for ʔayʔaǰuθəm are remarkably similar to Ebert et al.'s (2020) for German, despite obvious differences in the determiner and demonstrative systems, suggesting commonalities in how co-speech gestures are interpreted cross-linguistically. In the future, we would like to expand our experimental work also to SDEMs in order to determine whether gesture is always at-issue with demonstratives or if it is not-at-issue with these forms, as we hypothesized in Section 5. If so, this would mean that only certain demonstratives act as dimension shifters along the lines proposed in Ebert et al. (2020).

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