The Inferential Typology of Language: Insights from Sign Language (ASL)*

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Abstract. Contemporary formal pragmatics has uncovered a rich inferential typology in spoken languages, one that includes at-issue contents, presuppositions, implicatures, homogeneity inferences, supplements and expressives. The division of informational contents among this typology is sometimes taken to be specified in the lexicon, but gestural research has argued against this view: with one possible exception (expressives), participants productively divide the content of iconic representations among the slots of the inferential typology, and this can be shown with pro-speech (= word-replacing) gestures as well as with novel visual animations. Despite important recent developments, sign language semantics has not systematically investigated this inferential typology. Based on published and on new data from ASL, we do so from a dual perspective: we exhibit the characteristic behavior of different inferential types in lexical signs, but also (when applicable) in iconically modulated constructions, notably classifier predicates. These have a lexically specified form but an entirely free position and movement in signing space, which are interpreted iconically and give rise to truth conditions that couldn't be stored lexically. Classifier predicates thus make it possible to replicate the productivity argument from pro-speech gestures and visual animations, but with greater ease and precision because, unlike pro-speech elements, they are a common and fully integrated part of sign language. They also address an objection to findings coming from pro-speech gestures and visual animations, namely that these are in essence codes for words; this objection has no plausibility for ASL iconic constructions, as these *are* words. Besides highlighting the importance of sign language for formal pragmatics, our study makes a broader point: any analysis of sign language must provide an explicit treatment of its iconic component and of its interaction with the inferential typology.

Keywords: semantics, pragmatics, sign language, ASL, scalar implicatures, presuppositions, supplements, cosuppositions, expressives, homogeneity

Note (Nov. 11, 2023): After this draft was written, we learned of the existence of Loos et al. 2020, which is directly relevant for Section 4. A discussion will be added as soon as this draft is revised.

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1 Introduction

1.1 Goals

Contemporary formal pragmatics has unearthed a rich typology of inferences in spoken languages, one that includes in particular at-issue contents, presuppositions, supplements, expressives, implicatures, and homogeneity inferences (for surveys, see for instance Schlenker 2016 and Križ 2019). The division of informational contents among this typology is sometimes taken to be specified in the lexicon, but gestural research has argued against this view: with one possible exception (expressives), speakers can productively divide the content of iconic representations among the slots of the inferential typology, and this can be shown both with pro-speech (= word-replacing) gestures and with novel visual animations (Schlenker 2019, Tieu et al. 2019).[1]

Despite important recent developments on the semantic side, sign language research has not systematically investigated this inferential typology; in fact, formal pragmatics is still a nascent field within sign language research. Based on published and on new data from ASL (American Sign Language), we investigate this typology from a dual perspective: we exhibit the characteristic behavior of different inferential types in lexical signs, but also (when applicable) in iconically modulated constructions, notably classifier predicates. These have a lexically specified form but an entirely free position or movement in signing space, which is interpreted iconically and gives rise to truth conditions that couldn't be stored lexically. Classifier predicates make it possible to replicate the productivity argument from pro-speech gestures and visual animations, but with greater ease and precision because, unlike pro-speech gestures and visual animations, they are a common and fully integrated part of the language. They also contribute something new to the argument. In the case of pro-speech gestures and visual animations, one could conceivably have thought that diverse inferential types arise from an attempt to silently reconstruct some missing words (e.g. the English words *take off* for a gesture representing a helicopter taking off, possibly in tandem with an iconic representation). But classifier predicates *are* words, which makes this line of analysis highly implausible. In other words, ASL classifier predicates will significantly strengthen the argument for productivity obtained in gesture research.

Besides highlighting the importance and fruitfulness of sign language for formal pragmatics, our study makes a broader point: any analysis of sign language must provide an explicit treatment of its iconic component and of its interaction with the inferential typology.

1.2 The dual face of sign language semantics

Recent sign language semantics has made two broad points. First, sign language ('sign' for short) has the same kinds of semantic mechanisms as spoken language ('speech' for short), but occasionally with a twist: some logical devices that are covert in speech are occasionally visible in sign ('Logical Visibility'[2]). This has been argued to be the case of some variables, which can be made visible by way of positions in signing space or 'loci'. Second, sign makes much more systematic use of iconicity than speech. Sometimes one and the same construction illustrates both points. Thus it has been claimed that loci may simultaneously be overt variables and simplified pictures of their denotations. As a result, talking about a giant, one may point upwards because this is where his head is represented; but if the giant gets rotated (for instance as part of training to become an astronaut), one may point downwards instead (Schlenker et al. 2013, Schlenker 2014). Similar points have been made about other constructions, such as pluractionals and plurals, which combine a logical and an iconic component (Kuhn and Aristodemo 2017, Schlenker and Lamberton 2019, 2022; see Schlenker, Lamberton and Kuhn 2023 for further examples).

The iconic component permeates multiple aspects of sign beyond these constructions. For

[1] The argument against lexical accounts is that iconic gestures can be modulated to yield numerous meanings that couldn't all be stored lexically, and that visual animations are not linguistic objects in the first place. We come back to the detailed arguments below.

[2] To our knowledge, nobody has ever claimed that *in general* aspects of Logical Forms that are covert in spoken language are overt in sign language. This would be a non-starter on empirical and theoretical grounds (e.g. to the extent that there are null pronouns in spoken languages, there are lots of them in sign languages).

instance, lexical elements may be modulated iconically: the verb *GROW*, produced by the two hands moving away from each other, may be realized more or less quickly to refer to a slower or faster growth, and with narrower or wider endpoints to refer to a smaller or larger amount of growth (e.g. Schlenker 2018a).

In addition, one construction type will be of special interest in this piece. Classifier predicates ('classifiers' for short) have a lexically specified shape, but their position and movement in signing space is free, and interpreted iconically. A textbook example appears in (1): a vehicle classifier represents a car, and the movement of the predicate in signing space iconically and gradiently depicts the movement of the car.[3] We will repeatedly use classifier predicates below to assess the inferential types produced by iconic elements.

(1) CAR CL-vehicle-DRIVE-BY. (ASL, cited and illustrated from Valli and Lucas 2000, cited in Zucchi 2017)

'A car drove by *like this*', where the information contributed by *like this* is produced by the movement of the classifier predicate in signing space (after Zucchi 2011)

Owing to the free realization of their position and movement, and to their iconic contribution, classifier predicates in sign are in some respects similar to pro-speech gestures in speech, with the difference that the latter usually do not have a lexical form.[4] Two additional similarities have been noted between classifier predicates and pro-speech gestures. On a syntactic level, ASL classifier predicates and pro-speech gestures alike may override the basic SVO order of other constructions of the language (ASL non-classifier constructions, English or French spoken words) in favor of orders with preverbal objects in some semantically determined cases (Goldin-Meadow et al. 2008, Liddell 1980, 2003a, Pavlič 2016, Schlenker et al., to appear). On a semantic level, classifier predicates and pro-speech gestures give rise to hybrid Logical Forms that combine normal words with 3-dimensional structures that may be relativized to a viewpoint, corresponding to the point in space relative to which the scene is viewed (in the implementation of Schlenker and Lamberton, to appear, manipulation of viewpoint variables is the 'glue' that connects the iconic component to the logical component in such cases).

These similarities between classifier predicates and pro-speech gestures lead one to expect that ASL might have within a single modality the union of the semantic mechanisms found in gesture-free speech (thanks the standard lexical and grammatical component of ASL), and of those found in pro-speech gestures (thanks to classifier predicates). This 'Hypothesis of Dual Semantics' is stated in (2).

(2) **Hypothesis of Dual Semantics**
Sign language has the union of the expressive means offered by words in spoken language and by pro-speech gestures thanks to its lexical component and to its classifier component respectively. In particular, classifier predicates should display the full typology of inferences that have been uncovered in pro-speech gestures.

We will see that this hypothesis is largely correct, and that our sign language data lead to some refinements, notably in the theory of alternative generation for implicatures.

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[3] See Zwisterlood' 2012 for a survey of classifier predicates, Emmorey and Herzig 2003 for experimental data that highlight their gradient contribution, and Liddell 2003a,b, Zucchi 2011, 2017, 2018, Davidson 2015 and Schlenker and Lamberton, to appear for different analyses of their meaning.

[4] We write 'usually' because some pro-speech gestures, 'emblems', certainly have a lexical form (e.g. the 'thumbs up' gesture, also used as an emoji: 👍). The connection between classifiers and gestures is an old one, and it has for instance been emphasized by Liddell 2003b and Schembri et al. 2005, among others.

1.3 Structure

After briefly introducing our elicitation methods and transcription conventions, we provide some background on the inferential typology in speech, gestures and visual animations (Section 2). We summarize recent results on presuppositions and supplements in ASL, with normal signs, classifier predicates and (non-grammatical) facial expressions (Section 3). We then discuss new data pertaining to ASL expressives, including nonce slurs obtained by modifying a non-expressive word (Section 4). We turn to scalar implicatures, which are attested with lexical expressions, iconic modulations of lexical expressions, and classifier predicates (Sections 6-7). Finally, we show that both plural/dual definites as well as some classifier predicates display the hallmarks of homogeneity (Section 8), before drawing some conclusions (Section 9).

1.4 Elicitation methods and transcription conventions

The main consultant (and co-author) is a Deaf, native signer of ASL (of Deaf, signing parents).[5] Elicitation was conducted using the 'playback method', described for instance in Schlenker et al. 2013, Schlenker and Lamberton 2019, 2022. While our goal is to provide a fine-grained description of our main consultant's idiolect, we provide an informal assessment of our data and generalizations by one additional native signer (also a co-author). Specifically, after an initial version of the paper was written, Jonathan Lamberton met with his brother Jason Lamberton to discuss all the new datapoints, and made a note of any important disagreements. These notes can be found in the Supplementary Materials. There was overwhelming agreement about the main contrasts; points of disagreements are mentioned in the text as we go (in addition, our second consultant commented on the complexity of some examples, but this usually did not drown contrasts that were of interest).

The playback method used with our main consultant involved repeated quantitative acceptability judgments of sentences played back on a video (on a 7-point scale, with 7 = best), as well as inferential judgments (when the latter were quantitative, they were also on a 7-point scale, with 7 = strongest inference). Acceptability scores appear as superscripts at the beginning of sentences. References such as *ASL 37, 2660; 3 judgments* at the end of paradigms cross-reference the ASL video (here video 37, 2660) and indicate the number of iterated judgment tasks (on different days, here three).[6]

Inferential judgments appear preceded by => if they tended to hold, by ≠> if they tended not to, with information about the strength of the endorsement. To illustrate, let us take the notation: => *the signer dislikes Country X (endorsement: 7)*. It means that the inference that the signer dislikes Country X was obtained with maximum strength, namely 7 on a 7-point scale. Now let us consider another notation: ≠> *the signer dislikes Country X (endorsement: 1)*. This means that the inference that the signer dislikes Country X was obtained with minimal strength, namely 1 on a 7-point scale, hence the sign ≠> (rather than =>) at the beginning.

To facilitate reading, we used the following correspondence between endorsement scores and endorsement symbols enriched with question marks; the information is redundantly included in both formats, numerical and arrow-based; readers may focus on whichever format they find clearer.

(3) **Correspondence between average endorsement scores and endorsement symbols**[7]

Endorsement scores:	1 |——> 2	——> 3	——> 4	——> 5	——> 6	——| 7
Endorsement symbols:	≠>	≠>?	≠>??	=>??	=>?	=>

When there was more than a 2-point difference across acceptability or inferential judgments for a given sentence, we put the raw results in parentheses (e.g. *3.7 (2, 4, 5)* in case an average result of 3.7 was obtained from scores 2, 4, and 5). For clarity, we provide links to several anonymized versions

[5] We use the term *consultant* to refer to a collaborator that assesses sentences, including if this person is also a contributor to the article. (This section is similar to ones we have used in other articles to describe elicitation methods and transcription conventions.)

[6] We aimed to have 3 judgments for any data point, but obtained 4 by mistake in some cases (we occasionally thought wrongly that we had two data points when in fact we had three and we thus collected a fourth set of judgments).

[7] In our representation, |– includes the lower interval bound, –| includes the upper interval bound, –> excludes the upper interval bound. For example, =>? is used if the score x satisfies $5 \leq x < 6$, => is used if $6 \leq x \leq 7$.

of the source ASL videos. Specialists are invited to consult the raw judgments in the Supplementary Materials when relevant.

Transcription conventions are standard for sign language, with glosses appearing in capital letters. Loci are alphabetized from dominant to non-dominant side (here: from right to left from the signer's perspective). A suffixed locus, as in *WORD–i*, indicates that the word points towards locus i (a position of signing space associated with a discourse referent). *IX-i* (for 'index') is a pointing index towards locus *i*. *EXPRESSION*$_i$ is used for some words associated with locus *i* by virtue of being signed in (rather than by pointing to) the corresponding area of signing space. Agreement verbs include loci in their realization – for instance the verb *a-HIT-b* starts out from locus *a* and targets locus *b*. Unless otherwise noted, we put *-cl* at the end of classifier predicates, and sometimes describe their movement with affixed words (e.g. *HELICOPTER-RISE-neutral-cl*). We only transcribe non-manual expressions in questions and conditionals (where they play an essential role), using ^——— to represent Brow Raise over a set of expressions, indicated by the extent of the line.

Gestures are encoded in capital letters in a non-standard font. This applies to gestures that accompany speech, and also to gestural material (non-grammatical facial expressions, manual gestures) that appear in some ASL examples. Special conventions will be introduced as we go.

2 Background: the Inferential Typology in Speech, Gestures and Visual Animations

2.1 General picture

Within contemporary semantics (broadly construed), formal pragmatics has uncovered an articulated typology of inferences, and it has sought to explain their interaction with logical operators on principled grounds.[8] Before we discuss the details of this typology in ASL, we sketch the main findings in speech, in gestures and in visual animations, following older and recent literature. One key question is whether the relevant inferences are encoded in lexical entries or are derived by productive rules.

Entailments follow from the literal meaning of words, either alone or combined with contextual assumptions.[9] Contemporary semantics/pragmatics has gone beyond entailments (= at-issue inferences) to offer the typology illustrated in (4). We will introduce it in more detail in the following subsections, but we already state in the second column whether common wisdom takes these inferences to be lexical, i.e. encoded in the meaning of some symbols (including abstract ones such as the 'comma intonation').

(4) **Typology of linguistic inferences**

Type	Lexical?	Examples
Scalar implicatures	No (Horn 1972), except possibly for the existence of lexical scales	Some group members attended. => not all group members attended
Presuppositions	Yes (Heim 1983). No for several recent studies	None of my students knows that he is incompetent. => all of my students are incompetent
Supplements	Yes, through the comma intonation (Potts 2005)[10]	One/#None of these women helped her son, which saved him.
Expressives	Yes (Potts 2005)	(#) If I were really prejudiced against the French, I wouldn't hire a Frog.
Homogeneity inferences	[not entirely clear yet, but probably not lexical]	Ann will/won't find her presents. => she will find all / she will find none

[8] This section follows the general structure and sometimes the details of the summary in Schlenker 2019, with two differences: (i) we disregard the issue of so-called 'anti-presuppositions' and 'blind implicatures', which to our knowledge haven't been systematically studied in sign language; (ii) we integrate to this summary results on pro-speech gestures and pro-speech visual animations (Schlenker 2019 and Tieu et al. 2019).

[9] To illustrate: *Ann is an American student* entails *Ann is a student* without contextual assumptions. *Ann is in Paris* entails *Ann is in France* with the assumption that Paris is in France.

[10] We write 'yes' in this cell because, on Potts's analysis, a special lexical entry is needed to handle appositive relative clauses, namely what he calls the 'comma intonation'. As hinted in the text, although the phonological realization of this lexical entry is rather abstract (possibly involving just a pause), it involves a semantic specification that does not follow from independent principles and is thus lexical in nature.

Recent work has argued that this typology can be replicated with pro-speech gestures, including when these gestures might not have been seen before; this might suggest that the underlying processes are entirely productive (Schlenker 2019). An experimental study by Tieu et al. (2019) made two further points: these results can be confirmed with experimental means, and the productivity argument can be strengthened by replacing pro-speech gestures with pro-speech visual animations that experimental participants could not possibly have seen before.

2.2 Scalar implicatures

Let us start with scalar implicatures, possibly the best understood inferential type besides at-issue content. According to a variety of neo-Gricean theories (from Horn 1972 to Chierchia et al. 2012), (5)a yields the inference that not all group members attended because it competes with (5)b, which is more informative (this is called a 'direct implicature' because the scalar terms are not embedded under a downward-monotonic [= negative-like] operator).[11]

(5) a. Some group members attended.
=> not all group members attended
b. All group members attended.

On virtually all recent views, once appropriate alternatives are provided, implicatures follow by a productive algorithm.

The key question, however, is how alternatives are generated. Horn 1972 posited 'lexical scales' to determine which expressions a word competes with; for instance, *or* had *and* as a lexical alternative. Correspondingly, Horn's theory of implicature generation had a lexical component. Katzir 2007, followed by Katzir and Fox 2011, tried to eschew lexical stipulations by taking alternatives to be either provided by the context, or by syntactic manipulations that consist, in essence, in replacing or simplifying parts of the target clause. In the example in (5)a, the replacement of *some* with *all* suffices to generate the desired alternative. In other cases, an alternative is obtained by simplifying the target sentence, as in the case in (6)b: *drink a lot* can be simplified (by removing some elements) to obtain *drink*, and as a result *Ann didn't drink a lot* evokes the more informative alternative *Ann didn't drink*. Negating the latter derives the inference that Ann drank. No such process arises in (6)a, in part because *drink a lot* is syntactically more complex than *drink* and thus isn't evoked as an alternative.[12]

(6) a. Ann drank.
≠> Ann didn't drink a lot
b. Ann didn't drink a lot.
=> Ann drank

When alternatives are made salient by the context, they trigger implicatures even if the relevant alternatives are more complex than the target expression. This is the case in (7), where the speaker's answer suggests that they didn't drink a lot.

(7) A: What did you do at the party - did you eat, or drink, or drink a lot? B: I drank.
=> B didn't drink a lot (Schlenker 2019).

To the extent that alternatives are made available, we expect that implicatures could be generated from entirely new and even non-standard material. This is indeed what was found in earlier literature about iconic gestures and visual animations (Schlenker 2019, Tieu et al. 2019). For instance, Tieu et al. 2019 showed with experimental means that (8) gives rise to an inference that at the next mile marker John will turn the wheel, but not completely. While this could be because the target gesture, glossed as TURN-WHEEL, just means 'turn exactly like this' (hence no more than is displayed by the

[11] In contemporary theories (e.g. Sauerland 2004, Spector 2006, Chierchia et al. 2012), an alternative *S'* to a sentence *S* can be negated in case it is non-weaker than *S*, or in other words if *S and not S'* is not contradictory; the case in which *S'* is more informative than *S* is just a sub-case of this rule.

[12] This is not the only reason. If *drink* could evoke *drink a lot*, it could presumably also evoke *drink little* or even *drink an average amount*. But negating all these more informative possibilities would contradict the assertion that Ann drank (this is known as the 'symmetry problem' for scalar implicatures; see for instance Breheny et al. 2018 for discussion).

gesture), a separate experimental condition (under negation) shows that this couldn't be all that happens. Rather, *TURN-WHEEL* has a general meaning of *turn the wheel*, and the *not completely* inference is obtained by competition with the broad wheel turning gesture, glossed as *TURN-WHEEL-COMPLETELY* (we add pictures to transcriptions to make them more explicit when necessary).

(8) *Context:* John is training to be a stunt driver. Yesterday, at the first mile marker, he was taught to TURN-WHEEL-COMPLETELY_  . Today, at the next mile marker, he will TURN-WHEEL_  . (Tieu et al. 2019)

The sentence in (8) involves a direct implicature, one that is derived in a positive environment. Indirect implicatures can be obtained in negative environments, and in the iconic case they make the analysis more straightforward because the relevant inference couldn't be part of the literal meaning of the construction. As shown by Tieu et al. 2019, (9) triggers the inference that at the next buoy John will turn the wheel (just not completely). This is plausibly derived by negating the stronger alternative, namely *he will not TURN-WHEEL*, hence John *will* turn the wheel.[13] Importantly, there is no plausible literal meaning for *TURN-WHEEL-COMPLETELY* that could explain this inference when the gesture is negated; the implicature-based analysis is the only plausible one in this case.

(9) *Context:* John is training to be a stunt boat driver. Out by the first buoy, he decided to TURN-WHEEL-COMPLETELY, but at the second one he did not TURN-WHEEL. At the next buoy, he will not TURN-WHEEL-COMPLETELY. (Tieu et al. 2019)

To highlight the fact that implicatures can be triggered from forms that experimental participants couldn't possibly have seen before, Tieu et al. 2019 extend their results to different stimuli in which pro-speech gestures are replaced with simple visual animations.

Tieu et al.'s cases all involve alternatives that are provided by the context. But it was surmised on the basis of other examples that "indirect gestural implicatures can apparently be triggered without contextual alternatives when a gesture contains a less informative one as a sub-part" (Schlenker 2019), as in (65), where the *BIG* gesture is the initial part of the *VERY-BIG* gesture.

(10) Robin isn't VERY-BIG_ 
=> Robin is big

In the following sections, we will see that indirect implicatures can be triggered both by lexical and by iconic material in ASL. The iconic case with indirect implicatures will have a striking theoretical consequence: algorithms of alternative generation, devised for syntactic trees, should be extended to the iconic case.

2.3 Presuppositions

Unlike implicatures, presuppositions were traditionally taken to be lexically encoded (e.g. Heim 1983). But numerous authors have argued that some or all are in fact triggered on pragmatic grounds (e.g. Grice 1981, Stalnaker 1974, Abbott 2000, Simons 2001, Abusch 2010, Schlenker 2010, Chemla 2010, Simons et al. 2010, Abrusán 2011, Romoli 2015, Tonhauser et al. 2013, Schlenker 2021b). Pro-speech gestures and visual animations have figured prominently in these debates because they have highlighted the need for a non-lexical procedure. A key result is that diverse pro-speech gestures generate

[13] As with all indirect implicatures, the inference is triggered by the stronger term, not by the weaker one as in (5)a. Thus *I doubt that all group members attended* triggers the inference that *I don't doubt that some group members attended*: the strong term *all* triggers the implicature because under *I doubt that* it yields the weaker sentential meaning. Similarly, in (9) the strong term *TURN-WHEEL-COMPLETELY* triggers the implicature.

presuppositions, including when the gestures are rather unlikely to have been seen before. Tieu et al. 2019 show with experimental means that two key presupposition tests, illustrated in (11)a, b, can be replicated with pro-speech gestures as in (12) (additional examples are discussed in Schlenker 2019). (11)a shows that presuppositions project out of questions, and (11)b that they can give rise to universal positive inferences under *none* (for future reference, we illustrate projection under *maybe* and under negation in (11)c, d). In (12)a, the same *TURN-WHEEL* gesture already used in (8) is seen to generate a presupposition that the agent is behind a wheel. In (12)b, it generates a universal positive inference under *none*. Here too, Tieu et al. show that their results are preserved when pro-speech are replaced with visual animations that subjects couldn't possibly have seen before. This suggests that a genuinely non-lexical mechanism is at work.

(11) a. Did Ann stop / continue / regret smoking?
=> Ann smoked before
b. None of my students stopped / continued / regretted smoking.
=> Each of my students smoked before.
c. Maybe Ann stopped / continued / regrets smoking.
=> Ann smoked before
d. Ann didn't stop / continue / regret smoking.
=> Ann smoked before

(12) a. *Context:* Jake and Lily are watching their four children ride bumper cars at the carnival. Each bumper car has two seats. As one of the bumper cars nears a bend in the track, the parents wonder:
Will Sally TURN-WHEEL?
=> Sally is in the driver's seat
b. *Context:* Blake and Diane are watching their group of friends ride bumper cars at the carnival. Each bumper car has two seats. As the various bumper cars near a bend in the track, they worry that:
None of their friends will TURN-WHEEL.
=> each of the relevant friends is in the driver's seat
(Tieu et al. 2019)

Presuppositions have another characteristic property which is found in presuppositional pro-speech gestures, and which will matter below: they may be satisfied by their linguistic environment without imposing constraints on the context of utterance (Schlenker 2019). Thus in a sentence of the form *if p, pp'*, where *pp'* asserts *p'* and presupposes *p*, the presupposition is satisfied by the *if*-clause, as illustrated in (13)a. Similarly, in *[not p] or pp'*, the presupposition *p* in the second disjunct is satisfied by the negation of the first disjunct, as illustrated in (13)b.[14]

(13) a. If Ann smokes, she will stop / continue / regret smoking.
≠> Ann smokes
b. Either Ann doesn't smoke, of she will stop / continue / regret smoking.
≠> Ann smokes

When the *if*-clause or the negation of the first disjunct asymmetrically entails the presupposition (i.e. is strictly stronger than it), as in (14), facts are less clear and may depend on the example under consideration (for discussion, see for instance Geurts 1996, 1999, Lassiter 2012, Mandelkern 2016).

(14) a. If Ann smokes Russian cigarettes, she will stop smoking.
≠>?[unclear] Ann smokes
b. Either Ann doesn't smoke Russian cigarettes, or she will stop smoking.
≠>?[unclear] Ann smokes

A twist was added to presupposition theory by the analysis of co-speech gestures and facial expressions. These were claimed to trigger conditionalized presuppositions, called 'cosuppositions'

[14] In the literature on pro-speech gestures (Schlenker 2019), three cases of satisfaction of a presupposition by the linguistic context were considered: (i) conjunctions, and (ii) conditionals, and (iii) disjunctions (as in (13)-(14)). They had different argumentative functions. (i) showed that gestural presuppositions behave like normal presuppositions in sometimes being 'absorbed' by the linguistic context. (ii)-(iii) helped establish that some gestural expressives are not mere presupposition triggers. In the present piece, we will make use of (ii)-(iii) but not of (i).

(Schlenker 2018c). Thus (15)a triggers the inference that for each of the relevant ten guys, helping his son would have involved lifting him. Despite the presence of *none*, this is a universal positive inference, just as in (11)b, which suggests that it is presuppositional in nature; but it is a conditionalized presupposition (Tieu et al. 2017, 2018; see also Esipova 2019). The same finding extends to facial expressions: (15)b triggers the inference that for each of the poor states in question, if they spent money, this would be bad. Thus both co-speech gestures and co-speech facial expressions appear to trigger cosuppositions.

Notation: Co-speech gestures and facial expressions appear before the expressions they modify, and the latter are boldfaced.

(15) a. None of these 10 guys 𝕌ℙ_  **helped** his son.
=> for each of these 10 guys, if he had helped his son, lifting would have been involved

b. No poor state :-(_  **[spends money]**.
=> for each of the poor states, it would be bad if they spent money
(Schlenker 2018c)

As we will see, the recent literature shows that ASL has both lexical presupposition triggers and iconic presupposition triggers; in particular, classifier predicates can trigger presuppositions just like pro-speech gestures can. This finding has an important theoretical consequence, as it strengthens the view that presuppositions can be generated on the basis of novel material. In addition, disgusted facial expressions co-occurring with ASL words can arguably trigger cosuppositions, and thus display the characteristic semantic behavior of gestures within the signed modality.

2.4 Supplements

Supplements rose to prominence following Potts's work (e.g. Potts 2005). Supplements are usually defined as the meaning of appositive relative clauses. As a first approximation, they fail to interact with operators in whose scope they may be.[15] One characteristic behavior of supplements is that they usually yield deviance if they are forced to be interpreted in the immediate scope of a negative expression, as in (16)b.

(16) a. One of these women helped her son, which saved him.
b. #None of these women helped her son, which saved him.

It was argued that gestures that follow the expressions they modify ('post-speech gestures') can display the behavior of appositive relative clauses (Schlenker 2018c; see also Esipova 2019). For instance, a lifting gesture (glossed as 𝕌ℙ) is acceptable as a post-speech gesture under *one* but not under *none* in (17)b, just as the close paraphrase with a *which*-appositive relative clause in (17)a.

(17) a. One/#None of these 10 guys helped his son, which he did by lifting him.
a'. One/None of these 10 guys helped his son, which is surprising.
b. One/#None of these 10 guys helped his son – 𝕌ℙ.

The same facts arguably hold with facial expressions, but with one independent difference. Ungrammaticality in the *none*-versions of (17) arises because the postposed element may only meaningfully modify the predicate, not the entire proposition. When the latter possibility is open, grammaticality is restored, as in (17)a': with *none*, the appositive *which is surprising* modifies a negative proposition but is not itself in the scope of a negative word. The disgusted facial expression that appears in (18) (glossed as :-( ) could in principle modify the predicate *spends money*, or the entire proposition. But if it modified the predicate, the post-speech facial expression would be in the scope of a negative quantifier, which should make it deviant. No such problem arises if the facial expression modifies the

[15] Systematic exceptions to the scopelessness of appositive relative clauses are discussed in Schlenker 2023, but these exceptions will not matter for present purposes.

entire proposition, and a salient reading is indeed that it is bad that no poor state spends money—in other words, it would be *good* for poor states to spend money. This post-speech facial expression minimally differs from the co-speech one in (15)b above, which yields the inference that it would be bad for poor state to spend money (Schlenker 2018c).

(18) No poor state spends money – :-(.
=> it is bad that no poor state spends money, hence it would be good for poor states to spend money
(Schlenker 2018c)

A further similarity between post-speech gestures and appositive relative clauses arises in the antecedent of conditionals. (19)a and c alike give rise to a 'modal subordination' reading which implies that slapping is involved in the worlds satisfying the *if*-clause (Schlenker 2018c, 2023; see also Roberts 1989); no such effect is found with control conjunctions, as in (19)b. The inferential contrast between post-speech gestures and embedded conjunctions was established with experimental means in Tieu et al. 2019.

(19) a. If Asterix punishes his enemy—SLAP, I might scream.
=> if Asterix punishes his enemy, slapping will be involved
b. If Asterix punishes his enemy by slapping him, I might scream.
≠> if Asterix punishes his enemy, slapping will be involved
c. If Asterix punishes his enemy, which will/would involve some slapping, I might scream.
=> if Asterix punishes his enemy, slapping will be involved
(modified from Schlenker 2018c)

Post-speech facial expressions seem to us to give rise to 'modal subordination' readings as well, as is illustrated in (20).

(20) If Asterix punishes his enemy—:-(, something important will happen.
=> if Asterix punishes his enemy, something unpleasant or disgusting will be involved

It is tempting to conclude from the behavior of post-speech gestures and facial expressions that supplements can be triggered on non-lexical grounds. But this conclusion would be too rash. The reason is that Potts 2005 took an abstract symbol, the 'comma intonation', to be responsible for the production of supplemental meaning. There is nothing in these gestural data to refute such an analysis: the comma intonation might be behind them as well (see also Esipova 2019).

As we will see, recent literature has argued that ASL can trigger supplements, but at this point results solely pertain to post-sign facial expressions—and here too, there is nothing to exclude the possibility that the comma intonation is at stake.

2.5 Expressives

Like supplements, expressives rose to prominence following Potts's work (e.g. 2005). Intuitively, they are expressions that provide information about the speaker's attitude towards their denotation; for instance, *Frog* used to refer to French people suggests that the speaker has a negative attitude towards them. Initially, expressives and supplements were lumped together because they mostly fail to interact scopally with operators (Potts 2005). An example appears in (21). Despite being in the scope of the negative operator *nobody*, *Frog* triggers the inference that the speaker has a negative attitude towards the French. But there are important differences between expressives and supplements. For instance, unlike the supplement in (16)b, *Frog* in (21) does not give rise to deviance in a negative environment.

(21) Nobody will hire any Frog.

Some have tried to analyze expressives as triggering presuppositions pertaining to the speaker's attitude (e.g. Macià 2002, Sauerland 2007, Schlenker 2007). But there is more to the story. On the presuppositional view, one might expect this attitudinal presupposition to impose constraints on its linguistic environment but not always on the context of utterance. Specifically, in a conditional *if p, q*, a standard presupposition triggered by *q* need not constrain the context of utterance if it follows from *p*, as was illustrated in (13)a above. Similarly, one might expect that in (22)a the purported presupposition that the speaker is prejudiced against the French is satisfied by the *if*-clause. This is not so: the sentence clearly conveys that the speaker is in fact prejudiced (and this makes the *if*-clause a bit

odd, as it implicates that there is uncertainty about this very fact, which is otherwise established by the expressive). The same reasoning applies to (22)b: one might expect the attitudinal presupposition to be satisfied by the negation of the first disjunct, just as in (13)b, but it's not (Thommen 2017; see also Schlenker 2016).

(22) There's plenty of implicit bias, but…
a. (#) if I were really prejudiced against the French, I wouldn't hire a Frog.
=> the speaker is prejudiced against the French
b. (#) either I am not really prejudiced against the French, or I won't hire a Frog.
=> the speaker is prejudiced against the French
(Schlenker 2019)

It was argued in Schlenker 2019 that some gestures have both the implications and the formal behavior of slurs: they suggest that the speaker has a negative attitude towards certain categories of people, and they behave like slurs in precisely the type of environments illustrated in (22). No claim was made that slurs can be created productively, however[16] (and slurs were not studied in Tieu et al.'s experimental piece).

We will see that ASL too has expressions that display the characteristic behavior of expressives, and we will discuss a possible case of limited productivity; we will also initiate a comparison between expressives and neutral words accompanied with a disgusted facial expression or an offensive gesture.

2.6 Homogeneity inferences

Homogeneity inferences were investigated in speech in connection with the inferential behavior of definite plurals, illustrated in (23) (e.g. Löbner 2000, Gajewski 2005, Spector 2013, Križ 2015, 2016, 2019, Križ and Spector 2021). In a context in which some presents were hidden for some children, (23)a behaves roughly like (23)a' in meaning that Mary will find all of her presents. However, the negation (23)b doesn't mean that Mary won't find all of her presents, as would be expected if *her presents* meant roughly *all of her presents*; rather, it means that she won't find any. This is the initial puzzle raised by homogeneity inferences.

(23) a. Mary will find her presents.
=> Mary will find (almost) all of her presents
a'. Mary will find all of her presents.
=> Mary will find all of her presents
b. Mary won't find her presents.
=> Mary will find (almost) none of her presents
b'. Mary won't find all of her presents.
≠> Mary will find none of her presents

For Križ (e.g. 2015, 2016, 2019), the source of homogeneity lies in a lexical property of many (though not all) predicates, which 'want' their plural arguments to have all their parts in the predicate extension or all their parts outside of the predicate extension. If a predicate extension includes a plurality a and excludes a plurality a', it is undefined of a+a'; the more general property is stated in (24). The projection of undefinedness (which we needn't go into here) is responsible for the inferences in (23).

(24) **Homogeneity Generalization** (Križ 2019)
If a plurality a overlaps with a plurality b, a homogeneous predicate that is true of b cannot be false of a: it can only be true or undefined with respect to a.[17]

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[16] It was speculated, however, that expressive gestures might have iconic implications that might require a productive rule. Thus a derogatory gesture used to refer to handicapped people "is indicative of a particular kind of disability (one that affects the body), rather than something more general, and one might try to modulate the gesture to determine if more precise iconic implications can be obtained" (Schlenker 2019).

[17] Križ 2019 defines the same property as follows: "A homogeneous predicate that is not true of a plurality a is undefined of a if it is true of some plurality b that overlaps (i.e., has parts in common) with a." An additional property, called 'exception-tolerance', is that, under pragmatically determined circumstances, homogeneous expressions allow for exceptions. Thus (23)a allows for a situation in which Mary found 9 of her 10 presents, whereas a control with *all of her presents* as in (23)a' does not allow for this. Križ 2015 connects exception-tolerance to projection: both derive from trivalence, combined with a pragmatic theory that allows a sentence with

Gestures (Schlenker 2019) and even visual animations (Tieu et al. 2019) can give rise to homogeneity inferences as well. All gestural (and even visual) examples discussed had the same structure: a gestural plural involving a repetition established an antecedent in a certain position; then a pointing gesture or a directed gesture (e.g. displaying an action of taking with both hands, directed to the established position) referred back to the antecedent, as illustrated in (25). On Križ's theory, it is unsurprising that the English predicate *take* displays homogeneity effects. It is more interesting to note that the gestural predicate *TAKE-2-HANDED* displays the same property, highlighting the existence of homogeneity effects in the gestural domain.
Notation: Here $_{\text{left}}$ and $_{\text{right}}$ transcribe gestural loci, on the speaker's left and right respectively.

(25) *Context:* Sam is participating in a treasure hunt in the forest, and she is looking for crosses and coins. Very quickly, Sam will find ⟦CROSS-rep3⟧$_{\text{left}}$ and ⟦COIN-rep3⟧$_{\text{right}}$.

a. Sam will take IX-right / TAKE-2-HANDED-right.

=> Sam will take all of the coins
b. Sam will not take IX-right / TAKE-2-HANDED-right.

=> Sam will not take any of the coins
(Tieu et al. 2019)

Related inferential examples were tested by Tieu et al. 2019 using visual animations, involving for instance a drawing with multiple stars to establish a plurality of stars, and a blinking disk in the position of the stars to indicate that these stars were targeted by a laser. Animations replicated the behavior of gestures, indicating that there too homogeneity effects can be found.

Unsurprisingly, homogeneity inferences can be obtained in ASL with lexical constructions (including plural and dual pronouns). More strikingly, we will see that classifier predicates can trigger homogeneity inferences, including in the absence of any overt definite expression.

2.7 Summary and outlook

In sum, natural language has a rich inferential typology, and in most cases the content of novel iconic expressions (be they gestures or visual animations) can be productively divided among its slots. (Expressives offer a possible exception because gestural expressives discussed in the literature might be lexicalized, and no extension to visual animations has been offered.)

In view of the Hypothesis of Dual Semantics in (2), we might expect most of this typology to extend both to the lexical and to the iconic component of sign language. As we will see in the remaining sections, recent results on ASL presuppositions and supplements confirm this expectation. We will then extend the findings to some ASL expressives, including nonce ones, to scalar implicatures, and to homogeneous expressions. With the exception of expressives, all slots of the typology will be filled both my lexical and by iconic constructions.

Setting aside expressives for a moment, ASL classifier predicates will address an important objection that could have been raised against data involving pro-speech gestures and visual animations. The objection goes like this. Pro-speech gestures and animations might give the impression that some words are missing, thus prompting the addressee to try to reconstruct them. For instance, in (8), one might take *TURN-WHEEL* and *TURN-WHEEL-COMPLETELY* to be codes for *turn the wheel* and *turn the wheel completely*. If so, the implicatures we observed might be triggered by the reconstructed words rather than by the gestures themselves. Schlenker 2019 and Tieu et al. 2019 argue that gestures couldn't be mere codes for words because they have iconic implications that would be lost with the most plausible translations. For instance, the size and position of the wheel are made clear by the gesture but not by the translation in words *turn the wheel*. What is harder to exclude, however, is the possibility that the gestures co-occur with a covert linguistic expression—so that one might mentally process *turn the wheel* together with the displayed gesture.

Classifier predicates offer a knock-down argument against any such objection. Since they are normal (if iconic) words of ASL, there is very little plausibility to the view that addressees must guess other covert words to understand them. Since ASL classifiers behave like pro-speech gestures in triggering diverse inferential types, they will strengthen earlier conclusions about the productive nature

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the third truth value # to be 'saved' under some circumstances.

of the underlying process.

3 Presuppositions and Supplements: Recent Results

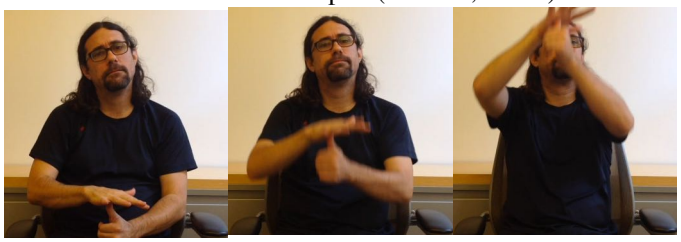
Replicating in ASL iconic and non-iconic constructions the five inferential types discussed in Section 2 would be too much for a single piece, but fortunately some of the work has already been done for two of them: presuppositions and supplements. Let us briefly summarize the main results, which are essential to the Hypothesis of Dual Semantics stated in (2).

3.1 Presuppositions

In Schlenker 2021a, two kinds of presupposition triggers were compared within ASL: lexical triggers such as *CONTINUE*, which behave like their English counterparts (*x continues to q* presupposes that x q-ed before); and classifier predicates with diverse kinds of movements, some of which trigger presuppositions. In (26)b, *CONTINUE* triggers the inference that the helicopter is currently taking off, and this inference is a presupposition, as shown for instance by the fact that it projects under *MAYBE* , a standard presupposition test (see (11)c above). In (26)a, a classifier predicate for a helicopter is used, illustrated in (27). It involves an upward movement starting from a low position. The 'low initial position' inference behaves like a presupposition, since it projects under *MAYBE*.

(26) *Context:* our company has one helicopter and one airplane.[18]
WITHIN 5-MINUTES OUR COMPANY HELICOPTER MAYBE
'Within the next five minutes, maybe our company's helicopter will
a. [7] GO-helicopter-up_-cl
take off.'
b. [7] CONTINUE GO-helicopter-up_-cl
continue to take off.'
(ASL, 34, 3556a,b; 3 judgments; Schlenker 2021a)
Video: https://youtu.be/wsw0B-snCbA, first two examples

(27) Vertical movement of a helicopter (ASL 34, 3556a)



Multiple other modifications of this paradigm, discussed in Schlenker 201a, lead to the conclusion that (i) as expected, some lexical constructions of ASL (such as *CONTINUE*) trigger presuppositions, and in addition (ii) certain movements of classifier predicates trigger presuppositions as well. The latter point strengthens the conclusions drawn in the literature on pro-speech gestures (reviewed in Section 2.3 above): presuppositions can be triggered on the basis of iconic forms whose specific meaning could not be stored in the lexicon, which argues that a triggering algorithm must exist for presuppositions. The objection that iconic forms could be codes for other words has very little plausibility here, since classifiers are just words of ASL.

Schlenker 2018c further argues that cosuppositions too can be found in ASL when disgusted facial expressions co-occur with signs.[19] The basic idea is to replicate different versions of (15)b above with ASL expressions embedded in environments (notably *NONE*) in which presuppositional/cosuppositional behavior is easy to diagnose. In this way, it was argued that when a disgusted expression co-occurs with *SPEND MONEY*, one obtains the inference that spending money

[18] We add to the transcriptions of classifiers *-cl*, absent from the transcription used in Schlenker 2021a.
[19] In a further twist, Schlenker 2021a argues that in pragmatically determined cases, cosuppositions can be triggered by some pro-speech gestures and by some ASL classifier predicates. We disregard this point here.

would be bad or difficult. This result is theoretically significant because it suggests that the characteristic behavior of co-speech gestures can be found in sign, where gestures are realized in the same modality as the expressions they modify.

3.2 Supplements

While one might hope to find supplements in appositive relative clauses in ASL, grammatical constructions with this precise status are difficult to find.[20] However post-sign facial expressions seem to behave like their English counterparts in triggering supplements, or at least this is one theory entertained in Schlenker 2018c. Specifically, the contrast between (15)b and (18) is replicated in ASL: in a homologous example, a disgusted facial expression following *<no poor states> SPEND MONEY* yields the inference that this entire (propositional) state of affairs is bad, or in other words: it would be good for poor states to spend money.

3.3 Intermediate summary and outlook

In sum, recent literature has shown that presuppositions can be triggered by lexical and by iconic means in ASL, and that cosuppositions and supplements can be triggered by co-sign and post-sign facial expressions respectively. The question is whether these results can be extended to the rest of the inferential typology reviewed in Section 2. We will provide a positive answer, starting with expressives, which will be contrasted both with presupposition triggers and with co- and post-sign derogatory gestures or facial expressions (building on the results of this section). We will then turn to scalar implicatures (which display some analytical complexities in iconic case) and then to homogeneity inferences. In all cases, earlier argues for productivity will be strengthened: in the case of expressives, because we will uncover one way to create nonce expressives; in the case of implicatures and homogeneity inferences, because these are triggered by classifiers, whose movement could not be stored in the lexicon.

4 Expressives[21]

To our knowledge, sign language semantics has not investigated the formal properties of expressives yet.[22] We will do so with three goals. One is to establish that some ASL words display the characteristic behavior of expressives (here: slurs), as illustrated by the patterns in (21)b, which set expressives apart from presupposition triggers. Our second goal is to assess the possibility of productively creating nonce expressives by modifying neutral (i.e. non-expressive) signs; the existence of a productive mechanism could prove useful in future research to find the source of expressive behavior. Our third goal is to compare expressives to neutral words modified by a disgusted facial expression or an offensive gesture, whether co-occurring or following their anchor. Current theories predict that there should be a subtle difference between expressives and such modified words. For instance, post-sign facial expressions should allow for modal subordination readings, as illustrated in (20), whereas expressives are more insensitive to their linguistic environment, as illustrated in (21)b. In accordance with this prediction, we will see that lexical expressives and nonce expressives systematically trigger stronger negative inferences than neutral words modified by facial expressions or gestures. Still, we won't draw definitive conclusions because the contrasts are subtle and would require work with further consultants.

Before we start, two cautionary remarks are in order. First, slurs may offend even if just quoted. We investigated some country names that were common in old ASL but are considered offensive in contemporary ASL (and we picked these examples for this reason and no other). We just gloss them

[20] Schlenker 2021c argues that some parentheticals in ASL share a property with appositive relative clauses in English and French in having the ability to attach non-locally to propositional nodes that dominate their surface position (Schlenker 2023). But this is syntactic property; there is no claim at all that these parentheticals trigger supplements.

[21] Note (Nov. 11, 2023): After this draft was written, we learned of the existence of Loos et al. 2020, which is directly relevant for Section 4. A discussion will be added as soon as this draft is revised.

[22] For a philosophical study that discusses some ASL slurs, see DiFranco 2017.

below as *COUNTRY_X* and *COUNTRY_Y*. Correspondingly, we transcribe and translate the capitals of Country X and Country Y as *CAPITAL_X* / *CAPITAL_Y*, *Capital X* / *Capital Y*. Since these country names may have been used by some signers without an intention to offend in earlier varieties of ASL, our contexts specify that the signer uses a *contemporary* form of ASL. Second, we focus the main discussion on just one such slur (*COUNTRY_X*), with very detailed controls; another derogatory country name that works essentially in the same way (*COUNTRY_Y*) is discussed in Appendix I.

4.1 Target expressions

Our target expressions appear in an unembedded environment in (28) (embedding tests will be needed to tease apart the behavior of these expressions). The normal (non-offensive) name for *COUNTRY_X*, in (28)a, is signed with the four flexed fingers of the dominant hand touching the signer's body in two positions. The offensive term, in (28)b, used to be the standard name for Country X in earlier forms of ASL. In (28)c and d, we use the neutral term *COUNTRY_X*, but with a disgusted facial expression respectively co-occurring and following it (here our second consultant preferred to have the disgusted expression during than after the sign). In (63)e, we created a nonce expressive by signing the neutral version of *COUNTRY_X* with the middle finger (otherwise used to 'give the finger') instead of the four flexed fingers. In (63)f, the middle finger appears after the normal version of *COUNTRY_Y*, while in (63)g the middle finger is produced with the non-dominant hand as the dominant hand signs the normal version of *COUNTRY_X*.[23] Finally, in (63)h we use *BAD COUNTRY_Y*, which will serve as a presuppositional control.

Notation: We transcribe gestures and facial expressions using a non-standard font. In addition, for clarity we indicate co-sign gestures and co-sign facial expressions as superscripts before the (transcriptions of the) expressions they co-occur with. \:-((transcribes a disgusted facial expression. In (28)d, a picture illustrates the facial expression.

(28) *Context:* The signer is using a contemporary form of ASL, and is not using terms to joke.

SELF NO PREJUDICE, BUT RECENTLY CAPITAL_X START TAKE-AWAY FREEDOM-FREEDOM, SO IX-1 OPPOSE
'I myself have no prejudice, but recently Capital X started to take away freedoms, so I oppose
a. [7]COUNTRY_X .
Country X.'
=> the signer opposes Country X
=> the signer dislikes Country X (endorsement: 7)
b. [7]COUNTRY_X-slur.
<slur for Country X>.'
=> the signer thinks badly of Country X
=> the signer dislikes Country X (endorsement: 7)
c. [7] \:-(([COUNTRY_X].
\:-((**Country X**.'
=> the signer thinks Country X is disgusting
=> the signer dislikes Country X (endorsement: 7)
d. [7][COUNTRY_X] \:-((_  .

[23] A spoken language comparison that immediately comes to mind is expletive infixation in English, as in *Kalamazoo–>Kalamafuckingzoo* (e.g. Aronoff 1974, section 4.3.1.2). It's not clear that the semantics is comparable, however. For instance, *fanfuckingtastic* certainly doesn't imply that the speaker has a negative attitude towards the denotation of *fantastic*. We leave this question for future research.

Country X \:-((.'
=> the signer thinks Country X is disgusting
=> the signer dislikes Country X (endorsement: 7)
e. [6.7] [COUNTRY_X]-middle_finger.
<nonce slur for Country X>.'
=> the signer hates Country X
=> the signer dislikes Country X (endorsement: 7)
f. [7] COUNTRY_X MIDDLE-FINGER .
Country X MIDDLE-FINGER.'
=> the signer hates Country X
=> the signer dislikes Country X (endorsement: 7)
g. [6] MIDDLE-FINGER[COUNTRY_X].
MIDDLE-FINGERCountry X.'
=> the signer hates Country X
=> the signer dislikes Country X (endorsement: 7)
h. [7] BAD COUNTRY_X.[24]
bad Country X.'
=> the signer thinks Country X is bad
=> the signer dislikes Country X (endorsement: 7)
(ASL 37, 2642; 3 judgments)

All the examples trigger the inference that the signer dislikes Country X. This is because of the assertion alone ('I oppose Country X'), and also because of the negative component of the target words (except in (63)a, where this word is neutral). The detailed inferences differ across examples, however: the neutral word *COUNTRY_X* just triggers the inference that the signer opposes that country, whereas the other examples suggest that the signer hates that country, or finds it bad, or finds it disgusting. As we will soon see, under embedding, more radical differences will emerge: the inference that the signer dislikes Country X will disappear or be weakened in some cases.

Since our ultimate goal is to show that the expressive in (29)b differs from presuppositional expressions, it is worth pausing to establish that *BAD COUNTRY_X* in fact displays a presuppositional behavior. In (29)b-e, the negative inference triggered by *BAD COUNTRY_X* projects out the scope of *MAYBE* and negation, which is indeed a characteristic behavior of presuppositions (as illustrated above in (11)a, c, d). The negative inference projects a bit more weakly out of questions, as seen in (29)e, possibly because our main consultant allows for a quotational/echoic use on which *BAD COUNTRY_X* simply repeats something that was said to him before (see the consultant's explicit remarks to that effect in the Supplementary Materials; our translation captures this echoic use). Despite its projective behavior under *MAYBE*, negation and questions, we will soon see that *BAD COUNTRY_X* behaves like the presupposition triggers in (13), and unlike the expressives in (22), in sometimes being satisfied by the linguistic environment rather than by the context of utterance.

(29) *Context:* The signer is using a contemporary form of ASL, and is not using terms to joke.
a. [7] ANNE OPPOSE COUNTRY_X.
'Anne opposes Country X.'
≠> the signer dislikes Country X (endorsement: 1)
b. [6.7] ANNE OPPOSE BAD COUNTRY_X.
'Anne opposes bad Country X.'
=> the signer dislikes Country X (endorsement: 6)
c. [6.7] MAYBE ANNE WILL OPPOSE BAD COUNTRY_X.
'Maybe Anne will oppose bad Country X.'
=> the signer dislikes Country X (endorsement: 7)
d. [6.7] ANNE WON'T OPPOSE BAD COUNTRY_X.
'Anne won't oppose bad Country X.'
=> the signer dislikes Country X (endorsement: 7)

[24] As can be seen in the Supplementary Materials, the consultant omitted to answer all questions pertaining to h. in the second session (which was remote). Correspondingly, averages are computed on the basis of 2 rather than 3 judgments for h.

e. [6.7] ^_____
[ANNE WILL OPPPOSE BAD COUNTRY_X QUESTION]
'Anne will be opposing bad Country X?'
=>? the signer dislikes Country X (endorsement: 5.7)
(ASL 37, 2646; 3 judgments)

4.2 *Target conditions and predictions: embedding under* IF *and* OR

As mentioned, a key theoretical issue is to distinguish expressives from presupposition triggers. For reasons laid out in (22) in Section 2.5, embedding in certain conditionals and disjunctions is particularly informative in this respect. We will consider the conditions and predictions described schematically in (30).

(30) **Predictions: embedding of negative expressions under conditionals and disjunctions**
Conditional: If Capital X starts to horribly take away freedoms, I'll oppose…
Disjunction: Either Capital X won't start start to horribly take away freedoms, or I'll oppose…

Semantic type	**Target expression**	**Example**	**Predicted inference**
a. At-issue content	Neutral	… COUNTRY_X	No inference
b. Expressive	Lexical slur	… Country_X-slur	The signer dislikes Country X
c. Presupposition	Presuppositional modification	… BAD COUNTRY_X	No or weak inference that the signer dislikes Country X
d. Supplement	Post-sign negative gesture/facial expressions	… COUNTRY_X **followed by** a negative gesture/facial expression	No or weak inference that the signer dislikes Country X
e. Unclear	Co-sign negative gesture/facial expression	… COUNTRY_X **cooccurring with** a negative gesture/facial expression	Unclear/ambiguous

With a neutral expression, as in (30)a, any negative implication of *I will oppose Country X* should be blocked by the embedding. With an expressive, as in (30)b, the negative implication should be fully preserved. With a presupposition trigger such as *BAD COUNTRY_X*, as in (30)c, the antecedent of the conditional and the negation of the first disjunct should justify the presupposition and it shouldn't be inherited by the entire sentence.[25]

The situation of supplements is a bit more complex. In principle, several expressions could be modified by the post-sign gesture and by the facial expression in (30)d: (i) the entire conditional *If Capital X starts to horribly take away freedoms, I'll oppose Country X*; (ii) the consequent only, namely *I'll oppose Country X;* (iii) conceivably, just the expression *Country X*. If the entire conditional is modified, it is unclear why there should be an inference that the signer in fact dislikes Country X; but in any event this modification seems to make little pragmatic sense here. Modifying the consequent makes sense, but should not yield such an inference either, since supplements can be understood with modal subordination, as illustrated in (19) and especially (20) above. The third possibility, namely modification of the proper name *COUNTRY_X*, has not been analyzed in detail in the literature (but see Esipova 2019). But even if it is possible and can yield an unconditional inference that the signer has a negative attitude towards Country X, it should definitely not be the only possible reading of the sentence, and the overall inference that the signer has a negative attitude towards Country X might be weak due to the possibility of a clausal reading of the post-sign facial expression.

The case in (30)e involves a gesture and facial expression co-occurring with a proper name. One might think that this should trigger a cosupposition, but cosuppositions can only arise in modifications of predicative and propositional expressions.[26] In the analysis of Esipova 2019, such cases

[25] This prediction is affected by the fact that there are remnants of projection in some cases in which the *if*-clause or the negation of the first disjunct asymmetrically entails the presupposition, as discussed in Section 2.3. But the empirical contrasts will turn out to be sharp, and thus this worry won't arise here.

[26] This is for essential reasons: for a conditional inference to arise, the modified expression must be of propositional or predicative type, corresponding to the antecedent of the conditional (a bit more generally: of a

could in principle involve (i) an appositive modifying an expression of individual type, or (ii) a cosupposition modifying a predicate *if* proper names are treated as containing a predicate (see for instance Geurts 1997, Matushansky 2008). In first case, the result would be akin to *Country_X, to which the signer has attitude blah;* in the second case, to: *the Country X,* with an inference that anything that is Country X licenses attitude blah.[27] Both options trigger the inference that the signer has a negative attitude towards Country X. But a further question is whether this property should hold in the actual world or in the worlds satisfying the antecedent of the conditional. This point would require independent investigation, and we thus take the prediction to be unclear in this case.[28]

In sum, *bona fide* expressives are the only expressions for which we can predict robust unconditional inferences to the effect that the signer has a negative attitude towards Country X in the target environments described in (30). As we will now see, our findings are fully compatible with this expectation.

4.3 *Projection facts under* IF *and* OR

All the target expressions in (40) trigger an inference that the signer dislikes Country X, but this leaves open four salient possibilities: the crucial negative component is at-issue (i.e. it is an entailment), or a presupposition, or a supplement, or an expressive. The characteristic behavior of expressives is that they project from all the environments we considered, including from conditionals and disjunctions, as illustrated in (13) and (22).

Since *BAD COUNTRY_X* displays a presuppositional behavior, its negative implication is expected not to project out of the consequent of a conditional when it is satisfied by the *if*-clause. This is what we find in (31)h. By contrast, the derogatory expression in (31)b triggers in all environments a strong inference that the signer dislikes Country X. This inference is also strong for the nonce slur in (31)e. While one might think that any expression accompanied by a disgusted facial expression or by the middle finger yields an expressive behavior in the technical sense, this is unlikely to be correct: examples with the post-sign facial expression and gesture in (31)d, f yield a much weaker inference, suggesting that they do not behave like expressives. The examples with the co-sign facial expression and gesture in (31)c, g give rise to a stronger endorsement, but one that appears to be less strong than for the offensive term, although the contrasts are too subtle to reach a firm conclusion.

(31) *Context:* The signer is using a contemporary form of ASL, and is not using terms to joke.

SELF NO PREJUDICE, BUT IF CAPITAL_X HORRIBLE START TAKE-AWAY FREEDOM-

FREEDOM, IX-1 WILL OPPOSE

'I myself have no prejudice, but if Capital X starts to horribly take away freedoms, I will oppose

a. [7] COUNTRY_X .

Country X.'

≠> the signer dislikes Country X (endorsement: 1)

b. [6.7] COUNTRY_X-slur.

<slur for Country X>.'

=> the signer dislikes Country X (endorsement: 6.7)

type that 'ends in t' [Schlenker 2018b]). It's entirely unclear how a conditional inference could arise from expressions of individual type.

[27] In greater detail: For Matushansky 2008 (and several other predicate-based theories of proper names), *France* is analyzed as *the France*, where the determiner is covert. A co-speech (or co-sign) disgusted facial expression could in principle modify this predicate, yielding the conditionalized presuppositional inference (i.e. the cosupposition): *for every x, if x is France, x is disgusting* – hence France is disgusting. Esipova 2019 derives the same effect by positing that the co-speech/co-sign expression is a redundant modifier.

[28] Relevant examples could take the form in (i), where the gesture TALL co-occurs with the proper name; the question is whether the example is coherent, which requires that TALL be evaluated in a counterfactual world.

(i) If he had continued to grow into adulthood, by age 30 TALL **Peter** would have been as tall as a giraffe.

c. [7] \:-(([COUNTRY_X].
\:-((**Country X**.'
=>?? the signer dislikes Country X (endorsement: 4.3)[29]
d. [7] [COUNTRY_X] \:-((.
Country X \:-((.'
=>?? the signer dislikes Country X (endorsement: 4)
e. [7] [COUNTRY_X]-middle_finger.
<nonce slur for Country X>.'
=> the signer dislikes Country X (endorsement: 6.3)
f. [7] COUNTRY_X MIDDLE-FINGER .
Country X MIDDLE-FINGER.'
≠>? the signer dislikes Country X (endorsement: 2.7)
g. [6] MIDDLE-FINGER [COUNTRY_X].
MIDDLE-FINGER Country X.'
=>?? the signer dislikes Country X (endorsement: 4 (3, 6, 3))
h. [6.7] BAD COUNTRY_X.
bad Country X.'
≠>? the signer dislikes Country X (endorsement: 2)
(ASL 37, 2636; 3 judgments)

For clarity, we display in (32) the inferential question we used, and in (33) our quantitative inferential results, boldfacing them when the average inferential strength at or above 6 (out of 7); the slur and the nonce slur clearly stand out.

(32) **Inferential question**
[On the assumption that the signer is not joking, and uses a contemporary form of ASL] Does the sentence suggest that the signer's **actual** attitude towards Country X is that he **in fact dislikes it in some way** [irrespective of whether Country X takes away freedoms][30]? (Indicate with which strength you derive the relevant inference: 1 = no inference; 7 = strongest inference)

(33) **Strength of the negative inference about Country X in (31)**

Example 37, 2636	**Strength of the inference that the signer in fact dislikes Country X** (with 7 = strongest)
a. COUNTRY_X .	1
b. COUNTRY_X-slur.	**6.7**
c. \:-(([COUNTRY_X]	4.3
d. [COUNTRY_X] \:-((.	4
e. [COUNTRY_X]-middle_finger.	**6.3**
f. COUNTRY_X MIDDLE-FINGER .	2.7
g. MIDDLE-FINGER [COUNTRY_X]	4 (3, 6, 3)
h. BAD COUNTRY_X.	2

The paradigm in (67) makes the same point using disjunctions. As noted in (13)b above, when the second disjunct triggers a presupposition, it can be satisfied by the negation of the first disjunct, and thus it can fail to project to the level of the entire sentence. This is roughly the behavior of *BAD COUNTRY_X* in (34)h. By contrast, the derogatory term and the neutral term signed with the middle finger give rise to strong projection, as seen in (67)b, e. The other target expressions give rise to somewhat intermediate levels of projection, which is consistent with the hypothesis that they are not expressives (the contrasts are too subtle to reach clear conclusions). Once again, our inferential results are summarized in a table, in (35), where the slur and the nonce slur stand out.

[29] Our second consultant would give slightly different inferential scores for c. and d., namely 5 and 3 respectively.
[30] The bracketed material did not appear in (28)-(29); it was added here and in alter paradigms to help tease part negative inferences triggered by our target expressions from those that might just stem from the objectionable actions of Country X.

(34) *Context:* The signer is using a contemporary form of ASL, and is not using terms to joke.

SELF NO PREJUDICE, BUT EITHER-OR CAPITAL_X WON'T HORRIBLE START TAKE-AWAY
'I myself have no prejudice, but either Capital X won't start to horribly take away
FREEDOM-FREEDOM, OR IX-1 WILL OPPOSE
freedoms, or I will oppose

a. [6.3] COUNTRY_X .
Country X.'
≠> the signer dislikes Country X (endorsement: 1)
b. [6.3] COUNTRY_X-slur.
<slur for Country X>.'
=> the signer dislikes Country X (endorsement: 6.3)
c. [6.3 \:-(( ] [COUNTRY_X].
\:-((**Country X**.'
=>?? the signer dislikes Country X (endorsement: 4.7 (3, 6, 5))
d. [6.3] [COUNTRY_X] \:-((.[31]
Country X \:-((.'
=>?? the signer dislikes Country X (endorsement: 4.7)
e. [6] [COUNTRY_X]-middle_finger. (acceptability scores: 7, 7, 4)
<nonce slur for Country X>.'
=> the signer dislikes Country X (endorsement: 6.7)
f. [6.7] COUNTRY_X MIDDLE-FINGER .
Country X MIDDLE-FINGER.'
≠>?? the signer dislikes Country X (endorsement: 3.3 (2, 5, 3))
g. [5.7 MIDDLE-FINGER] [COUNTRY_X]. (acceptability scores: 6, 7, 4)
MIDDLE-FINGER Country X.'
=>? the signer dislikes Country X (endorsement: 5)
h. [6.3] BAD COUNTRY_X.
bad Country X.'
≠>? the signer dislikes Country X (endorsement: 2.7)
(ASL 37, 2634; 3 judgments)

(35) **Strength of the negative inference about Country X in (34)**

Example 37, 2634	**Strength of the inference that the signer in fact dislikes Country X** (with 7 = strongest)
a. COUNTRY_X .	1
b. COUNTRY_X-slur.	**6.3**
c. \:-(([COUNTRY_X]	4.7 (3, 6, 5)
d. [COUNTRY_X] \:-((.	4.7
e. [COUNTRY_X]-middle_finger.	**6.7**
f. COUNTRY_X MIDDLE-FINGER .	3.3 (2, 5, 3)
g. MIDDLE-FINGER [COUNTRY_X]	5
h. BAD COUNTRY_X.	2.7

4.4 Summary and open questions

In our data, there is a relatively clear contrast between a presuppositional expression, *BAD COUNTRY_X*, and two target expressives, a lexical one, and a nonce offensive term obtained by signing the neutral term for Country X with the middle finger. In some environments in which the presupposition fails to project to the level of the entire sentence (because it justified by its linguistic environment), the negative implications of the lexical slur and the nonce term strongly project. This mirrors the behavior of expressives in spoken language and in gestures. Our paradigms also included

[31] Due to a production error, this example had *START HORRIBLE* in lieu of *HORRIBLE START*. The inversion does not seem to have degraded acceptability.

co- and post-sign gestures and facial expressions. These seem to rise to weaker projection than expressives, but a more detailed investigation will be needed to reach a conclusion on their precise status.

Appendix I presents similar paradigms in which neutral and derogatory terms for Country X are replaced with counterparts denoting another country, Country Y. The results go in the same direction, with two differences: acceptability scores for the slur *COUNTRY_Y-slur* are in several cases lower than was the case above. And *BAD COUNTRY_Y* yields weaker projection effects in questions than was the case above; here too, our main consultant commented explicitly on an echoic use.

On the basis of these results, we have evidenced the characteristic behavior of expressives in some lexical terms of ASL. But we have also uncovered a way to create expressives by signing a neutral term with the middle finger (this procedure might not be applicable to all terms, as it relies on a special features of the phonology). While one might think that all terms accompanied with the middle finger display an expressive behavior, our co-sign and especially our post-sign expressions show that this is not so. A question for future research will be to explain why this particular way of integrating the middle finger yields an expressive behavior.

5 Scalar Implicatures I: Earlier Results

We turn to the analysis of scalar implicatures in ASL, in two types of cases: standard lexical constructions, and classifier predicates. Earlier results focused on direct scalar implicatures triggered by quantifiers and static classifiers. We will extend them with a systematic study of direct and indirect implicatures triggered by adverbial constructions and moving classifiers.

5.1 Direct implicatures with quantifiers, numbers and classifier predicates

Direct scalar implicatures were experimentally investigated in Davidson 2014, both in English and in ASL. Three types of under-informative sentences were investigated, as illustrated for English in (36).

(36) **Types of under-informative sentences investigated in Davidson 2014**

a. Quantifiers

"Some of the cans are red."

b. Numerals

"There are two bears."

c. Ad hoc scales

"There is a candle and a globe."

In (36)a, *some* is used although *all* is appropriate. In (36)b, *two* are used although *three* is appropriate. And in (36)c, two conjuncts are mentioned (*a candle and a globe*) although three would be appropriate (*a candle and a globe and a wallet*). Davidson 2014 investigated comparative rates of rejection of under-informative sentences in English and in ASL.

Davidson 2014 summarized her results as follows:

Native signers of ASL calculate scalar implicatures based on a prototypical scale <all, some> in ASL in the same pattern as native speakers of English, within the same experimental paradigm. There are similarly high rates of exact interpretations of numbers <three, two> in ASL as in English, despite the iconicity of the numerals in ASL. Finally, an ad hoc scale was tested showing fewer implicatures in English than on the conventionalized scales. In ASL, there was a trend toward increased implicatures on the ad hoc scale which made use of the unique ability of ASL to convey spatial information using the classifier system. (Davidson 2014)

While limited to direct implicatures, Davidson's results show that, as one might expect, ASL patterns with other languages in generating scalar implicatures.

5.2 Iconic meanings vs. scalar implicatures

One of Davidson's cases requires a special discussion, however. For iconic scales in ASL, she used classifier predicates, which provide iconic information about the location of their denotations. Thus in

(37) (which preserves Davidson's transcription), *CL-B*, *CL:C* and *CL:5* are three classifier predicates (with shapes resembling the manual *B*, the manual *C*, and the number *5*, hence the glosses); they are placed in positions x, y and z, and stand for a wallet, a candle and a globe respectively.

(37) THERE WALLET CL:B_x CANDLE CL:C_y GLOBE CL:5(claw)
'There is a wallet, a candle, and a globe.' (Davidson 2014)

This example raises the following issue: there are two conceivable reasons why an under-informative version of this sentence (with two classifiers rather than three) could be rejected in the situation represented in (36)c. One possibility, following Davidson, is that the context makes salient an *ad hoc* scale involving three classifiers, and using just two triggers a direct implicature, hence a rejection of the target sentence. But a conceivable alternative is that the classifiers create a pictorial representation of a scene, and that the representation is literally false in the situation at hand (whether this is so would depend on the details of the iconic semantics of classifier predicates). Davidson 2014 notes that "there was quantitatively a higher percentage of implicatures drawn based on ad hoc scales in ASL than ad hoc scales in English", but the result is difficult to interpret owing to these two possibilities. [32]

This echoes a more general issue with iconic constructions triggering direct implicatures. We saw a version of it in Section 2.2: the argument for the existence of direct scalar implicatures in iconic pro-speech gestures is somewhat complex owing to the potential existence of an 'exactly' reading for the target iconic form. By contrast, the argument for indirect scalar implicatures is simpler because the iconic reading couldn't be responsible for the purported implicature. Moving classifier predicates raise the same analytical issues as iconic pro-speech gestures, and since they will figure prominently in our discussion, we will start our discussion with indirect scalar implicatures.

6 Scalar Implicatures II: Indirect Implicatures

To investigate indirect implicatures, we focus on three types of expressions: lexical constructions that evoke a weaker alternative, for instance *DANCE LONG* ('dance for a long time'), which has *DANCE* as a simpler and weaker alternative; iconic modulations of a lexical term, for instance *DANCE* produced with more iterations than is standard; and classifier predicates. In all cases, we find that all expressions seem to automatically evoke alternatives that are less complex, be it structurally or iconically; in the latter case, there are fine-grained differences across cases, however.

6.1 Complex lexical expressions vs. iconic modulations

The negation of the neutral form of a verb such as *DANCE* gives rise, as expected, to no inference at all that there will be dancing on the agent's part, as seen in (38). As can be seen in the videos, the neutral form of *DANCE* involves two iterations of a joint movement of the index and middle finger of the dominant hand; iterative forms will involve additional iterations of this movement. Here and throughout, we provide endorsements of the crucial inferences in parentheses (hence: *endorsement: 1* in (38)); detailed inferential questions can be found in the Supplementary Materials.

(38) [7] TOMORROW ANN WON'T DANCE-neutral.
'Tomorrow Ann won't dance.'
≠> Ann will dance tomorrow (endorsement: 1)
(ASL 35, 2388; 3 judgments; https://youtu.be/QjSIU0F1G3o)

(39) **DANCE in ASL** (one iteration out of two)

[32] Davidson 2014 speculates that the use of spatial information affects the underlying question under discussion (QUD): "In ASL, the use of locational classifiers could bias the possible question to be along the lines of "What configuration are the things on the table in?".

Still with the neutral form, the negation of *DANCE LONG* ('dance for a long time'), as in (40)b, gives rise to an indirect implicature, of a kind familiar from English: *Ann didn't dance for long* implicates that Ann danced. This is expected in view of Katzir's theory of alternative generation: *DANCE LONG* automatically evokes the simpler alternative *DANCE,* hence the observed implicature. Relatedly, a greatly lengthened realization of *DANCE* (with many more iterations than is standard) gives rise to the same effect, as seen in (40)a, albeit in a slightly weakened version. We show in Appendix II-A2 that with a more moderate lengthening, the inference is weaker still.

(40) TOMORROW ANN WON'T
'Tomorrow Ann won't dance
a. [7] DANCE-very_long.
for a very long time.'
=>? Ann will dance tomorrow (endorsement: 5)
b. [7] DANCE LONG.
for a long time.'
=> Ann will dance tomorrow (endorsement: 6.3)
(ASL 35, 2382; 3 judgments; https://youtu.be/EYeZaPd1m-g)

The same conclusions can be reached (somewhat less clearly) in examples that involve the verb *REFLECT*. As expected, under negation the neutral form of *REFLECT* does not give rise to any inference that the agent will reflect, as seen in (41). Here too, the neutral form involves an iteration—specifically, an iteration of an alternation of hand movements; this will make it possible to express iterative forms by just increasing the number of iterations. Still with the neutral form, the negation of *REFLECT EXAGGERATE* ('reflect excessively') yields a clear implicature that the agent will reflect, as seen in (42)b. And a greatly lengthened version of *REFLECT* (with more iterations of the basic hand movements than is normal) yields the same inference, but in a greatly weakened version, as seen in (42)a. Here too, a more moderate lengthening of the verb gives rise to a weaker inference still, as can be seen in Appendix II-A2.

(41) [7] POSS-2 EMAIL, BEFORE ANN-a REPLY, IX-a, WON'T REFLECT-neutral.
'Before Ann answers your email, she won't reflect.'
≠> Ann will reflect before answering the addressee's email (endorsement: 1)
(ASL 35, 2376; 3 judgments; https://youtu.be/nuaGSjJlcho)

(42) POSS-2 EMAIL, BEFORE ANN-a REPLY, IX-a WON'T
'Before Ann answers your email, she won't
a. [7] REFLECT-very_long.
reflect for a very long time.'
=>?? Ann will reflect before answering the addressee's email (endorsement: 4)
b. [7] REFLECT EXAGGERATE.
reflect excessively.'
=>? Ann will reflect before answering the addressee's email (endorsement: 5.7)
(ASL 35, 2372; 3 judgments; https://youtu.be/tjNEZXAywII)

The implicatures obtained with modified verbs are expected, and they are similar to those found in their English counterparts. A natural interpretation of the effect found with iconic modulations is that a lengthened realization of a verb automatically evokes its neutral version. This can be analyzed in two ways. We can posit that the lengthened version is abstractly made of two components, which leads to the automatic generation of an alternative without the 'lengthening' component within Katzir's theory. But an alternative possibility is that the neutral form is automatically evoked because, even without a discrete decomposition, its form is a subpart of the lengthened version: the neutral forms *DANCE* and *REFLECT* are each produced with fewer iterations of hand movements than the lengthened forms. This

is compatible with the spirit of Katzir's theory of alternative, but not with its current implementation: the simplifications considered by the authors pertain to the replacement of discrete symbols, not to gradient iconic forms; we will make a proposal to extend Katzir's theory in Section 6.3.2.

6.2 Classifier predicates vs. complex lexical expressions

We turn to classifier predicates, with findings that converge with those obtained with iconic modulations: When a classifier movement is visibly longer than normal and appears under negation, an indirect implicature is generated.

We start with indirect implicatures triggered by very long movements of a classifier predicate representing a helicopter taking off. Its movement is presented in neutralized form[33] (i.e. without a particularly long movement) under negation in (43)a, which excludes the possibility of any take-off, just like the lexical control in (43)b. We do not seek to explain the existence of such general meanings, but simply contrast them with cases that generate implicatures.[34] An indirect implicature is triggered by (44)b, as is expected because *MOVE HIGH* should have *MOVE* as a simpler alternative. The moving classifier in (44)a doesn't yield a very clear implicature in this case.

(43) THAT HELICOPTER WON'T
'That helicopter won't
a. [7] HELICOPTER-RISE-neutral-cl.
take off.'
≠> the helicopter will take off (endorsement: 1)
b. [7] MOVE-UP.
move up.'
≠> the helicopter will take off (endorsement: 1)
(ASL 35, 2326; 3 judgments; https://youtu.be/JMR-DpiHaKU)

(44) THAT HELICOPTER WON'T
'That helicopter won't
a. [7] HELICOPTER-RISE-long-cl.
take off, rising a lot.'
≠>?? the helicopter will take off (endorsement: 3.7)
b. [7] MOVE-UP HIGH.
move high.'
=>? the helicopter will take off(endorsement: 5.7)
(ASL 35, 2322; 3 judgments; https://youtu.be/dX8sw2ZBM9Q)

Since the purported indirect implicature triggered by the helicopter classifier is extremely weak, it is essential to consider further examples. We turn to a classifier representing a person walking in a corridor, and we manipulate two properties: the length of the movement relative to that of the corridor; and the realization of the end of the classifier movement, with or without a sharp ending meaning 'and stopped'. The corridor is described by an iconic sign (glossed as *CORRIDOR==*) representing its walls, and the term *DOORS* iconically represents the end of the corridor. As in the case of the helicopter classifier, the moving person classifier appears to have a neutralized form whose negation excludes any kind of walking down the corridor, as in (45)a, which behaves in this respect like the lexical control in (45)c. The moving person classifier with a sharp ending in (47)b appears to trigger an indirect implicature, but the inferential results are less than clear. We gloss the neutral version as *PERSON-WALK-1/2-cl* because it involves a movement over approximately half the corridor representation.

(45) ANN INJURED, IMPROVE BUT TIRED. YESTERDAY CORRIDOR== DOORS PERSON-WALK-

[33] We write 'neutralized' rather than 'neutral' form because there is a clear iconic component, to the effect is upwards. In other words, even though the classifier has a general meaning that encompasses all kinds of ascent, it still has an iconic component.
[34] Static classifier predicates are argued to *lack* such general (non-iconic) meanings in Schlenker and Lamberton, to appear. We leave a comparison with the present data for future research.

complete-cl.
'Ann is injured. She is getting better but is tired. Yesterday she walked to the end of the corridor.
TODAY WON'T
Today she won't
a. [7] PERSON-WALK-1/2-cl.
walk in the corridor.'
≠> Ann will walk in the corridor (endorsement: 1.3)
b. [5.3] PERSON-WALK-1/2+sharp-cl.
walk in the corridor and stop.'
=>?? Ann will walk in the corridor (endorsement: 4.5 (2, 5, 5, 6))
c. [7] WALK CORRIDOR.
walk in the corridor.'
≠> Ann will walk in the corridor (endorsement: 1)
(ASL 36, 0785; 4 judgments; https://youtu.be/7ft3Qn46T5Q)

When it is denied that the agent will walk down over three quarters of the corridor, the complex lexical constructions in (46)c, d trigger a rather clear implicature that the agent will walk in the corridor. This inference is weaker with the simple walking classifier displaying a movement over three quarters of the corridor representation, as in (46)a. But it is strong in the case of the walking classifier with a sharp ending, as in (46)b. In addition, this construction also triggers an implicature that the agent will walk down over three quarters of the corridor. It appears that the classifier with the sharp ending strongly evokes as an alternative the same classifier without the sharp ending, and that this triggers an indirect implicature. Furthermore, alternative generation does not rely on the context in this case: although an alternative is given in the context, namely the walking classifier moving over the entire corridor representation, it is not the alternative needed to trigger the inference in (46)c, to the effect that the agent will walk down three quarters of the corridor.

(46) ANN INJURED, IMPROVE BUT TIRED. YESTERDAY CORRIDOR== DOORS PERSON-WALK-complete-cl.
'Ann is injured. She is getting better but is tired. Yesterday she walked to the end of the corridor.
TODAY WON'T
Today she won't
a. [6.7] PERSON-WALK-3/4-cl.
walk down the corridor and reach 3/4 of the distance.'
=>?? Ann will walk in the corridor (endorsement: 4.3)
≠>? Ann will walk at least half the distance in the corridor (endorsement: 2.7)
b. [5.7] PERSON-WALK-3/4+sharp-cl.
walk 3/4 of the corridor and stop.'
=>? Ann will walk in the corridor (endorsement: 5.7)
=>? Ann will walk at least half the distance in the corridor (endorsement: 5.3)
walk and stop.'
c. [6.7] WALK 3/4 CORRIDOR.
walk 3/4 of the corridor.'
=>? Ann will walk in the corridor (endorsement: 5.7)
≠>? Ann will walk at least half the distance in the corridor (endorsement: 2.7)
d. [7] WALK AT-LEAST 3/4 CORRIDOR.
walk at least 3/4 of the corridor.'
=> Ann will walk in the corridor (endorsement: 6.3)
≠>?? Ann will walk at least half the distance in the corridor (endorsement: 3.7)
(ASL 36, 0782; 3 judgments; https://youtu.be/OjKRRrpcw2E)[35]

The example in (47) confirms that the classifier with a sharp ending evokes an alternative

[35] Two notes should be added. (i) As can be seen in the Supplementary Materials, there were 4 iterations of the judgment task, but the 4th one had to be discarded because the consultant answered only two out of three inferential questions. (ii) Our second consultant agreed with these judgments, but had slightly weaker inferences for a (4 for walking in the corridor, and 2 for walk over at least half of the corridor).

without it.[36] In this case, the classifier moves over half the corridor representation, and this gives rise to the inference that the agent will walk down half the corridor (note that in this case as well, the alternative given in the context is not the crucial needed to trigger the indirect implicature).

(47) ANN INJURED, IMPROVE BUT TIRED. YESTERDAY CORRIDOR== DOORS PERSON-WALK-complete-cl.
'Ann is injured. She is getting better but is tired. Yesterday she walked to the end of the corridor.
6.3 TODAY WON'T PERSON-WALK-1/2+sharp-cl.
Today she won't walk half of the corridor and stop.'
=>? Ann will walk in the corridor (endorsement: 5.8)
=>? Ann will walk at least half the distance in the corridor (endorsement: 5.3)
(ASL 36, 0779b; 4 judgments; https://youtu.be/UhhgfddJjqk)

6.3 Summary and theoretical consequences

6.3.1 Summary

In sum, we have evidenced three kinds of indirect implicatures in ASL. Our examples do not include the crucial alternatives in the context, and thus they suggest that the target expressions automatically evoke them. In the lexical case, complex modified verbs evoke unmodified ones and trigger the same kinds of indirect implicatures as their English counterparts, something that follows from Katzir's algorithm to generate alternatives. In the iconic case, iconic modulations obtained by iterating lexical verbs more than normal similarly evoke unmodulated versions. Similarly, classifier predicates with sharp endings clearly evoke versions without sharp endings. Whether lengthened classifier movements evoke neutralized ones is far less clear, and this case will require further research (including theoretical research in case the indirect implicature turns out to be weaker than in other iconic cases).

Iconic modulations of lexical verbs and lengthened classifier movements could be analyzed by taking these expressions to contain two abstract components, for instance with an abstract suffix corresponding to the lengthening. If so, alternative generation would follow in the same way as in the standard case (e.g. with *drink a lot* evoking the simpler alternative *drink*). But a competing view is that any iconic representation naturally evokes as an alternative a simpler one that it contains as a subpart. This idea dovetails with suggestions made about gestural implicatures in Schlenker 2019. In the gestural case, a discrete decompositional analysis was not particularly plausible, which made the idea of iconic alternative generation appealing.

6.3.2 Amending Katzir's algorithm

We thus propose a technical amendment to the theory of alternatives of Katzir and Fox 2011, summarized in (48). In the original theory, *S'* is an alternative of *S* if *S'* can be obtained from *S* by replacing subconstituents of *S* with (i) lexical elements, (ii) subconstituents of *S*, or (iii) salient constituents given by the context. Part (ii) is responsible for the generation of alternatives by way of tree simplification. For instance, *[Ann [didn't [drink a lot]]]* contains a constituent *[drink a lot]*, which can be replaced by the simpler constituent *drink*, yielding the alternative: *[Ann [didn't drink]]*. We propose to add a replacement possibility to this algorithm: subconstituents of *S* can also be replaced with subparts of iconic elements of X, as stated in (48)(iv).

(48) **Definition of alternatives in Katzir and Fox 2011 (with a boldfaced extension)**
a. S' is an alternative of S if S' can be derived from S by successive replacements of sub-constituents of S with elements of the substitution source for S in a context C, SS(S, C).
b. SS(X, C), the substitution source for X in context C, is the union of the following sets:
(i) the lexicon
(ii) the sub-constituents of X,
(iii) the set of salient constituents in C,

[36] This example is extracted from a longer paradigm similar to (46), with movement over half rather than 3/4 of the corridor representation. The '1/2' counterpart of (46)a did not give rise to an inference that Ann will walk, probably because the realization of the sign was too close to a neutral realization of the classifier.

(iv) iconic subparts of iconic elements of X.

In view of this amendment, there are now two important cases in which a sentence *S* automatically evokes an alternative *S'* but *S'* does not automatically evoke *S*: in case *S'* structurally simpler than *S*, and in case *S'* is obtained from *S* by replacing an iconic element with a subpart of it. This is stated in (49)

(49) If *S* and *S'* are not salient constituents in C, then if
a. *S'* is obtained from *S* by way of structural simplification [i.e. with some constituents of *S* replaced with subconstituents], or
b. *S'* is obtained from *S* by way of iconic simplification [i.e. with some iconic elements of *S* replaced with some of their subparts],
then *S* has *S'* as an alternative but *S'* does not have *S* as an alternative.

As a result, the lengthened form of a classifier predicate automatically evokes a neutralized form. This may simply be because the neutralized form is an iconic subpart of the lengthened form. Alternatively, one may posit a discrete analysis in which the lengthened form contains an abstract morpheme; while this view is possible, it is by no means necessary in view of the iconicity-based explanation.

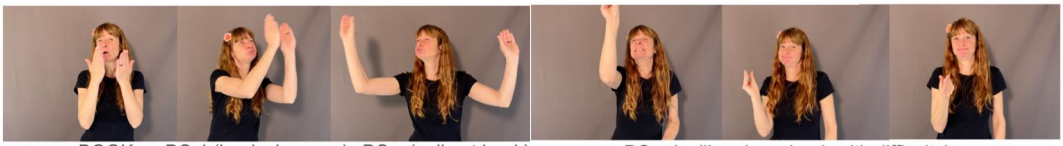
To illustrate, the extended realization of the classifier *HELICOPTER-RISE-long-cl* automatically evokes the neutralized version *HELICOPTER-RISE-cl*, and correspondingly the sentence in (44)a has as an alternative *THAT HELICOPTER WON'T HELICOPTER-RISE-cl*; when this alternative is negated, we obtain the inference that the helicopter will rise (although not a lot). The same logic can be applied to iconic modulations, as in *REFLECT-very_long* in (42)a. The alternatives need not just involve neutralized movements, however. In (46)b, *PERSON-WALK-3/4+sharp-cl* (with a sharp ending) seems to evoke the alternative *PERSON-WALK-3/4-cl* (without a sharp ending), hence the inference that Ann will walk over 3/4 of the corridor. The revised analysis can be applied to iconic gestures as well, as with *TURN-WHEEL-COMPLETELY* in (9), which should evoke as an alternative *TURN-WHEEL*.

This is not the end of the story, however. Future research will have to find ways to choose among these alternatives. Suppose *all* alternatives to an iconic form, for instance *TURN-WHEEL-COMPLETELY*, were treated in the same way. Then from *John won't TURN-WHEEL-COMPLETELY*, we would obtain an alternative *John won't TURN-WHEEL-95%*, realized by effecting 95% of the maximal movement, and one might get the inference that *John will turn the wheel almost completely*. This is incorrect, and thus the system will have to be constrained; for the moment, we are content to specify in (48)(iv) that only *salient* subparts of iconic elements need be considered (see Appendix II-A1 for further details on the formal problem to be solved).

6.3.3 The existence of iconic alternatives

Davidson 2022 argues that depictive expressions are incompatible with alternative generation. According to Davidson, one general argument is that classifier predicates are degraded under negation, as illustrated in (50)b.

(50) a. Handling classifier, positive



'Of all the books in a row, it was difficult to pull one down.'
b. Handling classifier, negative
*BOOK DS_c(books lined up), not DS_c(pull down w/difficulty)
'Of all the books in a row, it wasn't difficult to pull one down'
(Davidson 2022)

Davidson speculates that the deviance might arise because negation "needs to act on a propositional

alternative", something that depictions do not provide.[37]

While our main goal was to assess the inferences triggered by various expressions under negation (in order to detect indirect implicatures), we included above systematic acceptability judgments, and they do not display the effect described by Davidson 2022. But our examples are very different from hers, and the source of the deviance of Davidson's examples needs to be investigated further.

One possibility is that the literal truth conditions obtained by negating iconic expressions are excessively weak in Davidson's cases. Thus (50)b is extremely uninformative, as it just denies that one would not have pulled out a book with the difficulty displayed by the classifier, leaving multiple other options open (maybe one just couldn't pull the book at all, or one could pull it out but in a different way). By contrast, our examples involved spatial scales, and our negative constructions meant in essence that the agent didn't move at least as much as was shown by the classifier, hence a far more useful meaning.

Still, two further facts suggest that Davidson's general prohibition against iconic alternative generation is undesirable. First, indirect scalar implicatures triggered by iconic gestures in Schlenker 2019 and Tieu et al. 2019 were exactly of the form prohibited by Davidson 2022, as they involved iconic gestures under negation. The examples of Tieu et al. 2019 involved contextual scales, which might have helped. But introspectively, removing the context from the indirect implicature in (9) doesn't make the target sentence ungrammatical; and Schlenker 2019 included examples, such as (10), with a logically strong iconic term under negation.

In addition, within sign language, there is a different corner of the literature in which iconic alternatives were considered. It pertains to the role of Brow Raise in generating alternatives and implicatures (Schlenker and Lamberton 2021). In a crucial example (= Schlenker and Lamberton's(46)), the signer stated: *POSS-2 HELICOPTER IX-1 DON'T-WANT HELICOPTER-FLY-cl*, with a classifier performing a complex movement in four parts ('I don't want your helicopter to perform the movements displayed'). Brow Raise was applied to one of the four movement parts, and gave rise to the inference that the signer *did* want the addressee's helicopter to perform the movement, just not with the highlighted part. It's hard to see how iconic alternatives aren't crucial in this case.[38]

7 Scalar Implicatures III: Direct Implicatures

We turn to direct implicatures. As noted at the outset, their analysis raises special issues because one needs to determine whether the purported implicature might not in fact follow from the literal meaning of the target expressions, hence the need for additional controls relative to the case of indirect implicatures.

In the case of indirect implicatures, we saw (in (49)) that a form *S* automatically evokes an alternative *S'* but *S'* does not automatically evoke *S* if *S'* is structurally or iconically simpler than *S*. For instance, a lengthened form of *DANCE* automatically evokes the neutral form *DANCE*, but the converse should not be true. Correspondingly, in a positive environment, we expect that *DANCE* should not trigger an implicature involving the more complex alternative *DANCE-long*. We will see that this prediction is broadly confirmed, both for iconically modified forms and for classifier predicates. What will be surprising, however, is that in some cases in which the more complex alternative is made salient by the context, we still don't get a strong implicature, hence an open puzzle.

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[37] In greater detail, Davidson 2022 writes that deviance under negation might arise "because depictions are functionally at odds with generaliz[ing] over details, given that they must evoke a particular image/experience. Negation needs to act on a propositional alternative" (e.g. ASL *HARD* as opposed to ASL *EASY*), "which is a partition that generalizes over details, and so [(50)b] is ill-formed."

While we do not fully understand Davidson's proposed theory, it is unclear to us why depictions should fail to be propositional or to have general meanings. Exactly the opposite is claimed by contemporary approaches to iconic semantics for pictures (e.g. Greenberg 2013, 2021), pictorial sequences (e.g. Abusch 2020) or classifier predicates (e.g. Schlenker et al., to appear; Schlenker and Lamberton, to appear).

[38] One further case of classifier predicates in a negative environment can be found in the context of *NONE* in Schlenker 2021a (the goal was not to assess implicatures, but rather presuppositions); average acceptability was of at least 6 on a 7-point scale (see examples 34, 3552; 34, 3570).

7.1 Scalar expressions vs. neutral forms

To have a well-understood point of comparison, we start with direct implicatures triggered by scalar expressions. In (51)b, c, *LITTLE-BIT* and *SOME* plausibly compete with *A-LOT*, hence the inference that the agent will dance a bit but not a lot; in this respect, the inferential effects are similar to those obtained with the fully explicit expression in (51)d, which means *a little bit but not a lot*. While one could imagine that *SOME* and *LITTLE-BIT* are different from their English counterparts in lexically having an upper bound component ('not a lot') , we show in Appendix II-A2 that this is not so: under *IF*, the expressions *SOME* and *LITTLE-BIT* mean 'at least some / at least a little bit'. An implicature is thus needed to account for the inferential data in (51)b, d. This part of our data fully dovetails with Davidson's (2014) findings about the implicatures triggered by *SOME*.

(51) TOMORROW ANN WILL
'Tomorrow, Ann will
a. [7] DANCE-neutral.
dance.'
≠>? Ann will dance but not for a long time (endorsement: 2)
b. [6.5] DANCE SOME.[39]
dance a bit.'
=>? Ann will dance but not for a long time (endorsement: 5.3)
c. [7] DANCE LITTLE-BIT.
dance a little bit.'
=> Ann will dance but not for a long time (endorsement: 6.7)
d. [7] DANCE LITTLE-BIT BUT NOT A-LOT.
dance a little bit but not a lot.'
=> Ann will dance but not for a long time (endorsement: 7)
(ASL 35, 2486; 3 judgments; https://youtu.be/M4whYf_Kdp8)

The facts with a neutral form of *DANCE*, as in (51)a, are entirely different: no implicature is triggered. This is expected because the potential alternatives, such as *DANCE A-LOT*, are more complex and shouldn't be available unless present in the context, as stated in (49). But at this point we should remember that *DANCE* is the very verb whose iconic modulations were investigated in Section 6.1: *DANCE-long* means 'dance for a long time'. If this alternative were automatically evoked by the neutralized form of *DANCE*, we would expect an implicature, but none is found. This is line with the asymmetry noted in (49): iconic forms evoke their subparts but not conversely.[40]

The same argument can be developed on the basis of *REFLECT*, as in (52). The natural conclusion is that the neutral forms of *DANCE* and *REFLECT* do not evoke the lengthened forms as alternatives, whereas the lengthened forms evoke the neutral forms (as shown in Section 6.1).[41]

(52) POSS-2 EMAIL, BEFORE ANN-a REPLY, IX-a WILL
'Before Ann answers your email, she will
a. [7] REFLECT-neutral.
reflect.'
≠>? Ann will reflect but not for a long time (endorsement: 2)
b. [7] REFLECT SOME.
reflect a bit.'

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[39] Acceptability for this example was computed on the basis of two judgments only, as the consultant omitted this particular acceptability score in the last iteration of the judgments.

[40] There might be a separate reason why *DANCE* does not trigger an inference that the relevant agent didn't dance a lot. On the assumption (*contra* Katzir and Fox) that there is in fact an alternative meaning *dance a lot* (namely *DANCE A-LOT*), there might also be another alternative meaning *dance but not a lot*. If so, one would encounter a 'symmetry' problem: one cannot deny both without making the uttered sentence contradictory (as the agent would have to dance, but not to [dance a lot], and also not to [dance but not alot]). See for instance Fox 2007 for an account of implicatures on which such implicatures fail to be generated.

[41] *THAT'S-ALL* in (52)d has the same function (establishing an upper bound) as *BUT NOT A-LOT* in (52)e, but the latter expressions is more explicit and was thus preferred in other paradigms, in particular in (51).

=> Ann will reflect but not for a long time (endorsement: 6)[42]
c. [7] REFLECT LITTLE-BIT.
reflect a little bit.'
=> Ann will reflect but not for a long time (endorsement: 6.3)
d. [7] REFLECT LITTLE-BIT THAT'S-ALL.
reflect just a little bit.'
=> Ann will reflect but not for a long time (endorsement: 7)
e. [6.7] REFLECT LITTLE-BIT BUT NOT A-LOT.
reflect a bit but not a lot.'
=> Ann will reflect but not for a long time (endorsement: 7)
(ASL 35, 2474; 3 judgments; https://youtu.be/jZSDaF9o3XE)

This leaves a question open: what happens when the alternatives are contextually given? On theoretical and cross-linguistic grounds, implicatures ought to be triggered. This is for instance the case in English: without salient alternatives, *I drank* definitely doesn't imply that I didn't drink a lot (if anything, it's the opposite when the meaning is *drink alcohol*). But with an explicit alternative, an implicature is derived, as was illustrated in (7) above. (As we will see below, in the case of classifiersthis expectation is not always met in our examples, and it's unclear why.)

7.2 Classifier predicates

We will now see that classifier predicates do not trigger sharp direct implicatures. Since the alternatives we will consider involve iconically more complex forms, this is consistent with the prediction in (49): in the absence of contextually salient alternatives, a less complex form should not evoke a more complex form (be it structurally or iconically more complex).

Let us consider the classifier *HELICOPTER-RISE*. We showed in (43)a that under negation the meaning obtained is that the helicopter won't take off at all, not that it won't take off *as shown*; similar facts hold under *IF*, as shown in Appendix II-A2. This suggests that its literal meaning is general, e.g. *take off* as opposed to *take off exactly as shown*. This leaves open the possibility that in positive environments, it triggers an implicature by competition with longer realizations of the movement. But this hypothesis is made implausible by the fact that the upper bound inference is far weaker in (53)a than in the *bona fide* implicatures in (53)b and (53)c. This is in line with the prediction in (49).[43]

(53) THAT HELICOPTER WILL
'That helicopter will
a. [7] HELICOPTER-RISE-neutral.
take off.'
≠> that helicopter will rise but not high (endorsement: 1.7)
b. [7] MOVE-UP SOME.
move up a bit.
=>? that helicopter will rise but not high (endorsement: 5.7)
c. [7] MOVE-UP LITTLE-BIT.
move up a little bit.'
=> that helicopter will rise but not high (endorsement: 6.7)
(ASL 35, 2458; 3 judgments; https://youtu.be/DUMLehuaNzU)

Here too, it is important to consider further examples. In (54), we pit a realization of the walking person classifier moving over half of the corridor representation against lexical controls with a related meaning. Starting with the lexical controls, the expression *WALK HALF CORRIDOR* seen in (54)c triggers a clear inference that the agent won't walk the entire distance, which is consistent with an

[42] Our second consultant commented that his endorsement of the inference for b. would be a bit lower (5 rather than 6).
[43] The weakness of this inference is also a problem for the analysis that takes this classifier to mean *rise as depicted*.

implicature.[44] As is the case with homologous English expressions, *AT-LEAST HALF CORRIDOR* triggers no such inference, as seen in (54)d. The walking person classifier moving over half the corridor representation does not yield a clear 'not all' inference, as seen in (54)a. Importantly, this version of the classifier is hard to distinguish from a neutralized realization. A related paradigm with different controls can be found in Appendix II-A2 (example (76)). While these results could be thought to be in line with the view that less complex forms do not evoke more complex forms, this wouldn't be sufficient: in this case, there is a an alternative *PERSON-WALK-complete-cl*, and it is unclear why it does not give to the derivation of an implicature.

(54) ANN INJURED, IMPROVE BUT TIRED. YESTERDAY CORRIDOR== DOORS PERSON-WALK-complete-cl. TODAY WILL
'Ann is injured. She is getting better but is tired. Yesterday she walked to the end of the corridor. Today she will
a. [6.7] PERSON-WALK-1/2-cl.
walk down the corridor and reach half the distance.'
≠>?? Ann will walk approximately half the distance in the corridor but not the entire distance
(endorsement: 3.7)
b. [7] PERSON-WALK-1/2+sharp-cl.
walk down the corridor, reach half the distance, and stop abruptly.'
=> Ann will walk approximately half the distance in the corridor but not the entire distance
(endorsement: 6)
c. [7] WALK HALF CORRIDOR.
walk half the distance in the corridor.'
=>? Ann will walk approximately half the distance in the corridor but not the entire distance
(endorsement: 5)
d. [7] WALK AT-LEAST HALF CORRIDOR.
walk at least half the distance in the corridor.'
≠> Ann will walk approximately half the distance in the corridor but not the entire distance
(endorsement: 1.3)
(ASL, 37, 2696; 3 judgments; https://youtu.be/ctnLjxhARvI)

In the paradigm in (55), which discusses a person walking over three quarters of the corridor, the 'not all' inference triggered by the classifier is even weaker, despite the fact that there too, the *walk to the end* alternative should be salient in the context. We leave this question for future research.

(55) ANN INJURED, IMPROVE BUT TIRED. YESTERDAY CORRIDOR== DOORS PERSON-WALK-complete-cl. TODAY WILL
'Ann is injured. She is getting better but is tired. Yesterday she walked to the end of the corridor. Today she will
a. [6.7] PERSON-WALK-3/4-cl.
walk down the corridor and reach three quarters of the distance.'
≠>? Ann will walk approximately three quarters of the distance in the corridor but not the entire distance
(endorsement: 2.7)
b. [7] PERSON-WALK-3/4+sharp-cl.
walk down the corridor, reach three quarters of the distance and stop abruptly.'
=>? Ann will walk approximately three quarters of the distance in the corridor but not the entire distance
(endorsement: 5 (6, 6, 3))
c. [7] WALK 3/4 CORRIDOR.
walk three quarters of the distance in the corridor.'
=>? Ann will walk approximately three quarters of the distance in the corridor but not the entire distance
(endorsement: 5.7)
d. [7] WALK AT-LEAST 3/4 CORRIDOR.
walk at least three quarters of the distance in the corridor.'
≠> Ann will walk approximately three quarters of the distance in the corridor but not the entire distance
(endorsement: 1.7)

[44] For a full argument, one would need to show that *HALF* does not lexically have an upper bound component ('not more than half'). This could tested by embedding the construction in a conditional, for instance, as is done for other examples in Appendix II.

(ASL 37, 2690; 3 judgments; https://youtu.be/WAqInxlT4So)

7.3 Interim summary

Three points can be taken away from the preceding three sections. First, the lexical expressions under investigation trigger direct and indirect implicatures in the same conditions as their English counterparts. Second, iconic modulations and classifier predicates can trigger indirect implicatures when they appear in negative environments, including when the crucial alternatives are not present in the context; this is arguably because the alternatives in question are a subpart of the form produced (a decompositional analysis with abstract affixes would make the same prediction but is not needed to derive it). Third, less complex forms (be they lexical or iconic) do not by default evoke more complex forms, as is predicted by Katzir's algorithm (and for iconic form, by the extension of it we proposed in (48)). What is currently unexplained is that some direct implicatures fail to strongly arise even when the crucial alternatives ought to be salient in the context, as seen in (54)-(55).

8 Homogeneity Inferences

We complete our investigation of the inferential typology in ASL by considering homogeneity effects—a standard topic in spoken language semantics, but an entirely new one in sign language semantics. As expected, we will find clear homogeneity effects with definites, specifically with plural and dual pronouns. Strikingly, we will see that some complex classifiers representing two individuals (e.g. meaning that *person 1 and person 2 move in a certain direction*) can trigger homogeneity inferences as well. In this iconic area, we will go beyond what has been found in gestures and visual animations. It was only to the extent that these involved definite plurals (by way of varieties of pointing) that they were shown to trigger homogeneity inferences, as we illustrated in Section 2.6. By contrast, we will display classifier-related effects that do not depend on pointing.

8.1 Plural pronouns

In (56)b, e, a plural pronoun triggers classic homogeneous inferences: an *all* meaning in the positive, a *none* meaning in the negative. This sharply contrasts with the behavior of control sentences with *ALL*, which yield an *all* meaning in the positive (in (56)c) and a *not all* meaning in the negative, combined with a *some* implicature (in (56)f), just as would be the case in English (compare: *you won't take all the coins*).

(56) *Context:* the addressee is taking part in a treasure hunt and is getting instructions.
IX-2 WILL ENTER CHURCH, WILL SEE [CROSS-rep3]$_a$ [COIN-rep3]$_b$.
'You will enter a church, and you will see crosses and coins.

IX-2 WILL TAKE
You will take
a. [5.7] IX-a.
a cross/the crosses.'
≠>? the addressee should take all crosses (endorsement for: 2.3)
b. [7] IX-arc-a.
the crosses.'
=> the addressee should take all crosses (endorsement: 6)
c. [7] ALL-a.
all crosses.'
=> the addressee should take all crosses (endorsement: 6.7)

IX-2 WON'T TAKE
You won't take
d. [6.3] IX-a.
any cross/the crosses.'
=> the addressee should take no crosses (endorsement: 6.3)
e. [7] IX-arc-a.
the crosses.'

=> the addressee should take no crosses (endorsement: 6.7)
f. [7] ALL-a.
all crosses.'
≠>? the addressee should take no crosses (endorsement: 2)
(ASL 35, 1786; 3 judgments; https://youtu.be/w2k7ffudrs4)

Plural marking is optional in ASL: unmarked forms, including the simple pointing sign, can be used to refer to pluralities. One might expect the unmarked pronoun to yield homogeneity effects, but the facts are unclear because the unmarked pronoun in (56)a does not yield an *all* meaning in the first place. This seems to our main consultant to be because this pointing sign has an indefinite reading in addition to the definite reading;[45] as a result, the behavior of the unmarked pointing sign is not informative in this case. We leave this issue for future research, and focus instead on the plural pronoun.[46]

8.2 Dual pronouns and classifier predicates

We turn to another definite expression, the dual pronoun *THE-TWO*, which contrasts minimally with the quantifier *BOTH*. But we add to the investigation a complex, two-handed classifier predicate, displaying two individuals walking together; it may just as well be analyzed as two classifiers moving together (we will not take a position on this analytical decision). Since our target constructions involve non-singular subjects, using simple negation might raise issues of scope ambiguity, as the subject would appear before *NOT*, with the result that negation might fail to scope above the subject, as desired. Instead, we choose clausal embedding under *IX-1 DON'T THINK*. To have a minimal comparison, we generally use *IX-1 THINK* in the positive.

The dual pronoun *THE-TWO* displays the hallmarks of homogeneity projection: in the positive, as in (57)b, the meaning is that *both* individuals will come to the front; in the negative, as in (58)e, it is that *neither* individual will. By contrast, the expression *BOTH* behaves like a universal quantifier (just like its English counterpart *both*, as can be checked in the translations): in the positive, we obtain the inference that both individuals will come to the front; but in the negative, there is only a weak inference that neither individual will come to the front, with a stronger endorsement of the inference that 'one but possibly not both' individuals will come to the front.[47] Strikingly, the complex classifier predicate in (57)a,d displays the hallmarks of homogeneity projection. It involves the indexes of the two hands, each representing an individual, moving together towards the signer. In the positive, the meaning is that *both will come to the front*, and in the negative, that *neither will*: homogeneous behavior is replicated (as seen in the Supplementary Materials, our second consultant found the inferences in (57)d-f difficult,

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[45] This could also be because it allows for exceptions, as definites often do, as we noted in Section 2.6 (why there should be a difference between the unmarked and the plural pronoun in this connection is unclear).

[46] The same point is made by another paradigm (35, 1808) in which *TAKE* is replaced with *COLLECT*. The key components appear in (i). Unfortunately, as was later confirmed by our consultant, there was an error in the last session for the inferential question ('the addressee should take no coins') in e.: the consultant gave a score, namely 1, which contradicted not just his earlier scores for the same inference (namely 5 and 5), but also his paraphrase of the meaning in that same session (the addressee "shouldn't take any of the coins on the left").

(i) *Context:* the addressee is taking part in a treasure hunt and is getting instructions.
IX-2 WILL ENTER HOUSE, WILL SEE [CROSS-rep3]$_a$ [COIN-rep3]$_b$.
'You will enter a house, and you will see crosses and coins.
a. [6.7] IX-2 WILL COLLECT IX-arc-b.
You will take the coins.'
=> the addressee should take all coins (endorsement: 6)
b. [7] IX-2 WON'T COLLECT IX-arc-b.
You won't take the coins.'
≠>?? the addressee should take no coins (endorsement: 3.7 (5, 5, 1))
(ASL 35, 1808b, e; 3 judgments; https://youtu.be/pZ7bXYYAM5M)

[47] This positive inference is natural if an indirect implicature is triggered through competition between *BOTH* and an expression meaning *at least one*. Specifically, *I don't think that at least one/either one will come* is more informative than *I don't think that both will come*, and by negating this stronger alternative we obtain the inference that at least one will come.

but agreed with our main consultant's contrasts).

(57) *Context:* there will be a political debate between two candidates.
TOMORROW DEBATE PERSON-cl^PERSON-cl. TIME 9:30
'Tomorrow there is a debate involving two candidates. At 9:30,

a. [7] IX-1 THINK WILL PERSON-mov-cl^PERSON-mov-cl FRONT.
I think they will come to the front.'
=> both candidates will come to the front (endorsement: 7)
b. [7] THE-TWO WILL COME FRONT.[48]
the two of them will come to the front.'
=> both candidates will come to the front (endorsement: 7)
c. [7] IX-1 THINK BOTH WILL COME FRONT.
I think both will come to the front.'
=> both candidates will come to the front (endorsement: 7)

IX-1 DON'T THINK
I don't think
d. [7] WILL PERSON-mov-cl^PERSON-mov-cl FRONT.
they will come to the front.'
=>?? neither will come to the front (endorsement: 4.8 (5, 6, 3, 5))
e. [7] THE-TWO WILL COME FRONT.
the two of them will come to the front.'
=>? neither will come to the front (endorsement: 5.8)
f. [7] BOTH WILL COME FRONT.
both will come to the front.'
≠>? neither will come to the front (endorsement: 2.5)
(ASL 35, 1830; 4 judgments; https://youtu.be/x_8bsIf_ucs)

To strengthen this empirical point, we note that the same behavior is replicated under other positive and negative expressions. In (58), we use *WILL* for the positive, and *IMPOSSIBLE WILL* in the negative, with similar results as in the previous paradigm.

(58) *Context:* there will be a political debate between two candidates tomorrow.
TIME 9:30
'At 9:30,
a. [7] WILL PERSON-mov-cl^PERSON-mov-cl FRONT.
they will come to the front.'
=> both politicians will come to the front (endorsement: 7)
b. [7] THE-TWO WILL COME FRONT.
the two of them will come to the front.'
=> both politicians will come to the front (endorsement: 7)
c. [7] BOTH WILL COME FRONT.
both will come to the front.'
=> both politicians will come to the front (endorsement: 7)

TIME 9:30, IMPOSSIBLE
'At 9:30, it's impossible that
d. [7] WILL PERSON-mov-cl^PERSON-mov-cl FRONT.
they will come to the front.'
=>? neither politician will come to the front (endorsement: 5)
e. [7] THE-TWO WILL COME FRONT.
the two of them will come to the front.'
=>? neither politician will come to the front (endorsement: 5.7)
f. [7] BOTH WILL COME FRONT.
both will come to the front.'
≠>?? neither politician will come to the front (endorsement: 3)
(ASL 35, 1866; 3 judgments; https://youtu.be/ywiF7PoIh8w)

[48] *IX-1 THINK* is missing from this sentence due to a production error.

Similar results are obtained in a paradigm involving two airplanes flying in a circle. *THE-TWO* displays a homogeneous behavior, as it has the meaning of *both* in the positive ((59)b) and of *neither* in the negative ((59)e). As before, *BOTH* displays the behavior of a quantifier (*both* in the positive, (59)c, *not both* in the negative, (59)f). The complex classifier in (59)a, d displays a homogeneous behavior, although the *neither* inference in (59)d is a bit weak.

(59) *Context:* Tomorrow will be an air show involving two planes.
TOMORROW PLANE COMPETITION. TWO PLANE TIME 9:30,
'Tomorrow there will be a plane competition. There will be two planes at 9:30.
IX-1 THINK
I think
a. [7] WILL PLANE-O-cl^PLANE-O-cl.
the two planes will fly in a circle together.'
=> at 9:30, both planes will fly in a circle (endorsement: 7)
b. [7] THE-TWO WILL FLY CIRCLE.
the two planes will fly in a circle.'
=> at 9:30, both planes will fly in a circle (endorsement: 7)
c. [7] BOTH WILL FLY CIRCLE.
both planes will fly in a circle.'
=> at 9:30, both planes will fly in a circle (endorsement: 7)

IX-1 DON'T THINK
I don't think
d. [7] WILL PLANE-O-cl^PLANE-O-cl.
the two planes will fly in a circle together.'
=>?? at 9:30, neither plane will fly in a circle (endorsement: 4.8)
e. [7] THE-TWO WILL FLY CIRCLE.
the two planes will fly in a circle.'
=> at 9:30, neither plane will fly in a circle (endorsement: 6)
f. [7] BOTH WILL FLY CIRCLE.
both planes will fly in a circle.'
≠>?? at 9:30, neither plane will fly in a circle (endorsement: 3)
(ASL 37, 2540; 4 judgments; https://youtu.be/kWyU5a5sm5I)

Effects go in the same direction (but are a bit less clear) with a complex classifier representing two airplanes landing, with a *both* inference in the positive, as in (60)a, and a dominant *neither* inference in the negative, as in (60)d; *THE-TWO* and *BOTH* display the same behavior as before.

(60) *Context:* Tomorrow will be an air show involving two planes.
TOMORROW PLANE COMPETITION. TWO PLANE TIME 9:30,
'Tomorrow there will be a plane competition. There will be two planes at 9:30.
IX-1 THINK
I think
a. [7] WILL PLANE-land-cl^PLANE-land-cl.
the two planes will land together.'
=> at 9:30, both planes will land (endorsement: 7)
b. [7] THE-TWO WILL LAND.
the two planes will land.'
=> at 9:30, both planes will land (endorsement: 7)
c. [7] BOTH WILL LAND.
both planes will land.'
=> at 9:30, both planes will land (endorsement: 7)

IX-1 DON'T THINK
I don't think
d. [7] WILL PLANE-land-cl^PLANE-land-cl.
the two planes will land together.'
=>?? at 9:30, neither plane will land (endorsement: 4.8)
e. [7] THE-TWO WILL LAND.
the two planes will land.'

=>? at 9:30, neither plane will land (endorsement: 5.8)
f. [7] BOTH WILL LAND.
both planes will land.'
≠>?? at 9:30, neither plane will land (endorsement: 3.3)
(ASL 37, 2544; 4 judgments; https://youtu.be/C-8IdGGAzKM)

8.3 Summary and perspectives

In sum, plural and dual pronouns display homogeneity effects, as is expected. Perhaps more surprisingly, complex classifier predicates (or combinations of classifier predicates, depending on the analysis) display homogeneity effects as well.

On the standard view of homogeneity, a predicate extension P comes with a requirement that any plurality X is wholly within P or wholly outside P; intermediate cases give rise to undefinedness, as was stated in (24). The projection of undefinedness is responsible for the specific interaction we saw above between homogeneous predicates and logical operators.

The complex classifiers we considered will fall under the Homogeneity Generalization if they are considered as predicates of pluralities. We can start from the type of lexical entry posited for classifiers in Schlenker and Lamberton (to appear), illustrated in (61)a in the case of an airplane classifier, with a viewpoint variable π that specifies the perspective relative to which the iconic representation is evaluated. The boxed condition requires that any object x of which the classifier is true should be a plane. The boldfaced condition requires that x should be iconically represented by the classifier, in the sense of a (modified) pictorial semantics that involves projections.[49] In a minimal modification, sketched in (61)b, we take the complex two-handed person classifier to be lexical, and to be true of pluralities which are made of exactly two individuals, and which are iconically represented by the two-handed moving classifiers (the relevant notion of projection needs to be a dynamic one to account for movement; see Schlenker and Lamberton, to appear, for an implementation).

(61) a. $[\![\text{plane-cl}^{\pi}]\!]^{c,s,t,w} = \lambda x_e$. # iff x = # ; otherwise, 1 iff $\boxed{\text{plane}'_{t,w}(x) = 1}$ and **proj(x, s(π), t, w) = plane-cl**
b. $[\![\text{person-move-cl\^{}person-move-cl}^{\pi}]\!]^{c,s,t,w} = \lambda x_e$. # iff x = #; otherwise, 1 iff $\boxed{\text{2-individuals}'_{t,w}(x) = 1}$ and **proj(x, s(π), t, w) =** person-cl^person-cl

On this basis, the failure conditions could then be extended by Križ's condition in (24), yielding a homogeneous behavior.[50]

A simplified Logical Form for the embedded clause in (67)a (disregarding *FRONT)* would be as in (62), where an empty pronoun pro_i denotes the two relevant individuals.

(62) will pro_i person-move-cl^person-move-cl$^{\pi}$

This is unlikely to be the full story, however, as the complex classifier should probably be analyzed as two co-occurring classifiers. Prospects for a compositional extension are discussed in Appendix II-B1.

One further remark could be useful in future research. Homogeneity is a property of many but not of all predicates. As was briefly mentioned at the outset, *be heavy* and *be numerous* are non-homogeneous predicates. For instance, *be heavy* is not true of my watch, but it is true of the set of all watches in the world, which overlaps with my watch, and similar remarks apply to *be numerous*. In the current literature, the distinction between homogeneous and non-homogeneous predicates is taken to be lexically specified. Our iconic examples show that the distinction must be extended to rare or nonce predicates, since the precise movement and meaning of the classifiers can be modulated at will. But there seem to be differences across classifier movements: some might *fail* to yield homogeneity inferences, and this could prove a very useful tool in the future to investigate the source of homogeneity.

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[49] In greater detail: x should project to the classifier *plane-cl* at the time and world of evaluation t and w, relative to the viewpoint s(π), i.e. the value of the viewpoint variable π according to the assignment functions.

[50] Using Križ's statement given in fn. 17, this could be done by adding to predicates a homogeneous operator *H* defined as in (i) (the boldfaced condition yields undefinedness, i.e. #, when homogeneity is violated):

(i) If *P* is an elementy predicate of pluralities,
$[\![\text{H P}]\!]^{c,s,t,w} = \lambda x_e$. # iff x = # or **$[\![\text{P}]\!]^{c,s,t,w}(x) \neq 1$ and for some y, $y \cap x \neq \emptyset$ and $[\![\text{P}]\!]^{c,s,t,w}(y) = 1$**; otherwise, 1 iff $[\![\text{P}]\!]^{c,s,t,w}(x) = 1$

One possible example is discussed in Appendix II-B2.[51]

9 Conclusion

In sum, we have offered the first systematic investigation of the inferential typology in a sign language. On the basis of recent literature and new data, we argued that presuppositions, cosuppositions, supplements, expressives, scalar implicatures and homogeneous inferences are all attested in ASL. In the case of expressives, we also argued that some nonce signs display the hallmarks of expressive behavior, which might prove important in the future to understand the sources of this behavior. As always, detailed work with a consultant has the advantage of fine-grainedness but not of generalizability. We alleviated this problem by informally checking all judgments with our second consultant, with overwhelming agreement with our main consultant. Still, it will be important to test the main data with further ASL consultants in the future, and if possible to extend the investigation to other sign languages.

Strikingly, several slots of the inferential typology include iconic expressions, in particular classifier predicates. These can trigger presuppositions, implicatures and homogeneity inferences (in addition, iconic modulations can trigger implicatures as well). This finding dovetails with results on iconic pro-speech gestures, which also fill the various slots of the inferential typology. This, in turn, shows that a dual approach is needed to account for sign language semantics, as it has the union of the expressive means of logical semantics familiar from spoken language, and of iconic means found in iconic gestures, as stated in our hypothesis of Dual Semantics in (2).

In line with earlier research, our results highlight the partial similarity between classifier predicates and pro-speech gestures. While the shape of classifier predicates is lexical (unlike that of most pro-speech gestures), their position and orientation is free and iconically interpreted, a property they share with several iconic gestures—an old observation in the literature. Recent formal work also pointed out two additional similarities. Syntactically, both classifier predicates and pro-speech gestureshave the ability to override the basic word order of a language (e.g. ASL and French) to yield preverbal objects in semantically determined circumstances (Schlenker et al., to appear). Semantically, both have a pictorial component that sometimes involves quantification over viewpoints (Schlenker and Lamberton, to appear). The present piece brings to the fore yet another similarity, namely the ability of both construction types to fill various slots of the inferential typology of language.

Last, but not least, the present piece highlights the importance of sign language for formal pragmatics, and conversely. This understudied area ought to give rise to further research in the future.

[51] As mentioned in fn. 17, the literature discusses an additional property that is characteristic of homogeneous expressions, namely their ability to tolerate exceptions (unlike universal quantifiers such as *all*). While we attempted to investigation this question in ASL, we did not reach a clear conclusion and leave this question for future research.

Appendix I. Complements on Expressives

We provide another paradigm, with *COUNTRY_Y*, which behaves roughly like the examples with *COUNTRY_X* discussed in Section 4. *COUNTRY_Y* is signed with the index finger of the dominant hand. Its offensive counterpart appears in (63)b; it iconically represents a physical property associated with inhabitants of that country. All examples convey that the signer dislikes Country Y, an inference that will in some cases disappear under embedding. Depending on the example, one obtains in (63)b-h an inference that the signer opposes Country Y, or thinks badly of it, or thinks it is disgusting, or hates it.

(63) *Context:* The signer is using a contemporary form of ASL, and is not using terms to joke.

SELF NO PREJUDICE, BUT RECENTLY CAPITAL_Y START WAR, SO IX-1 OPPOSE
'I myself have no prejudice, but recently Capital Y started a war, so I oppose
a. [7] COUNTRY_Y .
Country Y.'
=> the signer opposes Country Y
=> the signer dislikes Country Y (endorsement: 7)
b. [6.3] COUNTRY_Y-slur.
<slur for Country Y>.'
=> the signer thinks badly of Country Y
=> the signer dislikes Country Y (endorsement: 7)
c. [7] \:-(([COUNTRY_Y].
\:-((**Country Y**.'
=> the signer thinks Country Y is disgusting
=> the signer dislikes Country Y (endorsement: 7)

d. [7] [COUNTRY_Y] \:-(( .
Country Y \:-((.'
=> the signer thinks Country Y is disgusting
=> the signer dislikes Country Y (endorsement: 7)
e. [6.3] [COUNTRY_Y]-middle_finger.
<nonce slur for Country Y>.'
=> the signer hates Country Y
=> the signer dislikes Country Y (endorsement: 7)
f. [7] COUNTRY_Y MIDDLE-FINGER.
Country Y MIDDLE-FINGER.'
=> the signer hates Country Y
=> the signer dislikes Country Y (endorsement: 7)
g. [5.3] MIDDLE-FINGER [COUNTRY_Y].
MIDDLE-FINGER Country Y.'
=> the signer hates Country Y
=> the signer dislikes Country Y (endorsement: 7)
h. [6.7] BAD COUNTRY_Y.
bad Country Y.'
=> the signer thinks Country Y is bad
=> the signer dislikes Country Y (endorsement: 7)
(ASL 37, 2660; 3 judgments)

The paradigm in (29) establishes that *BAD COUNTRY_Y* behaves like a presuppositional expression under *MAYBE* and negation. It is unexpected that the negative inference fails to project out of questions, as seen in (64)e. But the consultant's answers to an open-ended question ("Say in words

what we infer about the signer's attitude towards' <Country Y>") show that he allows for an echoic/quotational use on which *BAD COUNTRY_Y* simply repeats what the addressee (or Ann) might have said before.[52]

(64) *Context:* The signer is using a contemporary form of ASL, and is not using terms to joke.
a. [7] ANNE OPPOSE COUNTRY_Y.
'Ann opposes Country Y.'
≠> the signer dislikes Country Y (endorsement: 1)
b. [6.7] ANNE OPPOSE BAD COUNTRY_Y.
'Ann opposes bad Country Y.'
=>? the signer dislikes Country Y (endorsement: 5.3)
c. [6.7] MAYBE ANNE WILL OPPOSE BAD COUNTRY_Y.
'Maybe Ann will oppose bad Country Y.'
=> the signer dislikes Country Y (endorsement: 6.7)
d. [6.7] ANNE WON'T OPPOSE BAD COUNTRY_Y.
'Ann won't oppose bad Country Y.'
=> the signer dislikes Country Y (endorsement: 7)
e. [6.3] ^_____
ANNE WILL OPPPOSE BAD COUNTRY_Y QUESTION?
'Ann will be opposing bad Country Y?'
≠>?? the signer dislikes Country Y.' (endorsement: 3.7)
(ASL 37, 2662; 3 judgments)

In (65)h, the *IF*-clause satisfies the negative contribution of *BAD COUNTRY_Y*, and as a result this contribution does not project to the level of the entire sentence: *BAD COUNTRY_Y* behaves like a presupposition trigger. Things are very different with the expressive in (31)b and the nonce expressive in (31)e: the negative inference projects. Other derogatory expressions give rise to intermediate levels of endorsement.

(65) *Context:* The signer is using a contemporary form of ASL, and is not using terms to joke.
^_____
SELF NO PREJUDICE, BUT IF CAPITAL_Y DIGUSTING START WAR,
'I myself have no prejudice, but if Capital Y disgustingly starts a war,
IX-1 WILL OPPOSE
I will oppose
a. [7] COUNTRY_Y .
Country Y.'
≠> the signer dislikes Country Y (endorsement: 1)
b. [6.3] COUNTRY_Y-slur.
<slur for Country Y>.'
=> the signer dislikes Country Y (endorsement: 6.3)
c. [6.3] \:-(([COUNTRY_Y].
\:-((**Country Y**.'
=>? the signer dislikes Country Y (endorsement: 5)
d. [6.7] [COUNTRY_Y] \:-((.
Country Y \:-((.'
≠>?? the signer dislikes Country Y (endorsement: 3.3)
e. [6] [COUNTRY_Y]-middle_finger.
<nonce slur for Country Y>.'
=> the signer dislikes Country Y (endorsement: 6.7)
f. [7] COUNTRY_Y MIDDLE-FINGER .
Country Y MIDDLE-FINGER.'

[52] As can be seen in the Supplementary Materials, the consultant noted (= [JL 22.10.08]) that the "signer likely thinks [Country X] is bad, unless here [the] signer was repeating back or checking on what was said to him (i.e., if this was an initial question then [the] signer thinks [Country X] is bad. If this question is in response to something said about Anna and [Country X], then perhaps [the] signer is neutral)." Similar remarks were made in the following two other sessions in which this video was assessed.

≠>?? the signer dislikes Country Y (endorsement: 3.3)
g. [5.3 MIDDLE-FINGER][COUNTRY_Y].
MIDDLE-FINGER Country Y.'
=>? the signer dislikes Country Y (endorsement: 5)
h. [6.7] BAD COUNTRY_Y.
bad Country Y.'
≠>? the signer dislikes Country Y (endorsement: 2)
(ASL, 37, 2656; 3 judgments)[53]

(66) Strength of the negative inference about Country Y in (65)

Example	**Strength of the inference that the signer in fact dislikes Country Y** (with 7 = strongest)
a. COUNTRY_Y .	1
b. COUNTRY_Y-slur.	**6.3**
c. \:-(([COUNTRY_Y]	5
d. [COUNTRY_Y] \:-((.	3.3
e. [COUNTRY_Y]-middle_finger.	**6.7**
f. COUNTRY_Y MIDDLE-FINGER .	3.3
g. MIDDLE-FINGER[COUNTRY_Y]	5
h. BAD COUNTRY_Y.	2

The paradigm in (67) makes the same point using disjunction. The structure is clearly marked and difficult, as seen in the degraded acceptability scores; our second consultant also found this paradigm hard to process. Still, we can assess inferences of interest (on which our two consultants mostly agreed). As noted in (13)b in the main text, when the second disjunct triggers a presupposition, it can be satisfied by the negation of the first disjunct and may thus fail to project to the level of the entire sentence. This is roughly the behavior of *BAD COUNTRY_Y* in (67)h, with some instability. By contrast, the offensive term and the 'middle finger' expressive give rise to strong projection, as seen in (67)b, e. The other target expressions give rise to intermediate levels of projection, which is consistent with the hypothesis that they are not expressives (but the contrasts are too subtle to reach a firm conclusion).

(67) *Context:* The signer is using a contemporary form of ASL, and is not using terms to joke.

SELF NO PREJUDICE, BUT EITHER-OR CAPITAL_Y WON'T DISGUSTING START WAR,
'I myself have no prejudice, but either Capital Y won't digustingly start a war,
OR IX-1 WILL OPPOSE
or I will oppose
a. [5] COUNTRY_Y.
Country Y.'
≠> the signer dislikes Country Y (endorsement: 1.3)
b. [4.3] COUNTRY_Y-slur. (acceptability scores: 6, 4, 3)
<slur for Country Y>.'
=> the signer dislikes Country Y (endorsement: 6.7)
c. [5.3 \:-((][COUNTRY_Y]
\:-((**Country Y**.'
≠>?? the signer dislikes Country Y (endorsement: 3)
d. [5] [COUNTRY_Y] \:-((.
Country Y \:-((.'

[53] Our second consultant agreed with our main consultant, with the following differences. (i) Our second consultant scored the inference for (d) as 4 and found the distinction with (c) to be weak. (ii) Our consultant rated in the inference for (f) and (g) higher, at 4 and 6 respectively.

=>?? the signer dislikes Country Y. (endorsement: 4)
e. [4] [COUNTRY_Y]-middle_finger. (acceptability scores: 6, 4, 2)
<nonce slur for Country Y>.'
=> the signer dislikes Country Y (endorsement: 6.3)
f. [5.3] COUNTRY_Y MIDDLE-FINGER .
Country Y MIDDLE-FINGER.'
≠>?? the signer dislikes Country Y (endorsement: 3.3)
g. [4] MIDDLE-FINGER[COUNTRY_Y].
MIDDLE-FINGERCountry Y.'
=>? the signer dislikes Country Y (endorsement: 5.3)
h. [5.3] BAD COUNTRY_Y.
bad Country Y.'
≠>?? the signer dislikes Country Y (endorsement: 3.7 (2, 4, 5))
(ASL 37, 2650; 3 judgments)

(68) **Strength of the negative inference about Country Y in (67)**

Example	**Strength of the inference that the signer in fact dislikes Country Y** (with 7 = strongest)
a. COUNTRY_Y .	1.3
b. COUNTRY_Y-slur.	**6.7**
c. \:-(([COUNTRY_Y]	3
d. [COUNTRY_Y] \:-((.	4
e. [COUNTRY_Y]-middle_finger.	**6.3**
f. COUNTRY_Y MIDDLE-FINGER .	3.3
g. MIDDLE-FINGER[COUNTRY_Y]	5.3
h. BAD COUNTRY_Y.	3.7 (2, 4, 5)

Appendix II. Complements on Scalar Implicatures and Homogeneity Inferences

A. Scalar Implicatures

A1. A problem with exhaustification involving a continuous set of alternatives (complement to Section 6.3.2)

If implicatures are obtained through the insertion of an exhaustivity operator akin to *only*, as argued in much recent research (e.g. Chierchia et al. 2012), having *all* gradient alternatives to *TURN-WHEEL-COMPLETELY* could lead to a contradiction. Let us take the Logical Form of the sentence to be *Exh [John doesn't turn the wheel 100%]*, with a set of gradient alternatives Alt = {John doesn't turn the wheel ≥n%: n in [0, 100]} (with ≥n% understood as: *at least n%*). To see a simplified form of the problem, let us view the exhaustivity operator, rather naively, as negating all the non-weaker alternatives. This would lead to an immediate difficulty: if n ranges over real numbers, we obtain the negation of the members of: {John doesn't turn the wheel ≥n%: $0 \leq n < 100$}. By elimination of double negations, we get the assertion of the members of: {John turns the wheel ≥n%: $0 \leq n < 100$}. But this immediately yields the claim in (69), which is inconsistent with the literal meaning, according to which John didn't turn the wheel complete.

(69) For all $n < 100$, John turns the wheel ≥n%.

Specifically, let n* be such that John turned the wheel exactly n*%. Clearly, in view of the assertion, $n^* < 100$, but then (69) cannot be true.

In this case, we derived a contradiction because we sought to negate all non-weaker alternatives. But exhaustivity operators usually do something more subtle. Gajewski 2009 asks in a related case, involving *more than n* rather than *less than n*, whether a contradiction is obtained when one doesn't just deny all non-weaker alternatives, but one uses the (popular) exhaustivity operator based of 'innocent exclusion' (Fox 2007).[54] Gajewski shows that with gradient scales, a contradiction is in fact derived. As far as we can tell, his case is isomorphic to ours. This contradiction would make it obligatory for the set of alternatives to be different from Alt as defined above.

The definition of Fox's operator, based on innocently excludable alternatives (= *I-E* below), is given in (70).

(70) If p is a proposition, A a set of alternative propositions and w a possible world,
a. $EXH(p, A, w) \Leftrightarrow p(w)$ and $\forall q \in I\text{-}E(p,A): \neg q(w)$
b. $I\text{-}E(p, A) := \cap\{A' \subseteq A: A' \text{ is a maximal set in A s.t. } A'^{\neg} \cup \{p\} \text{ is consistent}\}$
c. $A^{\neg} := \{\neg p: p \in A\}$

Now the problem unearthed by Gajewski is that in some gradient cases, there is no maximal set of excludable alternatives, which means that the boldfaced set in (70)b is empty.

To see the main intuition, assume that there is a non-empty maximal set M of propositions of the form *John turns the wheel ≥ n%* consistent with *John doesn't turn the wheel 100%*. The set N of the n's that define the propositions has a lowest upper bound n*. But then one can reason as follows.
(i) It couldn't be that n* = 100. By the non-emptiness of M combined with *John doesn't turn the wheel 100%*, it has to be that for some $n^{**} < 100$, John turns the wheel exactly n**%. So for small enough ε, $n^{**}+\varepsilon < 100$ is an upper bound of N, contrary to the assumption that 100 is the lowest upper bound of N.
(ii) But now assume $n^* < 100$. Then, for $0 < \varepsilon < (100-n^*)$, $M \cup$ {John turns the wheel $\geq n^*+\varepsilon$%} is a strict superset of M (because $n^*+\varepsilon > n^*$) and yet consistent with *John doesn't turn the wheel 100%* (because $n^*+\varepsilon < 100$). This contradicts the maximality of M.

This reasoning shows that the boldfaced set in (70)b is empty. But as Gajewski notes, the intersection of an empty set of propositions is the set of all propositions, and denying all propositions

[54] As B. Spector notes (p.c.), the exhaustivity operator based on 'minimal models' yields stronger statements than the exhaustivity operator based on innocent exclusion. Thus if the latter operator yields a contradiction, so does the former. For a comparison of exhaustivity operators, see Spector 2016.

gives rise to a contradiction. One might want to say that exhaustification fails to occur in this case, but this would be incorrect, as an indirect implicature is triggered, and probably even in the absence of salient alternative.

A2. Additional examples of iconic implicatures

We provide below additional data on indirect scalar implicatures with iconic modulations, and on the availability of general meanings in the antecedent of conditionals.

❑ *Indirect scalar implicatures with iconic modulations*

The following examples are similar to those discussed in (40) and (42) in Section 6.1, with the difference that the lengthening is less pronounced. As can be seen in (71)a and (72)a, the indirect implicature is weaker, i.e. endorsed less strongly. Our second consultant obtained similar inferences for (71) (with endorsement strengths of 5 for a. and 6 for b.), but slightly stronger ones than our main consultant for (72)a (scored as 4, with b. at 6).

(71) TOMORROW ANN WON'T
'Tomorrow Ann won't
a. [7] DANCE-long.
dance for a long time.'
=>?? Anne will dance tomorrow (endorsement: 4.3)
b. [7] DANCE LONG.
dance for a long time.'
=> Anne will dance tomorrow (endorsement: 6.3)
(ASL 35, 2380; 3 judgments)

(72) POSS-2 EMAIL, BEFORE ANN-a REPLY, IX-a WON'T
'Before Ann answers your email, she won't
a. [7] REFLECT-long.
reflect for a long time.'
≠>? Ann will reflect before answering the addressee's email (endorsement: 2.7)
b. [7] REFLECT EXAGGERATE.
reflect excessively.'
=>? Ann will reflect before answering the addressee's email (endorsement: 5.7)
(ASL 35, 2368, 3 judgments)

❑ *General meanings under* IF

(73) shows that in the antecedent of conditionals (a downward-monotonic environment), the neutral form of *DANCE* as well as *DANCE SOME* and *DANCE LITTLE-BIT* have general meanings, corresponding to: *dance, dance for some time (or more), dance for a little bit (or more)*. They contrast in this respect with *DANCE LITTLE-BIT BUT NOT A-LOT*. (74) displays similar results when *DANCE* is replaced with *REFLECT*.[55] Our second consultant found the next three paradigms (namely (73), (74) and (75)) very hard to assess (see the Supplementary Materials; his informal answers seem consistent with the optional computation of a local implicature in the scope of the conditional for examples in b. and c., involving *SOME* and *LITTLE-BIT*).

(73) TOMORROW IF ANN ___, IX-1 1-GIVE-2 20 DOLLAR.
'Tomorrow, if Ann …, I will give you $20.'
a. [7] DANCE-neutral
dances
=> the signer must give the interlocutor $20 in case tomorrow Ann dances a lot (endorsement: 7)
b. [7] DANCE SOME
dances a bit
=> the signer must give the interlocutor $20 in case tomorrow Ann dances a lot (endorsement: 7)
c. [7] DANCE LITTLE-BIT

[55] We originally thought that *REFLECT LITTLE-BIT THAT'S ALL* could serve as an upper bound control ('reflect a little bit but not more'), but as seen in the inferential judgments in (74)d, this was in error. By contrast, *REFLECT LITTLE-BIT BUT NOT A-LOT* had the intended reading.

dances a little bit
=> the signer must give the interlocutor $20 in case tomorrow Ann dances a lot (endorsement: 6)
d. [7] DANCE LITTLE-BIT BUT NOT A-LOT
dances a little bit but not a lot
≠> the signer must give the interlocutor $20 in case tomorrow Ann dances a lot (endorsement: 1)
(ASL 35, 2494; 3 judgments)

(74) POSS-2 EMAIL, BEFORE ANN-a REPLY, IF IX-a _____ , IX-a TELL TRUTH.
'Before Ann answers your email, if she … , she will tell the truth.'
a. [7] REFLECT-neutral
refects
=> Ann will say the truth in case she reflects a lot (endorsement: 7)
b. [7] REFLECT SOME
reflects a bit
=> Ann will say the truth in case she reflects a lot (endorsement: 7)
c. [7] REFLECT LITTLE-BIT
reflects a little bit
=> Ann will say the truth in case she reflects a lot (endorsement: 6.7)
d. [7] REFLECT LITTLE-BIT THAT'S-ALL
reflects just a little bit
=>? Ann will say the truth in case she reflects a lot (endorsement: 5 (7, 4, 4))
e. [7] REFLECT LITTLE-BIT BUT NOT A-LOT
reflects a little bit but not a lot
≠> Ann will say the truth in case she reflects a lot (endorsement: 1.3)
(ASL 35, 2478; 3 judgments)

Similar points are made about the neutralized form of the helicopter classifier predicate in (75)a, with similar controls as above.

(75) THAT HELICOPTER IF ___, 1-GIVE-2 20 DOLLAR.
'If that helicopter … , I'll give you $20.'
a. [7] HELICOPTER-RISE-neutral-cl
takes off
=> the signer must give the addressee $20 in case the helicopter rises high (endorsement: 7)
b. [7] MOVE-UP SOME
moves up a bit
=> the signer must give the addressee $20 in case the helicopter rises high (endorsement: 7)
c. [7] MOVE-UP LITTLE-BIT
moves up a little bit
=> the signer must give the addressee $20 in case the helicopter rises high (endorsement: 6.7)
d. [7] MOVE-UP BUT NOT HIGH
moves up a bit but doesn't go high
≠> the signer must give the addressee $20 in case the helicopter rises high (endorsement: 1)
(ASL 35, 2464; 3 judgments)

❑ *Direct implicatures with classifier predicates*

In a positive environment, in a context that makes explicit an alternative with the meaning *walk to the end of the corridor*, the neutralized form of the walking classifier yields unclear and unstable results, with or without an inference that the agent won't walk the entire distance, as seen in (76)a. This sentence is in essence identical to (54)a in the main text, but with different controls; as we noted there, the walking person classifier moving over half the corridor representation is hard to distinguish from a neutralized realization of the classifier. The lexical combination *WALK CORRIDOR* clearly yields no such incompleteness inference.[56] Unsurprisingly, the walking classifier stopping in the middle with a sharp ending yields the inference that the agent stopped in the middle of the corridor, as seen in (76)b.

(76) ANN INJURED, IMPROVE BUT TIRED. YESTERDAY CORRIDOR== DOORS PERSON-WALK-complete-cl. TODAY WILL

[56] Our consultant noted in discussions (after the paper was written) that if the question asked whether the agent would walk at least quarter of the way, there would be a stronger inference, but still not at ceiling.

'Ann is injured. She is getting better but is tired. Yesterday she walked to the end of the corridor. Today she will
a. $^{6.7}$ PERSON-WALK-1/2-cl.
walk in the corridor.'
=>?? Ann will walk approximately half the distance in the corridor but not the entire distance
(endorsement: 4 (2, 5, 5))
b. $^{6.7}$ PERSON-WALK-1/2+sharp-cl.
walk and stop abruptly.'
=> Ann will walk approximately half the distance in the corridor but not the entire distance
(endorsement: 6)
c. $^{6.7}$ WALK CORRIDOR.
walk in the corridor.'
≠> Ann will walk approximately half the distance in the corridor but not the entire distance
(endorsement: 1.3)
(ASL, 37, 2684; 3 judgments; https://youtu.be/3OTuQqRq76A)

B. Homogeneity Inferences

B1. Towards a compositionality analysis of complex classifier predicates

In Section 8.3, we treated the two-handed complex classifier representing two individuals moving in tandem as a single predicate, with the semantics in (61)b, repeated as (77) (as noted, this entry could then be enriched with further failure conditions to capture the Homogeneity Generalization).

(77) $[\![\text{person-cl}\hat{}\text{person-cl}^{\pi}]\!]^{c,s,t,w} = \lambda x_e$. # iff x = #; otherwise, 1 iff 2-individuals'$_{t,w}$(x) = 1 and proj(x, s(π), t, w) = person-cl^person-cl

But it might make better sense to analyze this complex predicate as a conjunction of two singular classifier predicates. How can this be achieved?

The first thing to note is that two predicates cannot be combined by standard predicate conjunction, for if so the result would be true of an individual x only in case x projects both to the first classifier and to the second (presumably relative to the same viewpoint). This is stated in (78), where the conjunction is covert (hence barred), and where we use indices to distinguish the two tokens of the person classifier; since they are in different positions in signing space, they give rise to different projective conditions. It is clear that the result is disastrous, as we end up with a predicate of individuals (rather than pluralities), and these individuals must satisfy impossible projective conditions.

(78) **Wrong result with standard predicate conjunction**
$[\![\text{person-cl}_1^{\pi}$ ~~and~~ person-$\text{cl}_2^{\pi}]\!]^{c,s,t,w} = \lambda x_e$. # iff x = #; otherwise, 1 iff $\boxed{\text{1-individual'}_{t,w}(x) = 1}$ and proj(x, s(π), t, w) = person-cl_1 and proj(x, s(π), t, w) = person-cl_2

What is needed is a cumulative reading of the conjunction (written as and_c), to the effect that the conjunction *person-cl*$_1^{\pi}$ ~~*and*~~$_e$ *person-cl*$_2^{\pi}$ is true of a plurality just in case (i) each of the classifiers is made true by an individual member of the plurality, and (ii) each individual member of the plurality is made true by a classifier. This turns out to be a reading that exists on independent grounds, as argued recently by Schmitt (2019). An example appears in (79)a; it is "true in any scenario where all of the farm animals are crowing or barking and some are crowing and some are barking — which means that it has the cumulative truth-conditions in [(79)b]".

(79) a. Good Lord! The farm is on fire, the ten animals are crowing and barking! And the farmer is singing Auld Lang Syne! (Adapted from Krifka 1990)
b. If S_A is the group of ten animals, C the set of crowing animals and B the set of barking animals:
(a) is true iff ∀x ∈ S_A (∃Y ∈ {C, B} (Y(x) = 1)) and ∀Y ∈ {C, B}(∃x ∈ S_A (Y(x) = 1))

By parity of reasoning, we will get for the combination of the two classifiers the truth conditions in (80).

Notation: We take x to range over atoms and pluralities, and $x' \in_A x$ to mean that x' is an atomic member of x, and write ~~*and*~~$_e$ for (covert) cumulative conjunction.

(80) **Truth conditions with cumulative predicate conjunction**

$[[\text{person-cl}_1^{\pi}\ \text{~~and~~}_e\ \text{person-cl}_2^{\pi}]]^{c,s,t,w} = \lambda x_e$. # iff x = #; otherwise, $\forall x' \in_A x\ \exists i \in \{1, 2\}$ $[[\text{person-cl}_i^{\pi}]]^{c,s,t,w}(x') = 1$, and for $\forall i \in \{1, 2\}\ \exists x' \in_A x$ $[[\text{person-cl}_i^{\pi}]]^{c,s,t,w}(x') = 1$

This is not the end of the story, however. We need to determine where the homogeneous behavior of *person-cl*$_1^{\pi}$ ~~*and*~~$_e$ *person-cl*$_2^{\pi}$ might come from on this view. There are in principle three possibilities:
(i) homogeneous behavior (i.e. semantic failure when the predicate is applied to certain pluralities) is lexically specified for atomic predicates only, and follows in some cases for derived predicates by the workings of trivalent logic;
(ii) homogeneous behavior can derive from the semantics of cumulative conjunction;
(iii) homogeneous behavior applies to all predicates, whether atomic or derived; if so, the failure conditions of (80) would be strengthened by 'brute force', for instance by adding a homogeneity operator to the complex predicate with the following entry, which in essence manufactures indeterminacy when Križ's Homogeneity Generalization is violated (this is the same operator already used in fn. 50, but now applying to complex as well elementary predicates):

(81) If *P* is a (possibly complex) predicate of pluralities,
$[[\text{H P}]]^{c,s,t,w} = \lambda x_e$. # iff x = # or $[[[\text{P}]]^{c,s,t,w}(x) \neq 1$ and for some y, $y \cap x \neq \emptyset$ and $[[\text{P}]]^{c,s,t,w}(y) = 1]$;
otherwise, 1 iff $[[\text{P}]]^{c,s,t,w}(x) = 1$

Option (i) is non-trivial to develop. Two popular analyses of trivalence computation are Strong Kleene logic and Supervaluations, which have in common that the third truth value, #, is treated as 'indeterminate between true and false'. Indeterminacy of an element gets inherited by complex constructions if it makes their value impossible to determine as well. For instance, on the assumption that *F* is indeterminate, so is *not F*, but in case *G* is false, *F and G* is false, not indeterminate (the reason is that whether *F* is true or false, the falsity of *G* suffices to conclude to the falsity of the entire conjunction).[57] Applying the same recipe to the truth conditions in (80), it follows that as soon as one member of a pair of individuals makes both classifiers false, the cumulative conjunction of the predicates should be false as well, and its negation should be true. In other words, the prediction is that in a non-homogeneous case in which one individual moves as specified by the complex classifier and the other doesn't, the negation should be true. This fails to derive the homogeneous inference we obtained for embedding under negation in Section 8.2.[58]

We leave it for future research to determine whether options (ii) and (iii) (or a more sophisticated version of option (i)) could be justified on independent grounds. But theory-neutrally, it would seem reasonable to explore the homogeneous behavior of Schmitt's cumulative conjunction of predicates, as it seems to arise in some examples, such as (82). To our ear, it yields a homogeneous inference that the man will not be an uncle and the woman will not be an aunt.

(82) [Talking about a man and a woman]
Unfortunately, these two individuals will never be uncle and aunt.

B2. A classifier predicate without homogeneity inferences?

The classifier predicates discussed in the main text all triggered homogeneity inferences. But other examples seem to be different. For instance, the paradigm (83) differs from that in (57) in that the two candidates' movement is towards the center of the stage, and thus towards each other, rather than towards the front of the stage (in parallel to each other). One might expect a homogeneous inference in (83)d, e, to the effect that *neither* candidate will go towards the center of the stage. This expectation is

[57] The difference between Strong Kleene and Supervaluations is that only the former is compositional, in the sense of giving the same rule for *not* and *and* no matter what *F* and *G* are. By contrast, Supervaluations are not compositional. Take for instance the case in which *F* and *G* are both indeterminate. Supervaluations treat *F and G* as indeterminate or false when *F* and *G* depending on the form of the arguments, rather than just on their semantic values. In particular, *F and not F* is treated as false because it is a contradiction, but *F and G* is indeterminate if *F* and *G* are atomic elements.
[58] It's also unclear to us how undefinedness could be triggered by one of the conjuncts in the first place, since all the relevant arguments are atomic objects in this case.

met for the lexical construction in (83)e but not for the classifier in (83)d. This might conceivably be because our consultant understood the classifier case to attribute to the two candidates the property of "[moving] to each other", rather than moving to the center, even though in physical terms this amounts to the same thing. Our main consultant notes that in its positive version this example implies that the candidates are going towards the center to great each other, hence a meaning difference relative to the control.

(83) *Context:* there will be a political debate between two candidates.
TOMORROW DEBATE STAGE PERSON-c^PERSON-cl. TIME 9:30 DEBATE FINISH,
'Tomorrow there will be a debate with two individuals on the stage. At 9:30, when the debate ends,

IX-1 THINK
I think
a. [7] WILL PERSON-WALK->cl^<-PERSON-WALK-cl.
the two individuals will move towards the center/towards each other.'
=> at 9:30, both candidates will come to the center (endorsement: 7)
b. [6.7] THE-TWO WILL GO CENTER STAGE.
the two individuals will go to the center of the stage.'
=> at 9:30, both candidates will come to the center (endorsement: 7)
c. [6.7] BOTH WILL GO CENTER STAGE.
both individuals will go to the center of the stage.'
=> at 9:30, both candidates will come to the center (endorsement: 7)

IX-1 DON'T THINK
I don't think
d. [7] WILL PERSON-WALK->cl^<-PERSON-WALK-cl.
the two individuals will move towards the center/towards each other.'
≠>?? at 9:30, neither candidate will come to the center (endorsement: 3.3 (2, 3, 5))
e. [7] THE-TWO WILL GO CENTER STAGE.
the two individuals will go to the center of the stage.'
=>? at 9:30, neither candidate will come to the center (endorsement: 5.7)
f. [7] BOTH WILL GO CENTER STAGE.
both individuals will go to the center of the stage.'
≠>? at 9:30, neither candidate will come to the center (endorsement: 2.3)
(ASL 36, 0791; 3 judgments; https://youtu.be/KAKHteKL2lg)

It is too early to tell whether this contrast is robust. But it is clear that iconic predicates in general and classifier predicates in particular could offer a powerful tool to probe the sources of homogeneity, as they make it possible to create new meanings 'on the fly' and see whether they are or are not homogeneous.

Supplementary Materials

Raw data can be found at the following URL:

https://www.dropbox.com/scl/fi/eyhcnmmz7zabpymrkvkx4/Inferential-Typlogy-Supplements-23.10.13-2-Submission.docx?rlkey=rh1u84bv2vbfrhc2aqjnzbwrx&dl=0

They contain the judgments of our main consultant and of our second consultant.

Ratings given by our main consultant can (redundantly) in the following Excel file:

https://www.dropbox.com/scl/fi/xiztdcgyyepbihv2ti2nb/Formal-Pragmatics-in-Sign-23.10.13-1-PS-Submission.xlsx?rlkey=2tiboj43n5k8ms19uo8a8tum6&dl=0

References

Abbott, Barbara. 2000. Presuppositions as nonassertions. *Journal of Pragmatics* 32: 1419–1437.

Abrusán, Márta. 2011. Predicting the presuppositions of soft triggers. *Linguistics and Philosophy* 34(6): 491–535.

Abusch, Dorit. 2010. Presupposition triggering from alternatives. *Journal of Semantics* 27(1): 37–80.

Abusch, Dorit: 2020, Possible worlds semantics for pictures. In L. Matthewson, C. Meier, H. Rullmann, and T. E. Zimmermann (eds.), *The Wiley Blackwell Companion to Semantics*, Wiley.

Aronoff, Mark: 1976, *Word Formation in Generative Grammar*.

Breheny, Richard; Klinedinst, Nathan; Romoli, Jacopo; Sudo, Yasutada: 2018, The symmetry problem: current theories and prospects. *Natural Language Semantics* 26, 85–110

Chemla, Emmanuel. 2010. Similarity: Towards a unified account of scalar implicatures, free choice permission and presupposition projection. Ms., LSCP, Paris.Chierchia, Gennaro; Fox, Daniel;

Davidson, Kathryn: 2014, Scalar implicatures in a signed language . *Sign Language & Linguistics* 17 (1):1 – 19.

Davidson, Kathryn: 2015, Quotation, Demonstration, and Iconicity. *Linguistics and Philosophy* 38(6), 477-520.

Davidson, Kathryn: 2022, *Formal Semantics and Pragmatics in Sign Languages*. Manuscript, Harvard University.

DiFranco, Ralph: 2017, Appropriate Slurs. *Acta Analytica* 32, 3: 371-384. DOI:10.1007/s12136-016-0313-0

Emmorey, Karen and Herzig, Melissa: 2003. Categorical versus Gradient Properties of Classifier Constructions in ASL. In K. Emmorey (Ed.), *Perspectives on Classifier Constructions in Signed Languages*, Lawrence Erlbaum Associates, Mahwah NJ, pp. 222–246

Esipova, Maria: 2019, *Composition and projection in speech and gesture*. PhD thesis, New York University.

Fox, Danny: 2007, Free Choice and the Theory of Scalar Implicatures. In U. Sauerland and P. Stateva (eds.), *Presupposition and Implicature in Compositional Semantics*, Palgrave Macmillan, pp. 71120.

Gajewski, Jon: 2005, *Neg-raising: Polarity and presupposition*. PhD dissertation, MIT.

Gajewski, Jon: 2009, Innocent exclusion is not contradiction free. Manuscript, University of Connecticut.

Geurts, Bart: 1996. Local Satisfaction Guaranteed: A Presupposition Theory and its Problems. *Linguistics and Philosophy* 19(3): 259–294.

Geurts, Bart: 1997, Good news about the description theory of names. *Journal of Semantics* 14, 319-348.

Geurts, Bart: 1999, *Presuppositions and Pronouns*. Elsevier.

Goldin-Meadow, Susan, So, Wing Chee, Özyürek, Asli and Mylander, Carolyn: 2008, The natural order of events: How speakers of different languages represent events nonverbally. *Proceedings of the National Academy of Sciences* 105(27): 9163-9168.

Greenberg, Gabriel: 2013. Beyond Resemblance. *Philosophical Review* 122:2, 2013

Greenberg, Gabriel: 2021, Semantics of Pictorial Space. *Review of Philosophy and Psychology*. https://doi.org/10.1007/s13164-020-00513-6

Grice, H. P. 1981. Presupposition and conversational implicature. In *Radical pragmatics*, ed. P. Cole, 183–198. New York: Academic Press.

Heim, Irene: 1983, On the Projection Problem for Presuppositions. In D. Flickinger et al. (eds), *Proceedings of the Second West Coast Conference on Formal Linguistics,* 114-125.

Horn, Laurence R.:1972, *On the Semantic Properties of the Logical Operators in English*. Ph.D. thesis, University of California at Los Angeles.

Katzir, Roni. 2007. Structurally-defined alternatives. *Linguistics and Philosophy*, **30**(6), 669–690.

Katzir, Roni, and Fox, Danny. 2011. On the characterization of alternative. *Natural Language Semantics*, **19**(1), 87–107.

Križ, Manuel: 2015, *Aspects of Homogeneity in the Semantics of Natural Language*. Dissertation, University of Vienna.

Križ, Manuel. 2016. Homogeneity, Non-Maximality, and all. *Journal of Semantics* 33(3). 493–539. doi:10.1093/jos/ffv006.

Križ, Manuel: 2019, Homogeneity effects in natural language semantics. *Language and Linguistics Compass* 13 (11), e12350.
Križ, Manuel and Spector, Benjamin: 2021, Interpreting plural predication: homogeneity and non-maximality. *Linguistics and Philosophy* 44, 1131–1178. https://doi.org/10.1007/s10988-020-09311-w
Kuhn, Jeremy and Aristodemo, Valentina. 2017. Pluractionality, iconicity, and scope in French Sign Language. *Semantics and Pragmatics*. https://doi.org/10.3765/sp.10.6
Lassiter, Daniel: 2012, Presuppositions, Provisos, and Probability. *Semantics and Pragmatics*, 5(2):1–37
Liddell, S. K.: 1980, *American Sign Language Syntax*. Hague: Mouton Publishers.
Liddell, Scott K. 2003a, Sources of Meaning in ASL Classifier Predicates. In: Emmorey, Karen (ed.), *Perspectives on Classifiers in Sign Languages*. Mahwah, NJ: Lawrence Erlbaum, 199220.
Liddell, Scott K.: 2003b, *Grammar, Gesture, and Meaning in American Sign Language*. Cambridge Cambridge University Press.
Löbner, Sebastian. 2000. Polarity in Natural Language: Predication, Quantification and Negation in Particular and Characterizing Sentences. *Linguistics and Philosophy* 23(3). 213–308. doi: 10.1023/A:1005571202592.
Loos, Cornelia; Cramer, Jens-Michael; Napoli, and Donna Jo: 2020, The Linguistic Sources Of Offense Of Taboo Terms In German Sign Language. *Cognitive Linguistics* 31(1): 73-112.
Macià, Josep. 2002. Presuposicion y significado expresivo. *Theoria: Revista de Teoria, Historia y Fundamentos de la Ciencia* 17(3): 499–513.
Mandelkern, Matthew: 2016, A Note on the Architecture of Presupposition. *Semantics and Pragmatics* 9(13): 1–24.
Matushansky, Ora: 2008, On the Linguistic Complexity of Proper Names. *Linguistics and Philosophy* **31**, 573–627.
McCarthy, John: 1982, Prosodic Structure and Expletive Infixation. *Language* 58, 3:574-590.
Pavlič, Matic: 2016, *The word order parameter in Slovenian Sign Language Transitive, ditransitive, classifier and locative constructions*. PhD dissertation, University of Venice.
Potts, Christopher: 2005, *The Logic of Conventional Implicatures*. Oxford University Press.
Roberts, Craige: 1989, Modal Subordination and Pronominal Anaphora in Discourse. *Linguistics and Philosophy* 12:683–721.
Romoli, Jacopo. 2015. The presuppositions of soft triggers are obligatory scalar implicatures. *Journal of Semantics* 32: 173–219.
Sauerland, Uli: 2004, Scalar implicatures in complex sentences. *Linguistics and Philosophy* 27(3), 367–391.
Sauerland, Uli. 2007. Beyond unpluggability. *Theoretical Linguistics* 33: 231–236.
Schembri, Adam; Jones, Caroline; Burnham, Denis: 2005, "Comparing action gestures and classifier verbs of motion: evidence from Australian Sign Language, Taiwan Sign Language, and nonsigners' gestures without speech. *Journal of Deaf Studies and Deaf Education* 10, 3, 272–290.
Schlenker, Philippe: 2007, Expressive Presuppositions. *Theoretical Linguistics* 33 (2) : 237-246.
Schlenker, Philippe. 2010. Local Contexts and Local Meanings. *Philosophical Studies* 151(1). 115–142. DOI: http://doi.org/10.1007/s11098-010-9586-0
Schlenker, Philippe: 2014, Iconic Features. *Natural Language Semantics* 22, 4: 299-356.
Schlenker, Philippe: 2016, The Semantics-Pragmatics Interface. In: Aloni, Maria and Dekker, Paul (eds), *The Cambridge Handbook of Formal Semantics*, pp. 664-727
Schlenker, Philippe: 2018a, Visible Meaning: Sign Language and the Foundations of Semantics. *Theoretical Linguistics* 44(3-4): 123–208
Schlenker, Philippe: 2018b, Gesture Projection and Cosuppositions. *Linguistics and Philosophy* 41, 3:295–365.
Schlenker, Philippe: 2018c, Iconic Pragmatics. *Natural Language and Linguistic Theory* 36, 3:877–936
Schlenker, Philippe: 2019, Gestural Semantics: Replicating the typology of linguistic inferences with pro- and post-speech gestures. *Natural Language and Linguistic Theory* 37, 2: 735–784.
Schlenker, Philippe: 2021a, Iconic Presuppositions. *Natural Language and Linguistic Theory* 39:215–289.
Schlenker, Philippe: 2021b, Triggering Presuppositions. *Glossa: a journal of general linguistics* 6(1):

35. 1–28. DOI: https://doi.org/10.5334/gjgl.1352
Schlenker, Philippe: 2021c, Non-local Attachment of Clauses: Evidence from ASL. *Natural Language and Linguistic Theory* 39:887–922 https://doi.org/10.1007/s11049-020-09486-8
Schlenker, Philippe: 2023, Supplements Without Bidimensionalism. *Linguistic Inquiry* 54 (2): 251–297.
Schlenker, Philippe; Bonnet, Marion; Lamberton, Jonathan; Lamberton, Jason; Chemla, Emmanuel; Santoro, Mirko; Geraci, Carlo: to appear, Iconic Syntax: Sign Language Classifier Predicates and Gesture Sequences. *Linguistics and Philosophy*.
Schlenker, Philippe, and Chemla, Emmanuel: 2018, Gestural Agreement. *Natural Language and Linguistic Theory*. 36, 2: 87–625587. https://doi.org/10.1007/s11049-017-9378-8
Schlenker, Philippe; Lamberton, Jonathan; Kuhn, Jeremy: 2023, Sign Language Semantics. Manuscript, Institut Jean-Nicod and New York University.
Schlenker, Philippe and Lamberton, Jonathan: 2019, Iconic Plurality. *Linguistics and Philosophy* 42: 45-108
Schlenker, Philippe and Lamberton, Jonathan: 2021, Focus and Intensification in the Semantics of Brow Raise. *Glossa: a journal of general linguistics* 6(1). doi: https://doi.org/10.16995/glossa.5706
Schlenker, Philippe and Lamberton, Jonathan: 2022, Meaningful Blurs: the Sources of Repetition-based Plurals in ASL. *Linguistics and Philosophy* 45: 201–264.
Schlenker, Philippe and Lamberton, Jonathan: to appear, Iconological Semantics. Accepted with minor revisions in *Linguistics and Philosophy*.
Schlenker, Philippe, Lamberton, Jonathan and Santoro, Mirko: 2013, Iconic Variables. *Linguistics and Philosophy* 36, 2, 91-149.
Schmitt, Viola: 2019, Pluralities across categories and plural projection. *Semantics and Pragmatics* 12(17). 1–49. https://doi.org/10.3765/sp.12.17.
Simons, Mandy. 2001. On the conversational basis of some presuppositions. In *Semantics and Linguistic Theory (SALT) 11*, eds. Rachel Hastings, Brendan Jackson, and Zsofia Zvolenszky, 431–448.
Simons, Mandy, Judith Tonhauser, David Beaver, and Craige Roberts. 2010. What projects and why. In *Semantics and Linguistic Theory (SALT) 20,* eds. Nan Li and David Lutz, 309–327.
Spector, Benjamin. 2006. *Aspects de la pragmatique des opérateurs logiques*. PhD diss., University of Paris VII.
Spector, Benjamin: 2012, Scalar implicatures as a grammatical phenomenon. In C. Maienborn, K. von Heusinger, & P. Portner (eds.), *Semantics: An international handbook of natural language meaning* (Vol. 3, pp. 2297–2331). Berlin: Mouton de Gruyter.
Spector, Benjamin: 2013, Homogeneity and plurals: From the strongest meaning hypothesis to supervaluations. Presented at Sinn und Bedeutung 18.
Spector, Benjamin: 2016, Comparing Exhaustivity Operators. *Semantics and Pragmatics* Volume 9, Article11:1–33.
Stalnaker, Robert. 1974. Pragmatic presuppositions. In *Semantics and Philosophy*, eds. Milton Munitz and Peter Unger 197–213. New York: New York University Press.
Thommen, Tristan. 2017. Are expressives presuppositional? The case of slurs. Ms., Institut Jean-Nicod, CNRS.
Tieu, Lyn;Pasternak, Robert; Schlenker, Philippe; Chemla, Emmanuel: 2017. Co-speech gesture projection: Evidence from truth-value judgment and picture selection tasks. *Glossa: A journal of general linguistics* 2(1).
Tieu, Lyn; Pasternak, Robert; Schlenker, Philippe; Chemla, Emmanuel: 2018, Co-speech gesture projection: Evidence from inferential judgments. *Glossa* 3(1), 109. DOI: http://doi.org/10.5334/gjgl.580
Tieu, Lyn; Schlenker, Philippe; Chemla, Emmanuel: 2019, Linguistic Inferences Without Words. *Proceedings of the National Academy of Sciences* 116 (20) 9796-9801.
Tonhauser, Judith, David Beaver, Craige Roberts, and Mandy Simons. 2013. Toward a taxonomy of projective content. *Language* 89(1): 66–109.
Valli, Clayton, and Lucas, Ceil: 2000. *Linguistics of American Sign Language: an Introduction*. 3rd ed. Washington, DC: Gallaudet University Press.
Zucchi, Sandro: 2011, Event descriptions and classifier predicates in sign languages. Presentation at

FEAST (Formal and Experimental Advances in Sign language Theory) in Venice, June 21, 2011.
Zucchi, Sandro: 2017, Event Categorization in Sign Languages. In: Cohen H. and Lefebvre C. (eds.) *The Handbook of Categorization in Cognitive Science*, Elsevier. 2017, pp. 377-396
Zucchi, Sandro: 2018, Sign language iconicity and gradient effects. *Theoretical Linguistics* 44(3-4): 283–294.
Zwitserlood, Inge: 2012, Classifiers. In: Roland Pfau, Markus Steinbach and Bencie Woll (eds) *Sign Language: An International Handbook*. De Gruyter Mouton, pp. 158-186. https://doi.org/10.1515/9783110261325.158