Iconic Presuppositions[*]

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Abstract. Why are some linguistic inferences treated as presuppositions? This is the 'Triggering Problem', which we attack from a new angle: we investigate highly iconic constructions in gestures (speech-replacing gestures or 'pro-speech gestures') and in signs (classifier predicates in ASL) and show that some regularly trigger presuppositions. These iconic constructions can be created and understood 'on the fly', with two advantages over lexical words: they suggest the existence of a productive 'triggering algorithm', since presuppositions can arguably be generated with no prior exposure to the iconic construction; and they make it possible to minimally modify the target constructions to determine which do and which don't generate presuppositions. Our investigation does not just target standard presuppositions, but also 'cosuppositions', initially defined as conditionalized presuppositions triggered by co-speech gestures. We show that pro-speech gestures and classifier predicates alike can trigger cosuppositions, which are thus an inferential class that goes beyond the confines of co-speech gestures (Aristodemo 2017). Our data argue for a triggering algorithm that can generate presuppositions on iconic grounds, and we offer a generalization of cosupposition theory on which these can be triggered for reasons of manner (co-speech gestures), but also for conceptual reasons.

Keywords: semantics, pragmatics, iconicity, presuppositions, cosuppositions, gestures, co-speech gestures, pro-speech gestures, gestural inferences, presupposition

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1 Introduction

1.1 Goals

1.1.1 Presuppositions and the Triggering Problem

Presuppositional inferences are characterized by their interaction with logical operators, giving rise to specific patterns of 'projection' illustrated in (1). The inference obtained in (1)a just shows that *John knows that he is incompetent* conveys the information that John is in fact incompetent. What makes this inference a presupposition is the fact that, unlike standard entailments, it is preserved in questions, under negation, *if*, and *might*; and that under *none*-type quantifiers, it gives rise to a universal presupposition that each of the relevant individuals is incompetent (see for instance Chemla 2009 for experimental data; Beaver 2001 argued instead for weaker patterns of existential projection in this case).

(1) a. John knows that he is incompetent.   => John is incompetent
     b. Does John know that he is incompetent?   => John is incompetent
     c. John doesn't know that he is incompetent.   => John is incompetent
     d. If John knows that he is incompetent, he'll get depressed.   => John is incompetent
     e. John might know that he is incompetent.   => John is incompetent
     f. None of these ten students knows that he is incompetent => each of these ten students is incompetent

   Most research of the last 50 years has sought to explain and predict how the presuppositions of elementary expressions (which may be stipulated) are inherited by complex sentences; this is the 'Projection Problem'. But why do some linguistic inferences triggered by elementary expressions get treated as presuppositions to begin with? This is the 'Triggering Problem': given some information that a linguistic expression conveys about the world, predict which part is at-issue and which part is presupposed. Within accounts that take unfulfilled presuppositions to trigger a semantic failure, captured by a third truth value # (besides 'true' and 'false'), the problem can be stated as follows: take as input information about the situations in which an expression is true vs. non-true, and seek to predict which of the 'non-true' situations yield failure, i.e. the third truth value #, as is illustrated in (2). An explicit rule that achieves this result is sometimes called a 'triggering algorithm'.

(2) Triggering algorithm: input-ouput relation

True
Non-true

➡️

True
False
(= failure)

1.1.2 Iconic presuppositions

Schlenker 2019a, and Tieu et al. 2019 showed (including with experimental means) that speech-replacing (henceforth 'pro-speech') gestures can trigger presuppositions, and that the same result extends when these gestures are replaced with (pro-speech) visual animations. This offers a new argument that a triggering algorithm is necessary, as some of the stimuli (especially pro-speech visual animations) could not have been seen by the subjects before. We will replicate this finding with further pro-speech gestures in English, but we will also extend it to different iconic constructions, namely classifier predicates representing a helicopter path in ASL (American Sign Language). We will show that depending on how the path is realized, a presupposition may or may not be triggered. For instance, if a helicopter path from Boston to New York is realized with an orthogonal detour or a pause to hover in the middle, this detour or pause becomes at-issue, and the fact that there will be a movement from Boston to New York becomes presupposed. But path-based iconicity also makes it possible to compare these iconic presuppositions with minimally different stimuli that do not trigger standard presuppositions; this, in turn, will put new constraints on the form of a triggering algorithm.

(3) **Claim 1: Presuppositions**
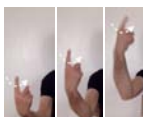   Presuppositions can be triggered not just by pro-speech gestures but also by path modulations of ASL

classifier predicates. Which modulations do or do not trigger presuppositions puts new constraints on triggering algorithms.

1.1.3   Cosuppositions

Our investigation does not just target standard presuppositions, but also 'cosuppositions', a new type of presuppositional inference that was recently used in the analysis of co-speech gestures. Briefly, the sentence *Will Mary LIFT help her son?*, with a lifting gesture (transcribed as *LIFT*) co-occurring with *help*, was argued to trigger a presupposition of the form: *if Mary helps her son, lifting will be involved* (Schlenker 2018a,b). While it was claimed that this is a presupposition, its conditionalized nature justified the introduction of a new term, *cosupposition:* a cosupposition is a presuppositional inference that is conditionalized on the at-issue content of an expression.[1] It was initially surmised that cosuppositions are triggered because co-speech gestures are somehow parasitic on the spoken words they modify, and thus that they should only be used in a context in which they can be ignored without affecting the truth conditions; a context, in other words, in which it is already presupposed that Mary's helping her son would involve lifting.[2] It was similarly argued that in ASL, co-sign facial expressions may trigger cosuppositions (Schlenker 2018b). An additional property of co-speech gestures and co-sign facial expressions is that they are optionally disregarded under ellipsis (Schlenker 2018b,d), possibly for syntactic reasons: ellipsis may copy the primary linguistic material without the parasitic enrichments.

On this general view, we would not expect cosuppositions to be triggered by iconic constructions that are not co-speech (or co-sign) gestures. But the opposite is true: as we will argue, classifier predicates in ASL can trigger standard presuppositions but also cosuppositions, and the same conclusion extends to some pro-speech gestures in English. To make things concrete, consider the sentence in (4), which summarizes several of our findings (the full paradigm is found in (46)). It contains a pro-speech gesture under negation, representing a helicopter take off (as roughly shown by the picture), but realized so as to evoke a difficult initial acceleration. This triggers a cosuppositional inference, of the form: *if the old helicopter were to take off, it would initially accelerate slowly/with difficulty*. For comparison, the same gesture also triggers a standard presupposition, to the effect that the helicopter is initially on the ground. This will give rise to a broader typology of presuppositional constructions, as well as a new challenge for future research: can we find algorithms that derive standard presuppositions or cosuppositions depending on the situation?
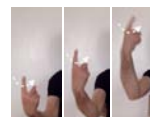
(4)   At 12:05, our company's old helicopter won't TAKE-OFF-difficult-accelerating___ , but our company's new helicopter will.
⇒ if the old helicopter were to take off (at 12:05), it would initially accelerate slowly/with difficulty
≠> the new helicopter will take off (at 12:05) with a slow/ difficult initial acceleration.
⇒ right before 12:05, the old and the new helicopter will both be on the ground
(video 15)

A further twist is added by the observation that in this case the cosuppositional inference can be disregarded under ellipsis: the elided clause can be understood without the 'difficult acceleration' component; by contrast, the 'on the ground' presupposition is preserved.[3] This gives rise to a new puzzle, since a syntactic explanation of the 'disappearing act' of the cosupposition is not easy to give (as it seems that part of the gesture is copied and part of it isn't).

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[1] While one may take the *co* in *cosupposition* to be mnemonic for 'conditionalized', the latinate prefix is justified as follows: a standard presupposition *p* of an expression *pp'* must be satisfied *before* one has access to the at-issue component *p'*, whereas a cosupposition can be satisfied *with* (thanks to) the at-issue component (see Schlenker, to appear a, Section 3.2, for relevant remarks).

[2] The intuition behind this initial theory is that co-speech gestures do not come with their own time slot and are secondary relative to the main modality, hence are presented as being omissible without truth-conditional loss. This is the case precisely when their content is presupposed to follow from the modified expression.

[3] Other paradigms, discussed in Section 5.5, provide clearer data about pro-speech cosuppositions disregarded under ellipsis.

(5) **Claim 2: Cosuppositions**
　　a. Cosuppositions can be triggered not just by co-speech (or co-sign) gestures, but also by some ASL classifiers and some pro-speech gestures in English.
　　b. In our data, the cosuppositions triggered by English pro-speech gestures (but not by ASL classifier predicates) can be disregarded under ellipsis.

1.2 Theoretical directions

In accordance with Claim 1, pertaining to the triggering of standard presuppositions on iconic grounds, we will argue not just for the existence of this algorithm, but for new constraints on its form. On the basis of Claim 2, we will argue that cosupposition theory must be refined. The initial puzzle was to explain why a co-speech gesture with content *p* modifying a word with content *p'* triggers a presupposition $p' => p$. One initial intuition (among several) was that the co-speech gesture, lacking its own time slot and being external to the main expression, 'wants' to be trivial once the word has been interpreted (Schlenker 2018a, Section 3.2; 2019b). On this view, it was the *manner* in which the content of a gesture is introduced (by way of an enrichment that is parasitic on a word) that was responsible for the cosupposition. We will argue that there is a second road to cosuppositions: sometimes, it is for conceptual reasons that part of a content 'wants' to be treated as trivial. This can happen when a pro-speech gesture has an overly strong content relative to a Question Under Discussion (QUD) in discourse. For instance, the QUD naturally associated with *Our helicopter won't TAKE-OFF-difficult-accelerating* is whether our helicopter will take off (call this: *?p'*). But without adjustment, the iconic information leads to the (irrelevant) meaning: *Our helicopter won't take off with a difficult initial acceleration* (call this *not pp'*). To ensure that this statement does address the QUD, one needs a presupposition that *p'* is equivalent to *pp'*, and thus that $p' => p$. In the end, then, cosuppositions arise from meaning components that 'want' to be trivial, but this has two sources: the manner in which the meaning component is expressed, and its conceptual role relative to a QUD.

1.3 Structure

The rest of this article is organized as follows. The end of this introductory section presents our main notational conventions pertaining to gestures and to signs. Section 2 summarizes extant results of cosuppositions triggered by co-speech gestures and standard presuppositions triggered by pro-speech gestures. Section 3 discusses new paradigms with classifier predicates in ASL, which trigger standard presuppositions or cosuppositions, as the case may be. In Section 4, we argue that some pro-speech gestures can also trigger cosuppositions. In Section 5, we discuss the behavior of cosuppositions under ellipsis, which might be important to distinguish them from standard presuppositions. We summarize our main findings in Section 6, before drawing consequences for presupposition theory in Section 7 and for cosupposition theory in Section 8, with concluding remarks in Section 9. (Appendix I provides additional information about the initial paradigms of Section 3, and Appendix II discusses in detail the important but complex behavior of iconic presuppositions and cosuppositions under ellipsis. Raw ASL data appear in the Supplementary Materials A, and the results of a small survey on English gestural inferences are found in the Supplementary Materials B.)

1.4 Transcription conventions and methods

1.4.1 Transcription conventions

Our notational conventions for gestures and signs are summarized in (6) and (7) respectively.

(6) **Notational conventions: spoken language**
　　a. A gesture that co-occurs with a spoken word (= a co-speech gesture) is written in capital letters in a non-standard font, or as a picture (or both) *preceding* the expression it modifies (which will be boldface, and enclosed in square brackets if it contains several words).
　　Examples:　　　Johnny SLAP **punished** his enemy.

　　　　　　　　Johnny SLAP_ **punished** his enemy.

Johnny [image] **punished** his enemy. (Pictures from Schlenker 2018b)

b. A gesture that replaces a spoken word (what we call a 'pro-speech gesture') is written in capital letters, also in a non-standard font (if necessary with an onomatopoeic sound as part of the transcription, e.g. *phh*); here too a picture may replace or illustrate the transcription.

Example: Your brother, I will SLAP-phh

Your brother, I will SLAP_[image]. (Pictures from Schlenker 2018b)

(7)   **Notational conventions: sign language**
a. Standard conventions: sign language sentences are glossed in capital letters, as is standard. Expressions of the form *WORD–i*, *WORD$_i$* and *[…EXPRESSION…]$_i$* indicate that the relevant expression is associated with the locus (= position in signing space) *i*. A suffixed locus, as in *WORD–i,* indicates that the association is effected by modulating the sign in such a way that it points towards locus *i* (this is different from the addition of a pointing sign *IX-i* to a word); a subscripted locus, as in *WORD$_i$* or *[…EXPRESSION…]$_i$*, indicates that the relevant expression is signed in position *i*. Locus names are assigned from right to left from the signer's perspective; thus when loci *a, b, c* are mentioned, *a* appears on the signer's right, *c* on the left, and *b* somewhere in between. *IX* (for 'index') is a pointing sign towards a locus, while *POSS* is possessive; they are glossed as *IX-i* and *POSS-i* if they point towards locus *i*; the numbers *1* and *2* correspond to the position of the signer and addressee respectively. *IX-i* is a standard way of realizing a pronoun corresponding to locus *i*, but it can also serve to *establish* rather than to *retrieve* one. Agreement verbs include loci in their realization – for instance the verb *a-ASK-1* starts out from the locus *a* and targets the first person locus *1;* it means that the third person individual denoted by *a* asks something to the signer. *IX-arc-i* refers to a plural pronoun indexing locus *i*, as it involves an arc motion towards *i* rather than a simple pointing sign.

b. A facial expression (whether grammatical or not) that co-occurs with some expression is written before that expression (surrounded by square brackets if it contains several words).

Examples: IX-arc-b NEVER :-([image] **[SPEND MONEY]**.

IX-arc-b NEVER [image] **[SPEND MONEY]**.

IX-arc-b NEVER :-(**[SPEND MONEY]**.

c. When it matters, the shape of iconic signs is described (often with iconic means) after the transcription. These are described as we go. For instance, *GO-helicopter-large__|__* transcribes a classifier predicate representing a large helicopter, and its movement involves an orthogonal detour, hence the notation: __|__.

1.4.2   Elicitation methods

Sign language data from earlier publications are cited as they initially appeared. New data were elicited using the 'playback method', with repeated quantitative acceptability judgments (1-7, with 7 = best) and repeated inferential (i.e. semantic) judgments (on separate days) on videos involving minimal pairs (see e.g. Schlenker et al. 2013, Schlenker 2014). An important innovation was to use a 7-point scale to also assess the strength of inferences triggered, with 1 = no inference and 7 = strongest inference (a point to which we return below).

In a nutshell, the playback method involves two steps. First, the sign language consultant signs sentences of interest on a video, as part of a paradigm (e.g. often with 2 to 6 sentences) signed as minimal pairs. Second, the consultant watches the video, provides quantitative acceptability ratings and inferential judgments, enters them in a computer, and redundantly signs them on a video. The second step can be repeated on other days, sometimes with a considerable time delay. This method has the advantage of allowing for the precise assessment of minimal pairs (signed on the same video), in a

quantitative, replicable fashion; its obvious limitation is that it solely assesses an individual's idiolect. While the judgments are obtained from just one consultant, the repetition of the task makes it possible to assess the stability of the judgments; and if necessary this method could be turned into an experimental one in the future, assessing the same videos with other signers.

For readability, in normal cases only average judgments are provided. Acceptability judgments appear as superscripts before the sentences; inferential judgments appear in separate tables. Complete quantitative judgments are given when there is more than a 2-point difference in the judgments obtained for a given sentence. Unless otherwise noted, sentences that appear in the same numbered example were assessed as part of the same video. Raw data (obtained during elicitation sessions) are provided in the Supplementary Materials.[4] While work with further consultants will definitely be useful, this is not a trivial task: just for the sign language part of this article, approximately 1200 quantitative data points (involving detailed inferential questions) had to be collected from our consultant.

While some English data were elicited informally, with standard introspective methods, more controlled methods were needed for the subtle cosuppositional data of Sections 4 and 5.5. We modeled our methods on those we used in ASL fieldwork, using quantitative judgments on a 7-point scale for acceptability as well as for inferential strength. We relied on three informants[5], who were consulted by way of a survey with videos (of the author) which we had previously recorded (see Sprouse and Almeida, 2012, 2013, Sprouse, Schütze and Almeida, 2013 on the general validity of introspective methods for standard linguistic judgments, and Tieu et al. 2017, 2018, 2019 for experimental replications of several gestural judgments that appeared in the literature).

2   Presuppositions triggered by co- and by pro-speech gestures

In this section, we summarize recent results that form the background of the present enterprise: co-speech gestures trigger cosuppositions; and some pro-speech gestures trigger standard presuppositions. We will later see that some classifier predicates in ASL trigger both types of inferences.

2.1   Co-speech gestures trigger cosuppositions[6]

2.1.1   Main idea

It was recently argued (Schlenker 2018a,b) that co-speech gestures trigger presuppositions that are conditionalized on the meaning of the spoken words they modify. To illustrate, the co-speech gesture *UP* in (8) definitely does not trigger the simple presupposition that some lifting will in fact take place, but rather the cosupposition that *if Mary helps her son, lifting will be involved*.

(8)   Will Mary *UP*_⬛⬛⬛ **help** her son?

One possible motivation goes like this: the context should guarantee that the co-speech gesture merely illustrates the expression it modifies, and thus that relative to that context the expression entails the content of the co-speech gesture. In unembedded cases, such as (8), one can posit that the relevant inference must follow from the context of the conversation. But in embedded cases a more sophisticated notion is needed, that of a *local context*. To see why it is needed, consider the example in (9).

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[4] Notations such as *ASL, 34, 1550a,e, 5 judgments* indicate that the relevant sentences appeared in ASL video 34, 1550, that only sentences *a* and *e* (i.e. the first and the fifth) from that paradigm are transcribed, and that averages are computed on the basis of 5 judgments (if no letters followed *34, 1550*, this would indicate that the entire paradigm was transcribed).

[5] We use the term 'consultant' for our ASL consultant (and occasional co-author), who helps construct judgments and is involved in a long-term collaboration. We use the term 'informant' for linguists we surveyed in a more *ad hoc* fashion (though one of them helped with the construction of the data).

[6] This section borrows from Section 3.2 of Schlenker, to appear b.

(9)   If little Johnny takes part in the competition, will his mother UP_ **help** him?
      => if little Johnny takes part in the competition, if his mother helps him, lifting will be involved

The requirement that the content of the gesture follow from the meaning of *help* relative to the global context would give rise to an overly strong inference, namely that *in general*, helping involves lifting. The inference that is in fact derived is narrower: besides the fact that it only applies to Johnny and his mother, it is relativized to the hypothesis that Johnny will take part in the competition; and we thus infer that this kind of competition involves some kind of upward movement.

      In modern theoretical parlance, the entailment need not hold with respect to the *global* context of the sentence, but only with respect to the *local* context obtained by 'updating' the global one with the antecedent of the conditional. The notion of a 'local context' is standardly used to motivate dynamic approaches to presupposition projection in the tradition of Heim 1983. As a first approximation, the local context of an expression recapitulates the semantic content already contributed by expressions that precede it, combined with the context of the conversation. In various theories of presupposition (e.g. Heim 1983, Beaver 2001, Schlenker 2009), if an expression pp' triggers a presupposition p in a sentence S uttered relative to a Context Set C, S is acceptable only if p follows from the local context of pp' in S given C. This condition applies in particular if p is a cosupposition, of the form $p = (p' \Rightarrow q)$, with conditionalization on the at-issue component p'. This means that x UP **help** y can be analyzed as a standard presupposition trigger, which happens to yield a presupposition of the rough form: *if x helps y, lifting is involved*.

2.1.2   *Experimental approach*

Numerous logical environments were discussed in the literature to argue that the inferences triggered by co-speech gestures do indeed project like presuppositions. Because there are also cases in which co-speech gestures make an at-issue contribution (especially under focus, as argued by Esipova 2017), co-speech gestures were treated as weak presupposition triggers (Schlenker 2018a), in the sense that it is easy for their content to be 'locally accommodated'. The main claims were put to experimental test in Tieu et al. 2017, 2018. Their clearest results pertain to an inferential task (Tieu et al. 2018), performed in two separate experiments illustrated in (10) and (11) on the example of the quantifier *none*, with the types inferential questions that assessed existential vs. universal projection (*for at least one vs. for each of these three girls, if she were to use the stairs, she would go up the stairs*).

(10)   **Experiment 1: Target Gestures**

      None of these three girls will **[use the stairs]**.

(11)   **Experiment 2: At-issue controls**

      None of these three girls will use the stairs in **[this direction]**.

      The expected cosuppositional inferences were found in a variety of environments involving *might*, *not*, *each*, *none* and *exactly one*, with some evidence of universal projection in the latter two cases – which is of interest because universal projection under *none* is argued by some (e.g. Chemla 2009) to be a characteristic property of presuppositions. Still, an earlier truth value judgment experiment (Tieu et al. 2017) only found existential projection in these cases.

2.1.3   *Extension to co-sign gestures*

Schlenker 2018b argues that the behavior of co-speech gestures in spoken language has a counterpart in the behavior of co-sign gestures in ASL. The argument is based on the semantic contribution of non-

grammatical facial expressions, as in (12): the disgusted expression co-occurs with the VP *SPEND MONEY*. It is in the scope of *NONE*, but still gives rise to a universal positive inference, namely that it is bad (or difficult) for poor states to spend money; in other words, for each of them, *if it were to spend money, this would be bad (or difficult)*. This behavior is unexpected if facial expressions make an at-issue contribution, but it is expected if they trigger a cosupposition: this explains the conditionalized form of the inference, and also the universal inference under *NONE*.

(12) [6] AMERICA [RICH STATE-rep HELP PEOPLE]ᵦ. [POOR STATE-rep NONE IX-arc-a :-(̲

[SPEND MONEY]]ₐ.
=> it is bad (3/4 judgments) or difficult (1/4 judgment) for poor states to spend money
(in one case, it is taken to be bad to for states in general to spend money; see the detailed data in the Supplementary Materials)
'In the US, rich states help people. But no poor states spend money.' (ASL, 34, 1670d; 4 judgments)
(Schlenker 2018b)

The important lesson for present purposes is that cosuppositions can arguably be triggered by elements that are extrinsic to or parasitic on the modified expressions, be they co-speech gestures or co-sign facial expressions; this will matter when we discuss what is common to all cosuppositions.

2.2   *Pro-speech gestures can trigger standard presuppositions*[7]

In a systematic study of inference types triggered by pro-speech gestures, Schlenker 2019a argues that some speech-replacing gestures trigger standard presuppositions. This pertains in particular to gestures that indicates the shape of an object, as in (13): *TURN-WHEEL* triggers the presupposition that the agent has his hand on a wheel; by contrast, a control of the form *get/be behind the wheel and TURN-WHEEL* fails to trigger such a presupposition – an expected result because the first conjunct suffices to satisfy the presupposition of the second conjunct, with the result that the conjunction as a whole doesn't presuppose anything.

(13)   a. Is John going to (i) TURN-WHEEL-small_ (ii) be behind the wheel and TURN-

WHEEL-small_ .
(i) => John is currently behind a wheel

b If John (i) TURN-WHEEL-small_ (ii) is behind the wheel and TURN-WHEEL-small_

, we'll notice.
(i) => John is currently behind a wheel
(Schlenker 2019a)

We note for purposes of comparison with a helicopter-related paradigm in ASL that Schlenker to appear e provides data involving a gestural verb representing a helicopter take-off, and argues that it gives rise to the same presupposition as the English verb 'take off': in (14)b(i) as well as in other embedding tests, we obtain the inference that the helicopter is initially on the ground, just as with the

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[7] This paragraph borrows from parts of Section 4.1.2 of Schlenker 2019a.

standard trigger *take off* (14)a(i). This is so despite the fact that the gesture $\mathit{TAKE\text{-}OFF\text{-}ROTATING}$ is not a mere code for the verb *take off*: first, because unlike the latter it cannot be applied to an airplane take off; second, because it can be modulated so as to provide information about the manner of the take off, as we will discuss in detail in Section 4.2).

(14) a. At 12:05, will the company's plane (i) take off (ii) be on the ground and then take off?
    (i) => right before 12:05, the company's plane will be on the ground
    (Schlenker 2019a)
    b. At 12:05, will the company's helicopter

    (i) $\mathrm{TAKE\text{-}OFF\text{-}ROTATING\_}$

    (ii) be on the ground and then $\mathrm{TAKE\text{-}OFF\text{-}ROTATING\_}$?
    (i) => right before 12:05, the company's helicopter will be on the ground
    (Schlenker 2019a)

Finally, Tieu et al. 2019 subjected these generalizations to experimental test. Subjects had to indicate their level of endorsement of inferences characteristic of presupposition projection, and of control inferences, including on a modified version of the $\mathit{TURN\text{-}WHEEL}$ example illustrated in (13).

A presuppositional behavior was indeed found. Importantly, Tieu et al. included 'iconicity controls' that suggested that gestures are not just codes for words: by varying the size of the wheel, they could ascertain that subjects drew iconic inferences that would not be triggered by the simplest translations in words (a point also made in Schlenker 2019a).

2.3   *Summary and outlook*

Standard linguistic methods and experimental results converge on two conclusions. First, co-speech gestures trigger (weak) cosuppositions, and this result may extend to some co-sign gestures in ASL. Second, some pro-speech gestures in English trigger standard presuppositions.

These results raise two questions.
1. First, can cosuppositions be triggered by iconic expressions that are not co-speech or co-sign gestures? In initial analyses, it was speculated that the special pragmatic status of these gestures is entirely due to their 'parasitic' nature, namely the fact that they co-occur with a full-fledged word that can be understood without them. We will argue that this initial view was too restrictive: iconic constructions that fully replace some words can also trigger cosuppositions.
2. Second, can standard presuppositions be triggered by highly iconic constructions in sign language? If so, one might need a general theory of iconic presupposition generation. We will see that this is indeed the case.

Our next step is to systematically study a highly iconic construction in ASL, based on classifier predicates. We will see that, depending on its particular realization, it can trigger cosuppositions or standard presuppositions. We will then extend the main findings to pro-speech gestures in English.

3   Presuppositions and cosuppositions of ASL classifier predicates

We turn to an investigation of the presuppositions and cosuppositions triggered by some classifier predicates in ASL. We summarize experimental results on the iconic nature of classifier predicates, and then turn to predicates involving the horizontal or vertical movement of a helicopter: by modulating the classifier predicate and its path, standard presuppositions or cosuppositions may be triggered.

3.1   *The iconic nature of classifier predicates*[8]

Classifier predicates are sign language constructions in which a sign represents the position or

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[8] The content of this summary is partly similar to one that appears in Schlenker, to appear c.

movement of an entity in a highly iconic fashion. Emmorey and Herzig 2003 displayed with experimental means the gradient and iconic nature of the information conveyed. Specifically, they studied a construction involving a classifier representing a small object (a sticker) relative to a handshape representing a flat object (a bar). Deaf signers were asked to provide a geometric representation of the scene. As the classifier's position was gradiently changed relative to the flat object handshape, so was the geometric representation of the scene: the signs were interpreted iconically.

Zucchi 2011 discusses further examples involving the movement of an object, as in (15)a, which describes the movement of a car; it is paraphrased in (15)b.[9]

(15) a. CAR CL-vehicle-DRIVE-BY
b. 'A car drove by *like this*', where the demonstration is produced by the movement of the classifier predicate in signing space (after Zucchi 2011)

The movement of the classifier predicate *CL-vehicle-DRIVE-BY* in signing space tracks in a gradient fashion the movement performed by the relevant car in real space. We will now show that modulation of such paths can trigger standard presuppositions or cosuppositions, as the case may be.

3.2   Comparing iconic triggers and lexical triggers in ASL: initial attempts

In a series of initial attempts, we compared the projection of iconic inferences to standard presuppositions triggered by the verb *CONTINUE*. The data are discussed in greater detail in Appendix I. Besides comparing iconic presuppositions to lexical presuppositions, they have the advantage of testing projection under diverse embeddings, involving *DOUBT, MAYBE, IF,* and *NONE*. They also have two disadvantages. First, they do not contain at-issue controls, i.e. constructions with explicit modifiers that convey comparable information but are not expected to trigger presuppositions. Second, one of our constructions, involving a sudden detour, could potentially be thought to include some kind of focus marking because it involves acceleration of part of a sign; such focus, if real, could affect projection results (M. Esipova, p.c.).

We considered two paradigms, one involving a horizontal path of a helicopter, from a locus referring to Boston to one referring to New York, and one involving a helicopter take-off. In the horizontal paradigm, we investigated a form of the classifier which, for our consultant, serves to represent a large, 2-rotored helicopter. As we will see, this too triggered presuppositions. Quantitative judgments of inferential strength (on a 7-point scale) helped bring out contrasts that could have been hard to tease apart without them, a point to which we come back in Section 3.5.

3.2.1   Horizontal paradigm

The horizontal movement paradigm is illustrated in (18) with embedding under *DOUBT*. In all cases, the lexical word for *HELICOPTER* was introduced with the standard form in (16), but the classifier predicate was represented with two hands, as illustrated in (17)[10] (we turn in the next section to a more standard helicopter classifier predicate, which is just a moving version of (16)). For our consultant, this represented a large helicopter with two rotors, with each hand representing one rotor. We have linked some of the relevant examples to anonymized videos in order help the reader appreciate the details of the iconic representation of the helicopter path.

(16) HELICOPTER (ASL 34, 3530a)

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[9] For Zucchi 2011 and Davidson 2015, classifier predicates genuinely have a demonstrative component, but here we are interested in the data rather than in the analysis.

[10] As Jonathan Lamberton (p.c.) notes, the realization of the 2-rotored (and 2-handed) helicopter varied: sometimes both hands were faced toward locus *b*, sometimes the hands faced each other. The difference is immaterial for our purposes and thus it is not transcribed in the glosses.

(17) Horizontal movement of a 2-rotored helicopter classifier (= *GO-helicopter-large*) (ASL 34, 3530a)
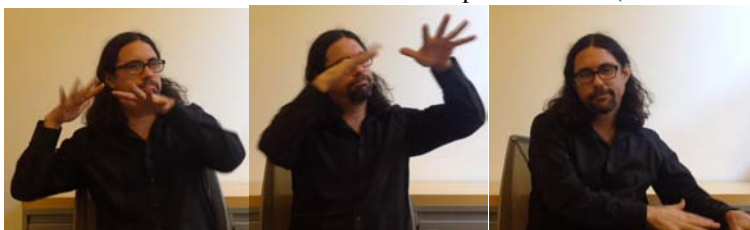
(18) *Context:* our company has one helicopter and one airplane.
WITHIN 1-HOUR OUR COMPANY BIG HELICOPTER BOSTON_a NEW-YORK_b DOUBT a-___-b .
'I doubt that within an hour our company's big helicopter will … from Boston to New York.' (ASL, 34, 3530; 3 judgments) Video: https://youtu.be/I30llXmMgT4

Condition (ASL, 34, 3530; 3 judgments)	Words (replacing ____) and acceptability	Translation (replacing …)
a. neutral path	6.3 GO-helicopter-large_	fly
b. CONTINUE	7 CONTINUE GO-helicopter-large_	continue to fly
c. swaying movement	5.7 GO-helicopter-large_/\/\/_	fly with a swaying movement
d. smooth detour	7 GO-helicopter-large_∩_smooth	fly (with the assumption that this would involve a smooth detour)
e. abrupt detour	6.7 GO-helicopter-large__/__abrupt	make an abrupt detour on its way

Throughout all embedding conditions, acceptability was high, scoring between 6 and 7, with the exception of the c. condition (swaying cosupposition), which was occasionally rated as 5.

What matters for present purposes are the inferences triggered by these constructions. It is important to remember that embedding under *DOUBT*, *MAYBE*, *IF*, and *NONE* was chosen because these are classic presupposition tests: an at-issue entailment would not be expected to project from these environments, but a presupposition (or cosupposition) would. While details are discussed in Appendix I, a summary of the main results is provided in (21). But some explanations are needed first. For propositional embeddings, inferences were assessed in a quantitative fashion by way of the questions in (19) .

(19) **Inferential questions: propositional case**
Does the sentence suggest that any of the following is the case? (1 = no inference; 7 = strongest inference)
Meaning 1: the helicopter has 2 rotors
Meaning 2: the helicopter has been on its way from Boston to NYC
Meaning 3: the helicopter will go from Boston to NYC within the next hour
Meaning 4: if the helicopter were to go from Boston to NYC within the next hour, it would
a. have a swaying-like motion
b. make a smooth detour
c. make an abrupt detour
(only pick the strongest inference among a, b, c)

For embedding under the quantifier *NONE*, questions were subdivided so as to assess both an existential inference and a universal inference, as in (20).

(20) **Inferential questions: embedding under *NONE***
Does the sentence suggest that any of the following is the case? (1 = no inference; 7 = strongest inference)
Meaning 1: a. each b. at least one helicopter has 2 rotors

Meaning 2: a. each b. at least one helicopter has been on its way from Boston to NYC
Meaning 3: a. each b. at least one helicopter <u>will</u> go from Boston to NYC within the next hour
Meaning 4: a. for each b. for at least one helicopter, <u>if</u> it were to go from Boston to NYC within the next hour, it <u>would</u>
a. have a swaying-like motion
b. make a smooth detour
c. make an abrupt detour
(only pick the strongest inference among a, b, c)

There were two reasons for this more complicated statement of the questions, with one version testing universal projection ('each') and another testing existential projection ('at least one'). First, as alluded to in Section 1.1.1, some theorists (e.g. Beaver 2001) argue that presuppositions project existentially under quantifiers, others argue that they project universally (e.g. Heim 1983), and still others that this depends on the quantifier (Chemla 2009, 2010). Second, although Chemla 2009 found strong universal inferences under *none*-type quantifiers in French, even with the lexical presupposition trigger *CONTINUE* our ASL consultant derived fairly weak universal inferences in this case: he endorsed 'At least one helicopter has been on its way from Boston to New York' fairly strongly, but not 'Each helicopter has been on its way from Boston to New York'[11]: existential inferences might thus be crucial.

(21) **Inferences: modulations of a horizontal path for the paradigm such as (18)** (see Appendix I for the full paradigms involving *MAYBE, IF, NONE*)
When there was more than a 2-point difference among scores for a given question, the raw scores appear in parentheses. (*Not*e: average acceptability, which is not reported here, ranged from 5.7 to 7.)

Target sentence / Inferences	Inference type	Inference about the helicopter	DOUBT	MAYBE	IF	NONE	
Video			34, 3530	34, 3540	34, 3518	34, 3552	
Number of judgments			3 judgments	4 judgments	3 judgments	**Universal inference** 2 judgments	**Existential inference** 2 judgments
a. neutral path	**presupposition**	it has 2 rotors	**5.7**	**7**	**6**	3.5	4
b. CONTINUE	**lexical presupposition** [+ 2-rotored presupposition]	it has been on its way from B to NYC	**6.3**	**6.5**	**6.3**	**5**	**6.5**
c. swaying movement	**at-issue? cosupposition?** [+ 2-rotored presupposition]	if it were to fly, it would have a swaying motion	3.3 (2, 3, 5)	3.8 (3, 2, 5, 5)	4.7	3 (5, 1)	3.5 (6, 1)
d. smooth detour	**cosupposition** + 2-rotored presupposition	if it were to fly it would make smooth detour	**6**	**6**	**6**	**6.5**	**6.5**
e. abrupt detour	**presupposition** + 2-rotored presupposition	it will fly from B to NYC	**6.3**	**5.5**	**5.7**	4	**5.5**

Let us explain how the table in (21) should be read. First, it only includes the main inference of interest in each example (more complete results appear in Appendix I). We selected in each case an inference that we believe to be triggered, and thus these ratings are, by construction, rather high. But it can be checked in Appendix I and in the raw data that this is not at all a systematic strategy on the consultant's part (= 'endorse everything'): many further inferences have very low endorsement strengths (we will discuss in Sections 3.3-3.4 more controlled paradigms in which the inferences for our target sentences are contrasted with those obtained in at-issue controls).

The type of the target inference (e.g. presupposition, cosupposition, at-issue) is boldfaced in the second column; additional inferences that are not reported here appear in square brackets. The third column summarizes the nature of the inference in question. The following columns to the right display the strength of the relevant inference in environments that are classic presupposition projection tests: under *DOUBT, MAYBE, IF, NONE*. For instance, line b. in (21) can be read as follows. It assesses the lexical presupposition triggered by *CONTINUE,* as seen in the 1st and in the 2nd columns, to the effect

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[11] Since the universal inference asymmetrically entails the existential inference, it is expected that the latter should be endorsed at least as strongly as the former. But the difference in endorsement strengths is rather striking in this case.

that the helicopter has been on its way from Boston to New York, as seen in the 3rd column. Since all sentences involved a 2-rotored helicopter classifier, they also trigger a presupposition that the helicopter has two rotors, but it is not assessed in line b. (it is assessed in line a., by contrast). We see that the lexical presupposition triggered by *CONTINUE* projects strongly under *DOUBT* (= 6.3), *MAYBE* (= 6.5) and *IF* (= 6.3), with a weaker universal inference under *NONE* (= 5), and a stronger existential inference (= 6.5). For readability, inferential strengths of 5 or more have been boldfaced throughout, but it should be kept in mind that this an arbitrary threshold.

Several conclusions can be drawn by inspecting this summary table:

(i) The inference that the helicopter has two rotors projects roughly like the presupposition triggered by *CONTINUE*, albeit more weakly under *NONE*. (Data are provided for the a. sentence only in (18), but the '2-rotored' inference was also tested in other conditions, as seen in Appendix I).

(ii) The same conclusion applies to the 'abrupt detour' sentence type in (18)e: a presupposition seems to be triggered to the effect that the helicopter will in fact fly from Boston to New York. For instance, in the case of embedding under *DOUBT*, what is denied is that there will be such an abrupt detour, but not that the trip will take place.

(iii) Very different results are obtained in the 'smooth detour' condition illustrated in (18)d: here no strong inference is obtained that the trip will take place (as can be checked in Appendix I), but a cosupposition seems to be triggered to the effect that *if the helicopter were to go from Boston to New York, it would have a curved path*.

(iv) The 'swaying' condition illustrated in (18)c does not trigger a significant cosupposition, contrary to our initial expectation (which is the reason we report the purported cosuppostional inference in this case): projection strength is very weak.

Thus using *CONTINUE* as a baseline, we can conclude that in this case iconic presuppositions pertaining to shape (two rotors) and to movement (the helicopter will fly from Boston to New York) can be triggered depending on the realization of the classifier predicate, and that further modifications can trigger cosuppositions as well (to the effect that if the helicopter were to fly from Boston to New York, it would have a curved path).

3.2.2 *Vertical paradigm*

Related conclusions can be reached on the basis of a different paradigm, involving a helicopter take-off. Here too, we investigated presupposition projection under *DOUBT, MAYBE, IF,* and *NONE*. The paradigm is illustrated in the case of embedding under *MAYBE* in (23). The helicopter predicate classifier is now a moving version of the noun *HELICOPTER* seen in (18), and correspondingly the inference that the helicopter has two rotors stops being relevant. But because the movement corresponds to a take-off, we can assess instead a different inference, to the effect that the helicopter is currently on the ground. The simple version of the take-off, corresponding to (23)a, is illustrated in (22).

(22) Vertical movement of a helicopter (ASL 34, 3556a)
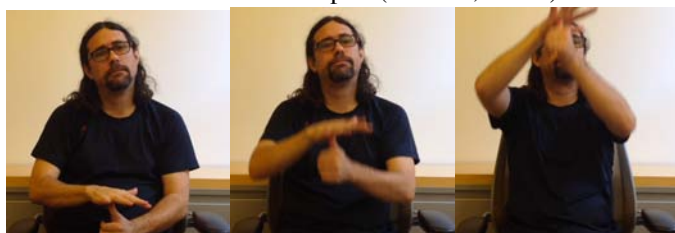
(23) *Context:* our company has one helicopter and one airplane.
WITHIN 5-MINUTES OUR COMPANY HELICOPTER MAYBE _____ .
'Within the next five minutes, maybe our company's helicopter will ____.' (ASL, 34, 3556; 3 judgments)
Video: https://youtu.be/wsw0B-snCbA

Condition (ASL, 34, 3556; 3 judgments)	Words (replacing ____) and acceptability	Translation
a. neutral path	[7] GO-helicopter-up_	take off
b. CONTINUE	[7] CONTINUE GO-helicopter-	continue to take off

	up_	
c. circling motion	[7] GO-helicopter-up_circling	take off (with the assumption that this would involve a circular motion)
d. undulating motion	[7] GO-helicopter-up_undulate_smooth	take off with a swaying motion
e. abrupt detour	[6,7] GO-helicopter-up__/__abrupt	make an abrupt detour during take off

The helicopter is initially represented as being on the ground (although the movement starts at slightly different heights in different conditions). The lexical trigger *CONTINUE* gives rise to the presupposition that the helicopter has been taking off, which makes it unlikely that it is still on the ground.[12] In all cases except under *CONTINUE,* the representation of the helicopter as being initially on the ground triggers a presupposition that it is currently on the ground. This 'on the ground' presupposition might be viewed as purely iconic, or it might be lexical in nature, as is natural for the English verb *take off*, as illustrated in (14). But it is worth noting that in English a pro-speech gesture representing a helicopter take-off, as in (14), can also trigger this presupposition – and in this case its source is probably iconic rather than lexical, since the gesture isn't a conventional one. Thus we could just as well analyze the ASL 'on the ground' presupposition as being triggered by iconic means. Presuppositional and cosuppositional inferences obtained for our ASL 'take-off' paradigm are summarized in (24) (see Appendix I for further details).

(24) **Inferences: modulations of a vertical path**
When there was more than a 2-point difference among scores for a given question, the raw scores appear in parentheses. (*Not*e: average acceptability, which is not reported here, ranged from 6 to 7.)

Target sentence / Inferences	Inference type	Inference about the helicopter	DOUBT	MAYBE	IF	NONE	
Video			34, 3562	34, 3556	34, 3568	34, 3570	
Number of judgments			2 judgments	3 judgments	3 judgments	**Universal inference** 2 judgments	**Existential inference** 2 judgments
a. neutral path	**on ground presupposition**	it is currently on the ground	**6.5**	**6.3**	**6.3**	3 (1, 5)	3.5 (2, 5)
b. CONTINUE	**lexical presupposition**	it is currently taking off	**6**	**6**	**5.3**	4.5	**6**
c. circling motion	**cosupposition** [+ on ground presupposition]	if it were to take off within the next 5 minutes, it would do so with a circular motion	**5**	**5.7**	4.3	**5**	**6**
d. undulating motion	**cosupposition** [+ on ground presupposition]	if it were to take off within the next 5 minutes, it would do so with an undulating motion	**5.5**	**5.3**	4.7	4.5	**5.5**
e. abrupt detour	**presupposition** [+ on ground presupposition]	it will take off in the next 5 minutes	**5**	**5**	4	3	4.5

Several conclusions can be drawn by inspecting this summary table:
(i) Under propositional operators (*DOUBT, MAYBE, IF*), the inference that the helicopter is currently on the ground projects roughly like the presupposition triggered by *CONTINUE* (data are provided for the a. sentence type in (23), but the 'on the ground' inference exists in the other conditions as well except under *CONTINUE*, as can be seen in Appendix I). Projection of the 'on the ground' presupposition appears to be weaker and variable under *NONE* (although we don't know why).
(ii) A weak presuppositional inference that the take-off will take place is to some extent triggered in the 'abrupt detour' condition in (23)e, especially under *DOUBT* and *MAYBE*. By contrast, it can be checked in Appendix I that the c. and d. conditions ('circling motion' and 'undulating motion') do not give rise

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[12] In addition, the predicate classifier starts a bit higher in this case than in some other conditions.

to a significant inference that the take-off will in fact take place.

(iii) In the 'circling movement' and in the 'undulating motion' conditions illustrated in (18)c,d, a cosupposition seems to be triggered to the effect that if the helicopter were to take off, this would involve a circling movement or an undulating motion, except under *IF* (for reasons unknown to us).

3.2.3   Weaknesses

Taken together, these results argue for presuppositions and cosuppositions can be triggered on iconic grounds. These paradigms have two weaknesses, however. The main one is that they do not compare presuppositions to comparable at-issue inferences. Ideally, one would want to show that the crucial inferences we obtain are genuinely due to presuppositions rather than to complex reasoning that would take place even if these inferences were linguistically at-issue. While it is not trivial to see how the reasoning would go, it would be reassuring to have more controlled paradigms in which presuppositional information is *contrasted* with comparable at-issue information.

Less importantly, the 'abrupt detour' condition might raise a question: as noted by M. Esipova (p.c.), the abruptness of the realization might conceivably make the 'detour' part prominent.[13] One could thus take this abrupt detour to be prominent or even focused. This could interact with the inferential task, because elements that are given (i.e. not in focus) can trigger what we may call 'pseudo-presuppositions'. Consider a sentence such as *Maybe the helicopter will fly FAST tomorrow*, with focus on *fast*. The non-focused part of the clause is 'given'. But it has often been observed in the literature that given material can be treated as presupposed if its 'given' status is not justified by the preceding discourse. This doesn't entail that givenness effects are intrinsically presuppositional, as emphasized by several researchers (see for instance Büring 2012). But this could cloud the source of some of the effects. As we will see in the next section, when the detour is less abrupt (and larger) while remaining orthogonal, the presuppositional effect is weakened.

3.3   Controlled paradigms I: Horizontal movement

In order to address the concerns raised at the end of the preceding section, we investigated more tightly controlled paradigms which included both target presuppositional and cosuppositional conditions, and controls involving explicit modifiers that are expected to be at-issue. Due to the large number of questions involved, we restricted attention to two particularly informative environments: embedding under *IF*, and under *MAYBE*. As was the case in Section 3.2, we explored both a paradigm involving the horizontal movement of a 2-rotored helicopter, and the vertical movement of a normal helicopter.

Our paradigm with horizontal movement and embedding under *IF* appears in (25) with acceptability judgments.

(25)   *Horizontal movement, IF*
        Context: our company has one helicopter and one airplane.
        WITHIN 1-HOUR OUR COMPANY BIG HELICOPTER BOSTON$_a$ NEW-YORK$_b$ **IF** a-_____-b, 2-EMAIL-1.
        'If within the next hour our company's big helicopter … from Boston to New York, e-mail me.'
        (ASL, 34, 3637; 3 judgments) Video: https://youtu.be/Ll5j0fqRQHU

Condition (ASL, 34, 3637; 3 judgments)	Words (replacing ____) and acceptability	Translation (replacing …)
a. neutral path	[7] GO-helicopter-large_	flies
b. curved path	[7] GO-helicopter-large_∩_smooth	flies (with the assumption that this would involve a curved path)
c. at-issue control of curved path	[5.3] GO-helicopter-large_ WITH _∩_smooth	flies with a curved path
d. orthogonal detour	[6.7] GO-helicopter-	makes an orthogonal detour on its

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[13] Typically focus in ASL also involves raised eyebrows, which are not present in our examples, but this doesn't preclude the possibility that manual intensification without raised eyebrows could mark focus as well. As Wilbur 1999 notes, in ASL "the primary indicator of stress marking is the significant increase in peak velocity of prominent signs".

	large__|__no_acceleration	way
e. at-issue control of orthogonal detour	[5.7] GO-helicopter-large_ WITH __|__no_acceleration	flies with an orthogonal detour on its way
f. pause in the middle	[6.7] GO-helicopter-large__ __	pauses to hover on its way
g. at-issue control of pause in the middle	[6.7] GO-helicopter-large__ WITH PAUSE __ __	flies with a pause to hover on its way

In all parts of the paradigm, the helicopter predicate classifier is two-handed and represents a 2-rotored helicopter, as was the case in (17). Besides a condition involving a neutral path in (25)a, three targets and three controls are considered.

• (25)b involves a classifier predicate following a curved path. The control in (25)c involves the predicate classifier with the neutral path in (17)a, but with an explicit modifier *WITH _∩_smooth*, where *WITH* is the lexical preposition, and _∩_smooth traces a curved path with the index finger of the dominant hand.

• (25)d involved an orthogonal deviation from the main path, but contrary to the abrupt deviations of Section 3.2, it was realized smoothly, without acceleration. (25)e is a control in which the classifier predicate with a neutral path is used, together with an explicit modifier *WITH __|__ no_acceleration*, tracing with the dominant hand the excursion from the path (represented by the non-dominant hand).

• (25)f is a modification of the neutral path in which there is a long pause in the middle, representing the helicopter hovering without movement somewhere between Boston and New York. (25)g is a control with an explicit modifier *WITH PAUSE __ __* , involving the lexical words *IF* and *PAUSE*, and an iconic representation of the 2-rotored hovering helicopter.

Inferential questions sought to assess the existence of presuppositional or cosuppositional inferences. Quantitative inferential questions were stated as in (26). Since the paradigm was presented in a single video, judgments pertaining to acceptability (reported in (25)) and inferential strength were contrastive as well as quantitative. Note that the question called *Meaning 2* tests an inference that one would expect to find with *CONTINUE* but not with the present paradigm; it can be taken to establish the baseline for an inference that is *not* expected to arise in this case.

(26) Quantitatively assessed inferences for the paradigm in (25)
Does the sentence suggest that any of the following is the case? (1 = no inference; 7 = strongest inference)
Meaning 1: the helicopter has 2 rotors
Meaning 2: the helicopter has been on its way from Boston to NYC
Meaning 3: the helicopter <u>will</u> go from Boston to NYC within the next hour
Meaning 4: <u>if</u> the helicopter were to go from Boston to NYC within the next hour, it <u>would</u>
a. make a smooth detour
b. make an orthogonal detour
c. stop and hover on its way
(only pick the strongest inference among a, b, c)

A second paradigm was constructed in the same way as (25)-(26), but with the second line (*IF ___, 2-EMAIL-1*) replaced with *MAYBE*, as shown in (27). Thus the meaning obtained for the baseline, modified from (25), was something like: 'Within the next hour, maybe our company's big helicopter will fly from Boston to New York'. This made it possible to investigate the projection of various inferences under *MAYBE*.

(27) *Context:* our company has one helicopter and one airplane.
WITHIN 1-HOUR OUR COMPANY BIG HELICOPTER BOSTON_a NEW-YORK_b **MAYBE** a-____-b.
'Within the next hour, maybe our company's big helicopter will ____ from Boston to New York.'
(ASL, 34, 3633; 3 judgments) Video: https://youtu.be/f324CA7wwWU

Condition (ASL, 34, 3633; 3 judgments)	**Words** (replacing ____) **and acceptability**	**Translation**
a. neutral path	[7] GO-helicopter-large_	fly
b. curved path	[7] GO-helicopter-large_∩_smooth	fly (with the assumption that this would involve a curved path)
c. at-issue control of curved path	[5] GO-helicopter-large_ WITH _∩_smooth	fly with a curved path

d. orthogonal detour	[6.7] GO-helicopter-large__|__no_acceleration	make an orthogonal detour on its way
e. at-issue control of orthogonal detour	[5.3] GO-helicopter-large_ WITH __|__no_acceleration	fly with an orthogonal detour on its way
f. pause in the middle	[7] GO-helicopter-large__ __	pause to hover on its way
g. at-issue control of pause in the middle	[6.7] GO-helicopter-large__ WITH PAUSE __ __	fly with a pause to hover on its way

Inferential results are given in (28) for embedding under *IF* and in (29) for embedding under *MAYBE*. As before we have boldfaced inferential strengths at or above 5, but now we can contrast those with control inferences triggered by at-issue modifiers.

(28) **Horizontal movement, *IF*: inferential results**

Target sentence / Inferences (ASL, 34, 3637; 3 judgments)	Inference type	1. Helicopter has 2 rotors	2. Helicopter has been on its way from B to NYC	3. Helicopter will go from B to NYC	4. If the helicopter goes from B to NYC, ____ (= strongest conditional inference)
a. neutral path	at-issue + 2-rotored presupposition	**6.7**	2	1.7	1
b. curved path	cosupposition + 2-rotored presupposition	**7**	1	1.7 (smooth detour)	**5.3** (smooth detour)
c. at-issue control of curved path	at-issue + 2-rotored presupposition	**6.3**	1.3	3.3 (smooth detour)	2 (smooth detour)
d. orthogonal detour	presupposition + 2-rotored presupposition	**7**	1.7	**5** (orthogonal detour)	2 (orthogonal detour)
e. at-issue control of orthogonal detour	at-issue? + 2-rotored presupposition	**6.3**	1.7	3.7 (orthogonal detour)	2 (orthogonal detour)
f. pause in the middle	presupposition + 2-rotored presupposition	**6.7**	2.3	**5.7** (stop and hover)	2 (stop and hover)
g. at-issue control of pause in the middle	at-issue + 2-rotored presupposition	**6.3**	1.7	3.3 (stop and hover)	2 (stop and hover)

(29) **Horizontal movement, *MAYBE*: inferential results**

Target sentence / Inferences (ASL, 34, 3633; 3 judgments)	Inference type	1. Helicopter has 2 rotors	2. Helicopter has been on its way from B to NYC	3. Helicopter will go from B to NYC	4. If the helicopter goes from B to NYC, ____ (= strongest conditional inference)
a. neutral path	at-issue + 2-rotored presupposition	**7**	1	1.3	1
b. curved path	cosupposition + 2-rotored presupposition	**7**	1	1.7 (smooth detour)	**5.7** (smooth detour)
c. at-issue control of curved path	at-issue + 2-rotored presupposition	**6.7**	1.3	2 (smooth detour)	2.3 (smooth detour)
d. orthogonal detour	at-issue? + 2-rotored presupposition	**7**	1.7	3.7 (5, 2, 4) (orthogonal detour)	2 (orthogonal detour)
e. at-issue control of orthogonal detour	at-issue? + 2-rotored presupposition	**6.7**	1.3	3 (4, 3, 2)[14] (orthogonal detour)	2.3 (orthogonal detour)
f. pause in the middle	presupposition + 2-rotored presupposition	**7**	2	4.7 (stop and hover)	2 (stop and hover)
g. at-issue control of pause in the middle	at-issue + 2-rotored presupposition	**7**	1.3	3 (stop and hover)	2.3 (stop and hover)

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[14] We provide the full scores although they don't display more than a 2-point difference; this is to facilitate comparison with the d. condition, 'orthogonal detour'.

Several conclusions can be drawn.

(i) In all conditions, we obtain in Column 1 a strong presuppositional inference that the helicopter has two rotors. This confirms results of earlier paradigms, but this particular presupposition does not come with an at-issue control (which would have involved an explicit modifier to the effect that the big helicopter had two rotors). At this point, then, we just replicate our earlier results.

(ii) In the b. sentences of both paradigms, we obtain a relatively strong cosupposition to the effect that, if the helicopter were to go from Boston to New York, it would have a curved path. Strikingly, this inference is quite a bit weaker in the at-issue control displayed in the c. sentences. This suggests that the cosuppositional inference is genuinely due to the path traced by the predicate classifier, rather than to common sense reasoning interacting with an at-issue contribution.

(iii) In (28), there is only a small difference between the d. sentence (orthogonal detour) and the e. sentence (at-issue control of orthogonal detour), and in (29) any difference is unclear and the judgments are unstable. Whereas in the paradigm of Section 3.2.1 a sudden orthogonal detour gave rise to the presupposition that the helicopter will fly from Boston to New York, the effect is lost with the new realization of the orthogonal detour, which is much larger than in the earlier case and involves no acceleration. This might be because the earlier realization was taken to involve some kind of linguistic focus (M. Esipova's suggestion). But the contrast might be due to something else: in (25)d and (27)d, the orthogonal detour was very large, and might have been indicative of a planned detour as opposed to an unexpected one. In Appendix II, we investigate a paradigm with embedding under *MAYBE*, and an additional clause involving ellipsis (which is irrelevant for the present discussion, but is discussed for other reasons in Section 5). The unelided part of the 'orthogonal detour' condition as well as the corresponding control are very similar to our conditions with *MAYBE* in (27)d,e, but with one important difference: we asked the consultant to realize the orthogonal detour (in (72)f in Appendix II) as being smooth but smaller than (27)d. The corresponding inferential judgment displays a presuppositional inference that the helicopter will in fact make the trip (inferential strength of 6 for the target, of 2.3 for the at-issue control, Column 3a of (74)f,g).

(iv) Despite our failure to trigger a presupposition in the d. sentences in the present paradigm (although we did succeed in Appendix II), a completely different modification, involving hovering of the helicopter mid-way through its movement, does give rise to a presupposition that it will go from Boston to New York. Certainly no acceleration is involved in this case, since the helicopter represented as hovering involves *less* movement than the rest of the iconic representation.[15] The inferential effect can be seen in the f. sentences, especially under *IF*, where the inferential strength is of 5.7; the inferential strength is only of 4.7 under *MAYBE*. In both cases, the at-issue controls in the g. sentences give rise to weaker inferences to the same effect (3.7 under *IF*, 3 under *MAYBE*). The unelided part of similar sentences with embedding under *MAYBE* in (72)h,i in Appendix II yield the same conclusions (the presupposition that the helicopter will make the trip is endorsed with strength 5.7 for the target and for 2.7 for the at-issue control, as seen in Column 3a of (74)h,i).

3.4 *Controlled paradigms II: Vertical movement*

We also studied a paradigm pertaining to the take-off of a normal helicopter (with modifications of the normal helicopter classifier predicate in (22)). Here too, we investigated embedding under *IF*, as shown in (30), and under *MAYBE,* as shown in (31).

(30) *Context:* our company has one helicopter and one airplane.
WITHIN 5-MINUTES OUR COMPANY HELICOPTER **IF** _____, 2-CALL-1.
'If within the next five minutes our company's helicopter …, call me.'
(ASL, 34, 3647; 3 judgments)

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[15] One could argue that longer duration can be used to mark focus (e.g. Schlenker et al. 2016). Thus one could try to analyze this example as well as involving a kind of focus on the hovering part, which would make it necessary to study further 'focus-free' paradigms in the future.

Video[16]: https://youtu.be/tJ8xD-tu7qo

Condition (ASL, 34, 3647; 3 judgments)	Words (replacing _____) and acceptability	Translation (replacing …)
a. neutral take-off	[7] GO-helicopter-up__	takes off
b. curved path	[7] GO-helicopter-up_∩_smooth	takes off (with the assumption that this would involve a curved path)
c. at-issue control of curved path	[6] GO-helicopter-up__ WITH PATH _∩_smooth	takes off with a curved path
d. orthogonal detour	[6.3] GO-helicopter-up__|__ no_acceleration	takes off with a horizontal detour
e. at-issue control of orthogonal detour	[5.7] GO-helicopter-up__ WITH PATH __|__ no_acceleration	takes off with a horizontal detour
f. pause in the middle	[6.7] GO-helicopter-up __ __	pauses to hover during its take-off
g. at-issue control of orthogonal detour	[6.7] GO-helicopter-up__ WITH PAUSE __ __	takes off with a pause to hover

(31) WITHIN 5-MINUTES OUR COMPANY HELICOPTER MAYBE _____ .
'Within the next five minutes, maybe our company's helicopter will ….'
(ASL, 34, 3643; 3 judgments) Video: https://youtu.be/xHe5UybzM9M

Condition (ASL, 34, 3643; 3 judgments)	Words (replacing _____) and acceptability	Translation (replacing …)
a. neutral take-off	[7] GO-helicopter-up__	take off
b. curved path	[7] GO-helicopter-up_∩_smooth	take off (with the assumption that this would involve a curved path)
c. at-issue control of curved path	[6.3] GO-helicopter-up__ WITH PATH _∩_smooth	take off with a curved path
d. orthogonal detour	[7] GO-helicopter-up__|__ no_acceleration	take off with a horizontal detour
e. at-issue control of orthogonal detour	[5.7] GO-helicopter-up__ WITH PATH __|__ no_acceleration	take off with a horizontal detour
f. pause in the middle	[6.7] GO-helicopter-up __ __	pause to hover during take-off
g. at-issue control of orthogonal detour	[7] GO-helicopter-up__ WITH PAUSE __ __	take off with a pause to hover

As before, inferential strength was assessed by way of quantitative questions, illustrated in (32). As before, the *Meaning 2* question tests an inference that one would expect to find with *CONTINUE* but not with the present paradigm (and thus it establishes the baseline for an inference that is not expected to arise).

(32) Quantitatively assessed inferences for the paradigm in (30)
Does the sentence suggest that any of the following is the case? (1 = no inference; 7 = strongest inference)
Meaning 1: the helicopter is currently on the ground
Meaning 2: the helicopter is currently taking off
Meaning 3: the helicopter <u>will</u> take off in the next 5 minutes
Meaning 4: <u>if</u> the helicopter were to take off within the next 5 minutes, it <u>would</u>
a. do so with a curved path
b. do so with an orthogonal horizontal detour
c. stop and hover on its way
(only pick the strongest inference among a, b, c)

Results for embedding under *IF* are displayed in (33) and those for embedding under *MAYBE* appear in (34).

(33) Vertical movement, *IF*: inferential results

Target sentence / Inferences (ASL, 34, 3647; 3	Inference type	1. Helicopter is currently on the ground	2. Helicopter is currently taking off	3. Helicopter will take off in the next 5 minutes	4. If the helicopter takes off within 5 minutes ____

---

[16] There was a false start for (30) (… *WITH PAUSE*…): the consultant aborts a sentence and immediately starts again.

judgments)					(= strongest conditional inference)
a. neutral path	**at-issue** + on ground presupposition	**6.7**	1	1.7	1
b. curved path	**cosupposition** + on ground presupposition	**6.7**	1	1.7 (curved path)	**5.3** (curved path)
c. at-issue control of curved path	**at-issue** + on ground presupposition	**6.3**	1	3.3 (curved path)	2 (curved path)
d. orthogonal detour	**presupposition?** + on ground presupposition	**6.7**	1.3	4 (orthogonal horizontal detour)	2 (orthogonal horizontal detour)
e. at-issue control of orthogonal detour	**at-issue?** + on ground presupposition	**6.3**	1	3.3 (orthogonal horizontal detour)	2 (orthogonal horizontal detour)
f. pause in the middle	**presupposition** + on ground presupposition	**6.7**	1.3	4.7 (stop and hover)	2 (stop and hover)
g. at-issue control of pause in the middle	**at-issue** + on ground presupposition	**6.3**	1	3.3 (stop and hover)	2 (stop and hover)

(34)   Vertical movement, *MAYBE*: inferential results

Target sentence / Inferences (ASL, 34, 3643; 3 judgments)	**Inference type**	**1. Helicopter is currently on the ground**	**2. Helicopter is currently taking off**	**3. Helicopter will take off in the next 5 minutes**	**4. If the helicopter takes off within 5 minutes ____ (= strongest conditional inference)**
a. neutral path	**at-issue** + on ground presupposition	**6.7**	1	1.7	1
b. curved path	**cosupposition** + on ground presupposition	**6.7**	1	2	**5.7 (curved path)**
c. at-issue control of curved path	**at-issue** + on ground presupposition	**6.3**	1	3	2.7 (curved path)
d. orthogonal detour	**presupposition?** + on ground presupposition	**6.7**	1.3	3.3 (5, 2, 3)	2.3 (orthogonal horizontal detour)
e. at-issue control of orthogonal detour	**at-issue?** + on ground presupposition	**6.3**	1	2.7	2.3 (orthogonal horizontal detour)
f. pause in the middle	**presupposition** + on ground presupposition	**6.3**	1.3	4	2 (stop and hover)
g. at-issue control of pause in the middle	**at-issue** + on ground presupposition	**6.7**	1	3.7	2.7 (stop and hover)

Conclusions are less sharp than for the horizontal paradigm, but they go in the same general direction. In addition, the '2-rotored presupposition' is now replaced with an 'on the ground' presupposition.

(i) In all conditions, we obtain the strong presuppositional inference that the helicopter is currently on the ground.

(ii) In the b. sentences (curved path), we obtain a relatively strong cosupposition to the effect that, if the helicopter were to take off, it would have a curved path. Strikingly, this inference is far weaker in the at-issue control in the target c. sentences.

(iii) As in the horizontal paradigm, and probably for the same reasons, there is little difference between sentences d. and e.: the orthogonal detour fails to trigger a presupposition. But here too, it is worth considering the data collected for other purposes (involving ellipsis) in Appendix II: an unelided sentence extremely similar to (31)d, displayed in (75)f, triggered a relatively strong inference that the take-off will take place, as shown in (76)f (Column 3a, inferential strength of 4.7); the at-issue control in (75)g failed to yield this inference ((76)g, Column 3a, inferential strength of 2.7). Importantly, the sentence in (76)f was similar to (31)d in eschewing any abruptness in the detour, but the detour was

smaller than in (31)d, which might have helped suggested that it was unexpected rather than planned. (iv) A realization of the predicate classifier in which the helicopter pauses to hover during take-off gives rise to an inference that the take-off will take place, but it is weaker than in our horizontal paradigm and thus one should not jump to conclusions in this case.

3.5   The importance of quantitative inferential judgments

One methodological remark should be added. While our results have obvious limitations (due to the use of a single consultant), they are based on numerous (and time-consuming!) judgments of inferential strength that were obtained in a quantitative fashion. It is striking that, for our consultant at least (who has considerable experience working with introspective judgments), this method made it possible to bring out subtle contrasts among inferential types (at-issue, presuppositional, cosuppositional), despite the relative weakness of some of the phenomena.[17] While quantitative judgments of inferential strength are now standard in experiment work, using them in fieldwork, including on sign language, could continue to prove useful in the future.[18]

3.6   Summary and outlook

3.6.1   Main results

Having shown in Section 2 that in English co-speech gestures trigger cosuppositions, and that pro-speech gestures may trigger standard presuppositions, we suggested in Sections 3.2 that ASL classifier predicates may, depending on their realization, trigger standard presuppositions or cosuppositions. In Sections 3.3-3.4, we systematically compared iconically modified classifier predicates with at-issue controls involving explicit modifiers. The contrasts obtained make it unlikely that world knowledge alone is responsible for the observed inferences: the at-issue controls provide essentially the same overall information as the iconically modified targets, and thus world knowledge should interact in the same way with this informatinal contribution as in the targets; still, presuppositions and cosuppositions are triggered in targets but not in controls.

3.6.2   The role of at-issue controls

A cautionary note is in order, however: there is only so much we can do in terms of controls, and the controls we used come with their own pragmatic requirements. Since our results assess in part the *difference* between the targets and the at-issue controls, it is essential to understand these requirements in order to determine what role, if any, they play in the difference. For instance, *The helicopter took off with movement X* comes with a pragmatic requirement that the modifier *with movement X* should not be semantically idle. This immediately explains why *The helicopter took off with an upward movement* is an odd thing to say: take-offs are *supposed* to involve an upward movement, hence the at-issue modifier doesn't add anything and is deviant. Thus it should not be the case that, relative to the relevant context, *the helicopter took off with movement X* should be equivalent to *the helicopter took off*.[19]

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[17] Our consultant noted that the inferential part of his task was made easier, not harder, by using quantitative judgments of inferential strength. Without these, he had to reflect at length about how to categorize judgments of intermediate strength; the quantitative method allowed for less arbitrary decisions in such cases. (The fact that our consultant has many years of experience with introspective judgments might of course have played a role in this impression.)

[18] Two remarks should be added. In the general case, graded inferential judgments "may help detect otherwise hidden effects", as is explicitly discussed by Cremers and Chemla 2017. In addition, quantitative assessment is particularly important in work on presuppositions because presupposition triggers can give rise to 'local accommodation' (= the phenomenon by which, at some cost, a presupposition gets turned into an at-issue contribution and fails to project; Beaver 2010, Tonhauser et al. to appear). As a result, presuppositional effects can be subtle, in a way that depends on the trigger (descriptively, some triggers are more conducive to local accommodation than others). Detecting subtle inferential effects is thus of the essence.

[19] According to Stalnaker 1978, an expression should not be trivial relative to (i.e. follow from) its local context. On the assumption that the local context of the modifier includes the semantic content of the verb it modifies, we obtain the condition that *The helicopter took off* should not be presupposed to entail *The helicopter took off with*

In the case at hand, our at-issue controls trigger a non-triviality inference that goes against the purported cosupposition. This is because the cosupposition *if the helicopter were to take off, this would involve movement X* leads to the prohibited equivalence: on the assumption that *take-off => take-off with movement X*, we get the unwanted equivalence *take-off <=> take-off with movement X* (because the right-to-left direction of the equivalence is trivial). The pragmatic prohibition against such cases will on its own create part of the difference between our cosuppositional targets and these at-issue controls. This problem is unavoidable when one compares cosuppositional targets with modified expressions with the same truth conditions. Still, it is reassuring that not just the *difference* between our targets and the controls is informative; the targets give rise to strong inferences on their own.[20]

Turning to the simple presuppositions of the form *the helicopter will in fact go from Boston to New York*, or *the helicopter will in fact take off*, our controls introduce small biases that go in the opposite direction, in the sense that they should make it *harder* for us to detect the desired differences. In this case, the non-triviality of the modifier does not go against the presupposition: one can for instance presuppose that the helicopter will take off while obeying the requirement that the manner of movement should be non-trivial. But there is another potential effect to keep in mind. It is conceivable that a sentence such as *the helicopter will take off with a pause in the middle* tends to be interpreted with focus on the modifier, which is final (both in ASL and in English), in which case the rest of the VP might be interpreted as 'given' - a phenomenon which, as mentioned above, sometimes gives rise to presupposition-like inferences, such as: *the helicopter will take off. Despite* this potential effect, our presuppositional targets with pauses (or orthogonal detours, see Appendix II) give rise to much stronger inferences than the at-issue controls with modifiers, suggesting that the desired effect is robust.[21]

3.6.3   New questions

While these methodological issues should be kept in mind in future research, they should not obscure our main finding, which pertains to the existence of iconically triggered presuppositions and cosuppositions with ASL classifier predicates. Our results raise a question about pro-speech gestures in English: could they be modulated in comparable ways to ASL predicate classifiers so as to trigger not just standard presuppositions but also cosuppositions? We give a positive answer in the next section.

4   Triggering cosuppositions with pro-speech gestures

In order to show that pro-speech gestures can trigger cosuppositions, it would be particularly natural to explore constructions that are directly inspired by ASL classifier predicates, such as ones involving the path of a helicopter or a missile flying, or of a person walking. Our preliminary attempts suggested that the data might be overly subtle for an initial exploration, and thus we take a less direct route. First, in order to have gestural cases are that are conceptually similar to co-speech gestures modifying full words, we consider various gestural constructions in which one element, for instance a facial expression, modifies a pro-speech gesture, but is easily separable from it, and intuitively makes a less important contribution (e.g. because it is omissible whereas the pro-speech gesture isn't). As we will see, the less important expression typically triggers a cosupposition. Second, we extend the finding to cases in which it an inseparable property of a gesture (the manner in which it is realized, rather than an add-on to it)

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movement X. Technically, this non-triviality requirement is an antipresupposition (Sauerland 2003, 2008; Percus 2006; Singh 2011; Schlenker 2012; Anvari 2018). For a derivation of the deviance of related cases in which a complex expression competes with structurally simpler alternatives, see Katzir 2007 and Katzir and Fox 2011.

[20] It is worth noting that the problem discussed in this section (to the effect that controls could be responsible for the desired) is pervasive in presupposition theory. For instance, in (14) above, we argued for the presuppositional behavior of the English verb *take off* by displaying a contrast between *Will the company's plane take off?* and *Will the company's plane be on the ground and then take off?* The traditional idea is that in the second sentence the underlined expression is at-issue and justifies the presupposition of *take off*, with the result that the entire conjunction is presuppositionless, hence should not give rise to a projection behavior. But the first conjunct comes with its own non-triviality requirement: it should not be presupposed that the plane is on the ground (this case immediately follows from conditions stated in Stalnaker 1978, see fn. 19). The contrast between the target and the at-issue control is thus due in part to this antipresupposition.

[21] See fn. 15 for some qualifications, however.

triggers a cosupposition; these cases will be close to the path modifications of our ASL classifier predicates.

To obtain judgments comparable to our ASL data, we conducted a detailed survey with three informants, all native speakers of American English (two from the United States, one from Canada). All are linguists and thus have considerable experience with acceptability and inferential judgments (as does our ASL consultant); two of them have worked on gestures, and none is a signer. We modeled our methods on those we used to elicit ASL data: acceptability as well as inferential judgments were recorded on a 7-point scale (with 7 = best for acceptability, and 7= strongest inference for inferential strength). One important difference is that the author rather than the informants recorded the videos; this was to ensure that gesture modifications were realized in exactly the desired way. In order to mitigate any inadequacies of the author as a model (a different line of work), informants were encouraged to "repeat the sentences for [themselves] with the same gestures in order to get a feel for acceptability or inferential contrasts".[22] Acceptability judgments suggest that videos were good enough to be assessed. Only averages will be discussed below, but raw data and informant comments can be found in the Supplementary Materials B.

4.1 Cosuppositions triggered by modifications of LIFT

Our first example contrasts three realizations of a lifting gesture, which we illustrate on the case of embedding in a question as in (35), which includes: a neutral lifting gesture, glossed as $LIFT$ in (35)a; a manual lifting gesture realized with difficulty (trembling hands), glossed as $LIFT\text{-}difficult$ in (35)b; and a manual lifting gesture realized with difficulty and co-occurring with a facial expression indicative of effort, glossed as $\text{:-/ } LIFT\text{-}difficult$ in (35)c.[23] Finally, we have a gesture-free at-issue control, as in (35)d. As in most cases discussed in this section, acceptability was reasonably high in view of the non-standard nature of gestural examples, as shown in the acceptability scores in (35).

(35) This child, will you
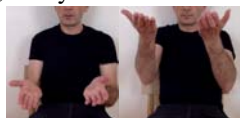
a. [6] LIFT_⎵⎵⎵⎵⎵⎵⎵⎵?

b. [5.3] LIFT-difficult?

c. [6.3] :-/ LIFT-difficult?

d. [5] lift with difficulty?

(video 01)

Our main focus was on the inferences triggered by these examples. We wished to determine whether, under embedding under yes-no questions, negation, *might* and *none*-type quantifiers, we obtained projection patterns characteristic of a cosupposition of the form: *if x were to lift y, effort/difficulty would be involved*. The four embedding types are illustrated in (36) on the case of $LIFT$, but they were tested as well with all four conditions appearing in (35). For simplicity, only universal inferences were tested under *none*-type quantifiers.

(36) Conditions and inferences, illustrated with condition a. (= $LIFT$)

(i) Question:	This child, will you $LIFT$?	(video 01)
(ii) Negation:	You son, I won't $LIFT$.	(video 02)
(iii) Might:	You son, I might $LIFT$.	(video 03)

Cosupposition tested in (i)-(iii): if the speaker were to lift the child, effort/difficulty would be involved.

(iv) None:	None of these children will I $LIFT$.	(video 04)

Cosupposition tested: for each of these children, if the speaker were to lift him/her, effort/difficulty would be involved.

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[22] As an anonymous reviewer points out, this method could introduce biases due to the subjects' training as linguists. We take this survey to be just a first step, which should be extended with experimental methods in the future.

[23] The manual gesture need not be realized exactly in the same way in b. and in c.

In (37), acceptability judgments appear under *Acc* while judgments of (cosuppositional) strength appear under *Cosup* and are boldfaced.

(37) Summary of acceptability and inferential results: LIFT

Target sentence / Conditions	(i) Question		(ii) Negation		(iii) Might		(iv) None	
Video	Video 01		Video 02		Video 03		Video 04	
	Acc	**Cosup**	Acc	**Cosup**	Acc	**Cosup**	Acc	**Cosup**
a. LIFT	6	**1**	5.67	**1**	6	**1**	5.67	**1**
b. LIFT-difficult	5.33	**4.67**	5.33	**5.33**	5.33	**5**	5.33	**5.67**
c. :-/ LIFT-difficult	6.33	**6.67**	6.33	**6.67**	6.33	**6.67**	6	**5.33**
d. lift with difficulty	5	**1.33**	5.67	**1.33**	6.67	**2.5**	6.33	**1**

We obtain a rather strong projection of the conditional inference triggered by the facial expression combined with the manual modification obtained in *:-/ LIFT-difficult*, illustrated in (35)c. This is relatively unsuprising: the optional facial expression plays the same kind of role relative to the pro-speech gesture *LIFT* as a co-speech gesture plays relative to a full word. What is particularly interesting for purposes of comparison with ASL predicate classifiers is that the manner modification of *LIFT* found in *LIFT-difficult* (illustrated in (35)b) triggers a cosupposition as well. Acceptability and inferential strength are weaker than in the case involving a facial expression (i.e. *:-/ LIFT-difficult*), but the inferential results are still sharply different from the controls in (37)a,d.

One could worry that informants took the task to be to 'find the words' coded by the gestures (and thus to replace *LIFT* with 'lift', for instance). This would nullify our conclusions about iconic inferences. However the results make this scenario unlikely: to trigger the relevant inferences, the gestures in (35)b,c would probably have to be paraphrased with modifiers (e.g. 'lift with difficulty'), but the inferential pattern obtained with explicit modifiers is completely different, as shown in (37)d.

We conclude that a gesture modification indicative of effort/difficulty might suffice to trigger a cosupposition, although the effect is strengthened in case it is accompanied with a facial expression with a related content.

4.2 *Cosuppositions triggered by modifications of TAKE-OFF*

Our second example followed the same logic, but involved a helicopter take-off, with a neutral pro-speech gesture as in (38)a, similar to the ascending rotating gesture illustrated in (14). In (38)b, the gesture was realized with a slow, irregular and difficult beginning, slowly accelerating. In (38)c, a neutral onomatopoeia, *ph*, was added to each cycle. In (38)d, an at-issue control with a 'like this' modifier was included, and *this* referred to the following gesture, realized silently as in (38)b.

(38) At 12:05, will our company's helicopter

    a. TAKE-OFF_ ?
    b. TAKE-OFF-difficult-accelerating?
    c. TAKE-OFF-difficult-ph-accelerating?
    d. take off like this TAKE-OFF-difficult-accelerating?
    (video 05)

The various embeddings are illustrated in (39). Judgments of inferential strength pertain to a cosupposition (to the effect if the plane were to take off, it would initially accelerate slowly/with difficulty), but also to a standard presupposition, corresponding to the helicopter's initial position on the ground.

(39) Conditions and inferences, illustrated with condition a. (= TAKE-OFF)
    (i) Question: At 12:05, will our company's helicopter TAKE-OFF?   (video 05)
    (ii) Negation: At 12:05, our company's helicopter won't TAKE-OFF.   (video 06)

(iii) Might: At 12:05, our company's helicopter might TAKE-OFF. (video 07)

Cosupposition tested in (i)-(iii): if the company's helicopter were to take off (at 12:05), it would initially accelerate slowly/with difficulty.

Presupposition tested in (i)-(iii): right before 12:05, the company's helicopter will be on the ground.

(iv) None: At 12:05, none of our company's helicopters will TAKE-OFF. (video 08)

Cosupposition tested: for each of the company's helicopters, if it were to take off (at 12:05), it would initially accelerate slowly/with difficulty.

Presupposition tested: right before 12:05, each of the company's helicopters will be on the ground.

In (40), acceptability judgments appear under *Acc*, judgments of cosuppositional strength (pertaining to manner of movement) appear under *Cosup*, while judgments of presuppositional strength (pertaining to the helicopter's initial position) appear under *Presup*. Judgments of inferential strength are boldfaced.

(40) Summary of acceptability and inferential results: TAKE-OFF

Target sentence /Conditions	(i) Question			(ii) Negation			(iii) Might			(iv) None		
Video	Video 05			Video 06			Video 07			Video 08		
	Acc	**Cosup**	**Presup**	Acc	**Cosup**	**Presup**	Acc	**Cosup**	**Presup**	Acc	**Cosup**	**Presup**
a. TAKE-OFF	6	**1**	**6.33**	6	**1**	**5.33**	6.17	**1**	**6.33**	6	**1**	**4.33**
b. TAKE-OFF-difficult-accelerating	5.33	**5.33**	**6.33**	6	**5.67**	**5.33**	6.33	**5.5**	**6.33**	6	**6**	**4.33**
c. TAKE-OFF-difficult-ph-accelerating	4.67	**5.67**	**6.33**	5.67	**6**	**5.33**	6	**5.67**	**6.33**	6	**6**	**4.33**
d. take off like this	6.67	**1.33**	**6.33**	6.33	**1**	**6.33**	6.67	**2**	**6.33**	6.33	**1.67**	**5**

The presuppositional inference, to the effect that the helicopter(s) is/are initially on the ground, projects as expected in these various conditions; a weak universal projection is obtained under *none*. What is of interest is the cosupposition, to the effect that *if the helicopter were to take off, this would involve a slow/difficult initial acceleration*. It is fairly strongly obtained in (40)c, where the onomatopoeia might play the same kind of role as a co-speech gesture, but also in (40)b, where it seems to be entirely triggered by the manner in which the manual gesture is performed.

Here too, one could worry that informants took the gestures to be a mere code for words, thus treating TAKE-OFF as a code to 'take off'. If so, the results in (40)a need not show that a presupposition is triggered on iconic grounds. But this explanation won't extend to the results in (40)b,c: as was the case for manner modifications of LIFT in the preceding section, the words would likely have to involve a modifier (e.g. 'take off with difficulty'), but here too it is striking that the control with an explicit modifier in (40)d displays a completely different inferential profile (as expected on theoretical grounds because the modifier is at-issue). So the gestures in (40)b,c are unlikely to be understood as mere codes for words. But strikingly, they trigger exactly the same presupposition as the simple gesture TAKE-OFF in (40)a, which suggests that presuppositions can be triggered on genuinely iconic grounds.

We conclude that in this case as well, a pro-speech gesture can trigger a cosupposition given the right realization of the manual component.[24]

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[24] We do not discuss here an additional part of our gesture survey, which pertained to pro-speech music, in the form of a song (the first words of the French national anthem) replacing a verb, as illustrated in (i)a:

(i) On Bastille Day, will your students

    a. ♫ *Allons-enfants-de-la-patrie*?

    b. ♫ *Allons-enfants-de-la-patrie*-unmusical?

    c. ♫ *Allons-enfants-de-la-patrie*-HAND-ON-HEART?

    d. sing the Marseillaise with HAND-ON-HEART **[this]** posture?

In (i)a, the French words *Allons enfants de la patrie* are literally sung as part of the sentence. In (i)b, they are sung in a reluctant and unmusical fashion. In (i)c, they are sung normally, but are accompanied by a patriotic posture, with the speaker's hand on his heart. (i)d is a control in which this position co-occurs with (and is the denotation of) *this posture*.

As can be seen in the Supplementary Materials B, (i)c and related embedding tests suggest that the posture triggers a cosupposition to the effect that *if the speaker's students were to sing the Marseillaise on Bastille*

4.3 Summary: pro-speech gestures vs. classifier predicates

Overall, the typology of inferences we have found with pro-speech gestures mirrors that obtained with ASL classifier predicates: in both cases, presuppositions and cosuppositions can be triggered. The next step would be to conduct a much more minimal comparison between classifier predicates and pro-speech gestures, for instance by investigating pro-speech gestures that resemble the path modifications we investigated in ASL.

The similarity we found between the inferential types triggered by classifier predicates and pro-speech gestures need not be surprising: in both cases, we are dealing with constructions that have a highly iconic component: this is obvious for pro-speech gestures; for classifier predicates, while the object shape may be lexical, the path certainly isn't, and is highly iconic in nature. These results suggest that iconic semantics can trigger standard presuppositions and cosuppositions.

5 Can iconic cosuppositions be disregarded under ellipsis?

5.1 The importance of ellipsis

Earlier literature noted that cosuppositions triggered by co-speech gestures can be ignored under ellipsis.[25] It was initially thought that this is because, in the course of ellipsis resolution, spoken words can be copied without the gestures that accompany them. On this view (henceforth the 'conservative hypothesis'), one would expect cosuppositions triggered by ASL classifier predicates to be less liberal because there is no clearly separable component responsible for the cosupposition – unlike a co-speech gesture, which can be neatly excised from the words it accompanies. The same expectation would naturally extend to the cosuppositions triggered by the pro-speech gestures *LIFT-difficult* and *TAKE-OFF-difficult-accelerating* in Section 4, since whatever is responsible for the cosupposition is hard to separate from the rest of the gesture.

We turn to data that might argue for a 'revisionist hypothesis' according to which cosuppositions can quite generally be disregarded under ellipsis; this leaves open the possibility that co-speech gestures are *particularly* easy to disregard because they can be excised from the words they modify.

The competing hypotheses are stated in (41).

(41) a. Conservative hypothesis: cosuppositions triggered by co-speech gestures are optionally disregarded under ellipsis; cosuppositions triggered by pro-speech gestures and classifier predicates cannot be.
b. Revisionist hypothesis: quite generally, cosuppositions are optionally disregarded under ellipsis.

It should be noted that elided clauses generally have *more* readings than their overt counterparts, and thus it is hard to see how any theory could predict that cosuppositions (of any sorts) are *obligatorily* disregarded under ellipsis; this is the reason both hypotheses only mention the *option* of disregarding certain cosuppositions.

The behavior of cosuppositions under ellipsis matters for two reasons. First, it might offer an additional diagnostic to distinguish cosuppositions from standard presuppositions: the latter cannot normally be disregarded under ellipsis, and it would thus be interesting to find out that cosuppositions can be (as seen in Section 8.3, this will have theoretical consequences). Second, Aristodemo 2017 and Aristodemo and Santoro 2018 argue that some signs in Italian Sign Language (LIS) trigger iconic cosuppositions, and suggest that this is because they include (co-sign) gestures in their realization. From the present perspective, the mere existence of cosuppositional inferences does not suffice to argue for the presence of gestures, as cosuppositions arise in a variety of iconic representations. Crucially, however, Aristodemo and Santoro argue that the cosuppositional contributions they investigate can be disregarded under ellipsis, which genuinely makes them similar to co-speech-induced cosuppositions.

Day, they would adopt a patriotic posture such as having one's hand on one's heart. On the other hand, the unmusical rendering of the song in (i)b only triggers a much weaker cosupposition (to the effect that, if the relevant students were to sing, they would do so in a reluctant/unmusical fashion).

[25] Schlenker 2015 notes that the 'disappearing act' of co-speech gestures can be replicated in the 'focus dimension' under *only*. Here we solely discuss ellipsis, but *only* and other particles that associate with focus should be studied in the future. (Ellipsis is particularly important for the present discussion because it is used by Aristodemo 2017 to argue that some of her LIS constructions might involve incorporated gestures.)

It is thus essential to determine whether iconic cosuppositions triggered by ASL classifier predicates and by pro-speech gestures can be disregarded under ellipsis. If they can be, the ignoring of cosuppositions under ellipsis might be a broader phenomenon, and Aristodemo's data might be re-analyzed without positing that some LIS words contain gestures.

We will now provide background on co-speech gestures under ellipsis and summarize Aristodemo's original findings.[26] We then present conflicting data: in ASL, cosuppositions are easily preserved under ellipsis, either because the revisionist hypothesis is wrong, or because our contexts did not sufficiently promote the cosupposition-free reading. As the data are complex, and give rise to a null result, we only summarize them in the main text and present them in greater detail in Appendix II. In English, some cosuppositions triggered by pro-speech gestures can be disregarded under ellipsis.

5.2   Co-speech gestures can be ignored under ellipsis

As noted in Schlenker 2015, 2018b, co-speech gestures can be disregarded under ellipsis, as is illustrated in (42)b. Importantly, unlike co-speech gestures, pro-speech gestures cannot be ignored in the course of ellipsis resolution: in (42)a, the elided VP is preferably understood as *hanged,* hence the need for a specific covert word: ~~hanged~~ but not ~~punished~~.

(42)   a. A traitor should be   HANG_. A whistleblower shouldn't be.

   Preferred interpretation: whistleblowers shouldn't be hanged

   b. A traitor should be   HANG_ **punished**. A whistleblower shouldn't be.

   Preferred interpretation: whistleblowers shouldn't be punished
   (Schlenker 2018b)

It has been similarly argued that co-sign facial expressions in ASL can be disregarded under ellipsis (Brentari 2018, Schlenker 2018d), as one would expect in view of their similarity with co-speech gestures.

A natural thought is that the disappearing act of co-speech/sign gestures is due to their parasitic nature, since one can recover a well-formed message by ignoring them. On this view, ellipsis can just copy the verbal part of the antecedent while disregarding the gesture.[27] As we will now see, recent data due to Aristodemo (2017) cast doubt on this theoretical direction, at least without significant additions.

5.3   Cosupposition in LIS maximal degree adjectives: Aristodemo's findings

Aristodemo 2017 notices that in LIS several lexical elements have an iconic component which (i) triggers presuppositions and (ii) can be disregarded under ellipsis. She bases her analysis on the behavior of the adjectives *FULL* and *BALD,* which mean 'completely full' and 'completely bald' respectively, and are illustrated in (43).

(43)   *FULL* and *BALD* in LIS (Aristodemo 2017)
      a. *FULL*   b. *BALD*
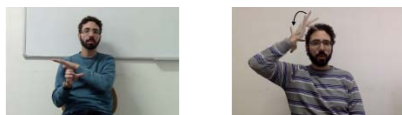
      Aristodemo's argument is in four steps, the first three of which are illustrated in (44).

(44)   a. GIANNI GLASS IX-3-poss FULL NOT.
      'Gianni's glass is not full.'

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[26] Aristodemo and Santoro 2018 summarize Aristodemo's findings and provide further examples in which iconic material under Role Shift (a construction that has sometimes been treated as overt context shift, e.g. by Quer 2005, 2013 and Schlenker 2017b, c); here we only discuss data from Aristodemo 2017.

[27] Similarly, one would need to posit that the 'focus dimension' under only is computed in a way that makes it possible to ignore gestures.

=> If Gianni's glass were full, it would be completely full.
b. GLASS IX-1-POSS WINE FULL PIERO BELIEVE, MARIA IX-3 NOT.
 'Piero believe that my glass is completely full of wine, Maria does not believe that my glass is (i) completely full, or (ii) full.'
c. GLASS IX-1-POSS WINE FULL PIERO BELIEVE, MARIA GLASS IX-1-POSS WINE FULL BELIEVE NOT.
'Piero believe that my glass is completely full of wine Maria does not believe that my glass[28] is completely full of wine.'
(LIS, Aristodemo 2017)

First, a negative sentence such as (44)a with *FULL* gives rise – despite the negation – to the cosupposition-style inference that *if the glass were full, it would be completely full*. Second, the 'completely full' component is optionally disregarded under ellipsis: (44)b optionally gives rise to the inference in (ii), according to which Piero believes that the glass is completely full whereas Maria doesn't believe that it's full. Third, this option is precluded when the adjective *FULL* is repeated in the second clause, as in (44)c (now without ellipsis). In a fourth step, Aristodemo investigates an Italian co-speech gesture, $COMPLETELY,$ which triggers a cosupposition and can be disregarded under ellipsis: when it co-occurs with the adjective *pieno* ('full'), as in $COMPLETELY$ *pieno*, the gesture triggers a cosupposition of the form *if x is full, it's completely full*. This is what is expected of a co-speech gesture, but the similarity with the 'completely' component of the LIS sign *FULL* is striking.

Aristodemo 2017 attributes these effects to an iconic component of *FULL* and *BALD*: in both cases, the maximum degree is iconically represented. As Aristodemo writes, the sign *BALD* "starts close to the forehead and ends behind the head covering the entire area of the head"; while in the sign for *FULL,* "the dominant hand which articulates a flat handshapes looks like a top of a container". She concludes (very cautiously) that these signs might contain an incorporated co-sign gesture, a conclusion further developed by Aristodemo and Santoro 2018. But if so, the view that it is the parasitic nature of co-speech/sign gestures that is responsible for their disappearing act under ellipsis is insufficient to account for these data: there are just no versions of the *FULL* and *BALD* signs that don't have the 'completely' component, and thus this component is in no way optional and parasitic.

5.4   The behavior under ellipsis of cosuppositions triggered by ASL classifier predicates

In Appendix II, we present detailed paradigms that seek to test whether the cosuppositions triggered by ASL classifier predicates in Section 3 can be disregarded under ellipsis. The judgments are unstable: among three judgment tasks, one gives rise to a positive answer, two to a negative answer. This does not provide any clear support for the revisionist hypothesis according to which all cosuppositions (not just those triggered by co-speech gestures) can be disregarded under ellipsis. It could be that the revisionist hypothesis is wrong about ASL classifier predicates, or that the contexts we used did not sufficiently promote the reading on which the cosupposition is ignored in the elided clause.

5.5   The behavior under ellipsis of cosuppositions triggered by pro-speech gestures

We turn to the behavior under ellipsis of cosuppositions triggered by pro-speech gestures. We base our discussion on the survey described in Section 4. The survey included cases in which a disgusted facial expression added to the pro-speech gesture $LIFT$ triggers a cosupposition (= lifting would involve a disgusted expression) that can be disregarded under ellipsis.[29] This behavior isn't surprising: the pro-

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[28] Aristodemo's dissertation has 'Piero's glass' rather than 'my glass' in the translation, but this is evidently a typo, which we have corrected. Thanks to an anonymous reviewer for noticing the error, and to V. Aristodemo (p.c.) for confirming that this was indeed a typo.

[29] The paradigm that appears in the Supplementary Materials B is summarized in (i):

(i)   Your son, I won't ____ , but your daughter, I will.
         a. $LIFT$
         b. :-($LIFT$
         c. lift with this kind of face :-(

speech gesture cannot be removed without making the sentence ungrammatical, whereas the facial expression can. It thus plays the same kind of role as a co-speech gesture co-occurring with a normal word, and can thus be expected to display the same behavior, as is in fact the case. The more crucial cases for us pertain to the cosupposition-inducing pro-speech gestures in (45)b and (46)b. As before, *LIFT-difficult* is a manual modulation of *LIFT*, with trembling hands, indicative of difficulty; and *TAKE-OFF-difficult-accelerating* is a manual modulation of *TAKE-OFF* displaying a difficult initial acceleration.

(45)   This [big][30] adult , I won't _____ , but this small child, I will.
      a. LIFT
      b. LIFT-difficult
      c. lift like this LIFT-difficult
      (video 14)

(46)   At 12:05, our company's old helicopter won't ___, but our company's new helicopter will.
      a. TAKE-OFF
      b. TAKE-OFF-difficult-accelerating
      c. take off like this TAKE-OFF-difficult-accelerating
      (video 15)

We will now see that (45)b triggers a cosupposition to the effect that *if the speaker were to lift the big adult, the movement would be slow/difficult*, but it can be disregarded under ellipsis. Things are less clear in (46)b: while a cosupposition is triggered by the antecedent clause to the effect that *if the company's old helicopter were to take off, it would initially accelerate slowly/with difficulty*, the inference is weakened, but doesn't fully disappear, in the elided clause. Still, this paradigm benefits from the presence of a normal presupposition, to the effect that the helicopter is initially on the ground. This makes it possible to compare the cosupposition with the presupposition; and under ellipsis, unlike the cosupposition, the presupposition is clearly preserved.

In greater detail, the inferential questions for the *LIFT* paradigm in (45) appear in (47), with the acceptability and inferential strength judgments in (48). The cosuppositional question is stated in conditional form for the antecedent, unelided clause, but as an unconditional statement for the elided clause. The reason for this differential treatment is that in the elided clause the cosupposition ought to be combined with the at-issue component: if it is the case that *I will lift this small child*, and that *if I were to lift this small child, the movement would be slow/difficult*, then it follows that *I will lift this small child with a slow/difficult movement*, and it would be odd to test a conditionalized inference whose antecedent is trivially true.[31] The problem does not arise for the unelided cause, which is under negation.

(47)   Inferential questions for the *LIFT* paradigm in (45)
    (i) Unelided cosupposition: If the speaker were to lift the big adult, the movement would be slow/difficult.
    (ii) Elided cosupposition: The speaker will lift the small child with a slow/difficult movement.

(48)   Acceptability and inferencial strength for the *LIFT* paradigm in (45)

Target sentence / Questions (video 14)	Acceptability	(i) Unelided cosupposition	(ii) Elided cosupposition
a. LIFT	6	1	1

(video 13)

The crucial condition is in (ib). It gives rise to the inference that *if the speaker were to lift the addressee's son, a disgusted expression would be involved*, but not that *the speaker will lift the addressee's daughter with a disgusted expression*.

[30] The survey contains 'fat' instead of 'big'.

[31] We could solve this problem by replacing *will* with *might* in (45) and (46): this would make the conditionalized inference entirely felicitous. But as we explain in greater detail in fn. 55 of Appendix II for an analogous case in ASL, embedding the elided clause in this way would cause problems of its own (because presuppositional inferences could fail to be drawn for two separate reasons: disappearance under ellipsis, or local accommodation).

b. LIFT-difficult	6	**6**	**1.33**
c. lift like this LIFT-difficult	5.33	**2**	**6.67**

The inferential strength results show that a cosupposition is derived in the unelided clause but not in the elided clause. In the latter respect, things are entirely different in the *like this* control in (45)c/(48)c, where the elided clause inherits the modifier and strongly triggers the corresponding inference.

The inferential questions for the *TAKE-OFF* paradigm in (46) appear in (49). They pertain not just to the cosuppositional inference of interest here, but also to the presupposition that the helicopter was initially on the ground. This makes it possible to compare the strength of these two inferences, especially under ellipsis.

(49)   Inferential questions for the *TAKE-OFF* paradigm in (46)

(i) Unelided cosupposition: If the company's old helicopter were to take off (at 12:05), it would initially accelerate slowly/with difficulty.
(ii) Elided cosupposition: The company's new helicopter will take off (at 12:05) with a slow/ difficult initial acceleration.
(iii) Unelided presupposition: Right before 12:05, the company's old helicopter will be on the ground.
(iv) Elided presupposition: Right before 12:05, the company's new helicopter will be on the ground.

(50)   Acceptability and inferencial strength for the *LIFT* paradigm in (46)

Target sentence / Questions (video 15)	**Acceptability**	**(i) Unelided cosupposition**	**(ii) Elided cosupposition**	**(iii) Unelided presupposition**	**(iv) Elided presupposition**
a. TAKE-OFF	6.17	**1**	**1**	**5.67**	**6.33**
b. TAKE-OFF-difficult-accelerating	5.67	**6**	**3.83** (scores: 2.5, 6, 3)	**5.67**	**6.33**
c. take off like this TAKE-OFF-difficult-accelerating	6.67	**1**	**7**	**6.33**	**6.33** (scores: 7, 7, 5)

Two results are relevant for present purposes. First, the cosupposition triggered by the realization in (46)b (slow/difficult initial acceleration) has an intermediate status in the elided clause; the individual scores show that two informants largely disregard it, while the third informant preserves it. Second, the presupposition to the effect that the helicopter is initially on the ground is strongly preserved by all three informants in the elided clause.

We conclude that cosuppositions triggered by the manual gestures under investigation in this section can to some extent be disregarded under ellipsis; furthermore, they seem to pattern in this respect differently from the initial state ('on the ground') presupposition triggered by the *TAKE-OFF* gesture.

5.6   *Summary and outlook*

According to the revisionist hypothesis, cosuppositions triggered by iconic constructions in general (rather than just by co-speech gestures) can be ignored under ellipsis; according to the conservative hypothesis, only cosuppositions triggered by co-speech gestures can be disregarded in this way (for syntactic reasons). Our investigations of ASL did not provide evidence for the revisionist hypothesis, although it could be that the relevant reading exists but was insufficiently promoted by our contexts. For pro-speech gestures, we conclude that, given the right context, cosuppositions can to some extent be disregarded under ellipsis. Both types of data will have to be investigated in much greater detail.

If these results are confirmed, they might suggest an alternative explanation of Aristodemo's findings. The LIS signs for *FULL* and *BALD* might turn out to fall under a broader generalization : (i) certain manner inferences, especially triggered by the iconic realization of signs or gestures (including pro-speech gestures), can give rise to cosuppositions; (ii) these can to some extent be disregarded under ellipsis. On this view, the behavior uncovered by Aristodemo does not argue that some LIS signs include incorporated gestures.

6   Summary of the semantic generalizations

In this section, we summarize our main semantic generalizations, whose theoretical consequences are discussed in the following sections. Our generalizations are of two types: some pertain to the triggering

of standard presuppositions by iconic pro-speech gestures and ASL classifier predicates, others pertain to the triggering of cosuppositions by co-speech gestures, pro-speech gestures and classifier predicates.

6.1   Generalizations about presuppositions

Cases of presupposition generation are of three (overlapping) types.
(i) Presence of a pre-existing object: the pro-speech gestures *TURN-WHEEL* as well as the 2-rotored helicopter classifier presuppose the presence in the relevant situation of a pre-existing object, namely the wheel or the 2-rotored helicopter.
(ii) Change of state: the pro-speech gestures *TAKE-OFF-ROTATING* as well as the classifier predicate involving a take-off are all change of state predicates, and they trigger a presupposition about the existence of the initial state, namely that the helicopter was on the ground.
(iii) Unexpected change from a trajectory: the modifications of a helicopter movement involving an orthogonal detour or a pause to hover are change of state predicates as well, but they do not presuppose the initial state; rather, they weakly presuppose that the relevant helicopter displacement will take place, and what is at issue is whether an orthogonal detour or a pause in the middle will take place.

6.2   Generalizations about cosuppositions

Turning to cosuppositions, they are of two main types.
(i) Co-speech gestures and co-sign facial expressions: they are external enrichments of regular words: they can be disregarded without affecting the grammaticality of the message.
(ii) Cosuppositions triggered by classifier predicates and pro-speech gestures: these, by contrast, are not syntactically distinct from the rest of the iconic representation. Semantically, they provide information about manner modifications: with a curved path, circling motion, or undulating motion for ASL classifier predicates, with difficulty for the English pro-speech gestures.

7   Consequences for presupposition theory

We turn to consequences of our results for presupposition theory. Standard analyses (e.g. Heim 1983, Schlenker 2009) focus on the Projection Problem and thus stipulate (in lexical entries) the presuppositions of elementary expressions. The existence of presuppositions triggered by iconic representations that one may see for the first time suggests that these theories would need to be supplemented with a productive triggering mechanism for the iconic case. This leaves open the possibility that a version of the same mechanism might be applied to the lexical case as well, which in turn might obviate the need (in some or all cases) for lexically encoded presuppositions.

There have been several attempts to propose triggering mechanisms, notably those of Abusch 2002, 2010, Simons et al. 2010 and Abrusán 2011.[32] We will briefly discuss the consequences of our data for these theories, especially the first and third (see Abrusán 2011, Section 2, for a detailed critical review of various proposals, including those of Abusch and Simons et al.).

7.1   Three analyses of the Triggering Problem

Abusch 2002, 2010 starts from the observation that an expression that triggers a set of focus alternatives often comes with the presupposition that at least one of these alternatives is true. She proposes that some presupposition triggers are in fact elements that lexically introduce such alternatives, as illustrated in (51); the presupposition that the disjunction of the alternatives is true can then derive what might initially have appeared to be lexical presuppositions.

(51) Examples of lexical alternative sets in Abusch 2002
    a. stop: {*stop, continue*}
    b. be right: {*be right, be wrong*}
    c. know: {*know, be unaware*}

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[32] We do not discuss further pragmatic accounts which (like Abusch's) need to stipulate alternatives to generate presuppositions; see for instance Chemla 2010, Schlenker 2010, Romoli 2015.

To illustrate, *John knows that p* generates (on the basis of (51)c, combined with the standard compositional mechanism of alternative generation in Rooth 1996) the alternative set {John knows that p, John is unaware that p}. In Abusch's analysis, neither member of the alternative set triggers a presupposition on its own: *John knows p* means something like *p and John believes p;* and similarly *John is unaware that p* means roughly: *p and it's not the case that John believes that p*. But the requirement that the disjunction of these alternatives be true yields a presupposition that *(p and John believes that p) or (p and not John believes that p)*, which simplifies to *p*, i.e the desired presupposition. But as Abrusán 2011 and Abusch 2010 discuss, Abusch thus replaces one kind of stipulation, pertaining to the presuppositions of lexical elements, with another, pertaining to their alternatives.

Simons et al. 2010, further developed in Beaver et al. 2017, propose a theory based on implicit or explicit 'Questions under Discussion' (QUD), sometimes evidenced by way of focus structure. Simplifying somewhat, the basic idea is that those implications of (embedded) clauses which fail to contextually entail an answer to the Question Under Discussion have the potential to project – and thus, in the cases of relevance here, to behave like presuppositions. To illustrate, consider (52):

(52) *Context:* A nutritionist has been visiting first grade classrooms to talk to the children about healthy eating
Q: What most surprised you about the first graders?
A: They didn't know that you can eat raw vegetables. (Simons et al. 2010)

They know that you can eat raw vegetables is under negation and contextually entails that *you can eat vegetables*, but this proposition does not entail an answer to the Question under Discussion, and for this reason it projects. By contrast, in (53), *Bill know that Harry is dating Sally* entails that Harry is dating Sally, which answers the Question Under Discussion, and for this reason the entailment does not project.

(53) Q: Is Harry dating Sally?
A: Bill doesn't know that he is. (Simons et al. 2010)

While appealing, this theory is hard to apply to our cases in the absence of explicit focus and Questions under Discussion, which would require more elaborate contexts than we have. In addition, we should mention a general problem discussed by Abrusán (and by the authors themselves): "the theory as it stands predicts such shifts with much more ease than is actually observed". In (54)a,b, the entailments that the first graders failed the exam, or that John smoked before, should answer the Questions under Discussion and thus fail to project - but they do.

(54) a. Q: What most surprised you about the first graders? A: They didn't know that they have failed the exam.
b. Q: What do you know about John? B: He still didn't quit smoking. (Abrusán 2011)

While Simons et al. 2010 notice the problem, they in effect give a lexicalist solution. In Abrusán's terms, this "gives up on predicting what projects from the meaning of utterances".

Focusing on the verbal case, Abrusán 2011 proposes instead that entailments that are not about the event time of the verb get presupposed (this is motivated by considerations on attention, as only entailments that are about the event time are taken to be the main point of such constructions). In the case of change of state verbs, which will matter below, Abrusán's theory works as in (55).

(55) a. John stopped smoking at t_1.
b. Entailment 1: John does not smoke at t_1
c. Entailment 2: John smoked at t_2 (where t_2 is some contextually given interval before t_1)

The simplified representation in (55)a, with event time t_1, comes with several entailments, two of which are stated in (55)b,c. Entailment 1 is about event time t_1 and thus it does not get presupposed. By contrast, Entailment 2 is not about event time t_1 and thus it gets presupposed. In order to make the account predictive, Abrusán develops a theory of 'aboutness'. Its details do not bear on the rest of our discussion and thus we can rely on an intuitive understanding of that notion in what follows.[33]

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[33] Simplifying somewhat, the key condition is stated in (i) (Abrusán explicitly defines a version of the relevant notions for a first-order logic):

(i) A sentence *S* is not about an object o just in case for every model M,
S is true in M if and only if for every model M' which is an o-variant of M, *S* is true in M'.

7.2   *Theoretical consequences of iconic presuppositions*

Let us see how our data bear on these three theories.

7.2.1   *Consequences for Abusch 2002, 2010*

Abusch 2010 observes that her analysis can in principle account for any presupposition *p* triggered by a construction *pp'* (with at-issue entailment *p'* and presupposition *p*) by stipulating an alternative set with meanings equivalent to {*p and p'*, *p and not p'*}: their disjunction will immediately yield a presupposition *p;* one may also use the alternative set {*p and p'*, *p*}, as its disjunction equally entails *p*. The question is whether such alternatives can be independently motivated or at least made plausible.

Let us start with gestural presuppositions pertaining to the presence of a pre-existing object, assuming that the alternatives are themselves gestural in nature. Consider first the pro-speech gesture *TURN-WHEEL*, which presupposes the presence of a wheel. Abusch would need to posit that the gesture evokes a set of alternatives whose disjunction entails the presence of a wheel. This result could be achieved by positing a gesture that conveys the information that the relevant agent held a wheel but didn't turn it - call this *HOLD-WHEEL*. In this way, we could analyze *x TURN-WHEEL* as having the content: *x has their hands on a wheel and turned it*, while *x HOLD-WHEEL* comes with the content: *x has their hands on a wheel and didn't turn it*. It is clear that the disjunction (*x TURN-WHEEL or x HOLD-WHEEL*) yields the desired presupposition.[34] On the other hand, positing an alternative set {*x TURN-WHEEL*, *x TURN-BIG-WHEEL*} where *x TURN-BIG-WHEEL* means that *x turns a large wheel* would still yield the presupposition that *x* had their hands on a wheel, but also that *x turned a wheel*, which is too strong. Thus Abusch's theory needs some independent criterion to determine what the 'right' alternatives are - a gestural incarnation of the general problem noticed by Abrusán and Abusch herself.

The problem is particularly acute when we turn to the ASL 2-rotored classifier. For instance, *GO-helicopter-large_* would need to evoke a set of alternatives whose disjunction entails that the helicopter was 2-rotored – hence a set of classifier predicates with different actions (or inactions) on the part of a 2-rotored helicopter. But if instead we posit that *a-GO-helicopter-large_-b* (connecting loci *a* for Boston and *b* New York) has an alternative set that just involves the unmarked helicopter classifier, hence {*a-GO-helicopter-large_-b*, *a-GO-helicopter_-b*}, we will lose the presupposition that the helicopter was 2-rotored, and we will get instead a presupposition that the helicopter went from Boston to New York. It is not obvious what should rule out this alternative set.[35]

The case of unexpected changes from a trajectory raises the same problems, but adds to them the contrast with versions that trigger cosuppositions. Take for instance the (abrupt or non-abrupt) orthogonal deviations with classifier predicates. It is easy for Abusch's theory to posit that they raise as alternatives various other ways in which the same global movement (from Boston to New York, or during a take-off) could have been performed, in such a way that their disjunction will yield the presupposition that this global movement was in fact performed. But why wouldn't the same reasoning apply to the constructions involving a curved path, a circling motion, and an undulating motion? They yield cosuppositions to the effect that if the movement were to take place, it would involve a certain

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A model M' is an o-variant of a model M just in case for every relation symbol *R*, the extension of *R* is made of the same tuples of objects in M' as in M, except possibly for those tuples that include object o.

[34] One could obtain the same result with a weaker alternative, a gesture *HANDS-ON-WHEEL* to the effect that the relevant agent has hands on a wheel (irrespective of whether the agent turned the wheel or not). If *x HANDS-ON-WHEEL* has the content that *x has their hands on a wheel*, the disjunction (*x TURN-WHEEL* or *x HANDS-ON-WHEEL*) will again yield the desired result.

[35] Similar issues are raised by change of state verbs presupposing the initial state, such as the pro-speech gesture or classifier predicate involving a take-off. Abusch's theory can account for them if their alternatives involve a helicopter doing various things starting from the same initial state – including just staying put; but this would need to be derived.

path or manner of motion, but not the presupposition that the movement does in fact take place. One could well posit that a movement involving a curved path raises as alternatives other global movements that don't have a curved path - which would yield the presupposition that global movement does in fact take place. One would thus need to posit that different alternatives are raised, but at this point the difference between this case and that of the orthogonal deviations must be stipulated.

7.2.2   Consequences for Simons et al. 2010

Turning to the analysis of Simons et al. 2010, we need to speculate on plausible Questions under Discussion in our paradigms. It makes good sense to posit that the pro-speech gesture *TURN-WHEEL* is used when one wishes to know whether the agent will turn the wheel – in which case entailments about the presence of a wheel would not answer the Question under Discussion and could thus project. With *TAKE-OFF-ROTATING*, one can posit that the Question Under Discussion is whether there will be a take-off. One can similarly argue that the entailment that *the helicopter is on the ground* does not answer the question and thus projects. But why couldn't one note as well that *the helicopter will ascend* does not on its own answer the question (since a take-off requires ascent *from a ground position*), in which case this entailment too should project? The same issue is raised by the ASL examples involving a helicopter take-off.

Turning to ASL classifier *GO-helicopter-large_* (involving a 2-rotored helicopter), we must postulate, plausibly enough, that the underlying question is whether a helicopter will go from Boston to New York, rather than whether a large helicopter will go from Boston to New York; this allows the entailment that the helicopter is large to project (because it fails to address the QUD). But what shall we say about paths that involve an orthogonal detour and a pause in the middle? One might think that here too the underlying question is whether the global movement will occur, but this would predict, incorrectly, that the fact that this global movement will take place is *not* presupposed. To compound the problem, the analysis needs to explain why these cases are different from the cosupposition-inducing constructions involving a curved path, a circling motion, and an undulating motion. More work is thus needed to derive these data from the Question under Discussion theory.

7.2.3   Consequences for Abrusán 2011

Abrusán's theory is in a good position to account for presuppositions pertaining to a pre-existing object and to an initial state. The key is that these entailments are not about the matrix event time, and thus Abrusán predicts that they should be presupposed. We schematically illustrate this reasoning in (56): given world knowledge, x *TURN-WHEEL at t_1* entails that x was in front of a wheel right *before* t_1, and that entailment is thus about some other time, call it t_2. On Abrusán's theory, it should get presupposed. The same logic can be applied to the 2-rotored helicopter classifier predicate, since it yields an entailment pertaining to the presence of a 2-rotored helicopter before the action took place.

(56) a. x TURN-WHEEL at t_1.
    b. Entailment 1: x turned a wheel at t_1
    c. Entailment 2: x was in front of a wheel at t_2 (where t_2 is some contextually given interval right before t_1)

Similar results are obtained with the pro-speech gesture and classifier predicate pertaining to a take-off: (57)a,a' both entail that right before the event time the helicopter was on the ground. That entailment is not about the event time and thus it gets presupposed.

(57) a. x TAKE-OFF-ROTATING at t_1.
    a'. x GO-helicopter-up__ at t_1.
    b. Entailment 1: x moved up at t_1
    c. Entailment 2: x was on the ground at t_2 (where t_2 is some contextually given interval right before t_1)

By contrast, it is not clear how Abrusán's theory should account for the (admittedly weaker) presuppositions obtained when a helicopter movement includes a pause in the middle or an unexpected orthogonal deviation. One possibility is that despite appearances the event time is really that of these subevents rather than of the entire development. But it's a bit unclear why this should be, since the iconic representation clearly provides information about an event that does not just include the pause

or the deviation.[36] So the account is incomplete as things stand.

7.3 An alternative direction: presuppositions as counterfactually stable entailments

Let us mention a further possibility, to be explored in future research. An old intuition in the literature on the Triggering Problem is that a presupposition is an entailment of an elementary[37] expression that is conceptualized as a 'precondition' for certain other entailments (e.g. Simons 2001, Thomason et al. 2006, Abusch 2010). As Abusch 2010 notes, however, an explicit and general definition of what a 'precondition' is has remained elusive. In addition, our examples involving a pause or an orthogonal deviation show that the 'pre' in 'precondition' cannot just be interpreted in temporal terms, since in this case what is (weakly) presupposed is that the global movement (from Boston to New York, or involving a take-off) will take place: the existence of an event *following* the pause or the deviation is presupposed.

Still, a more abstract implementation of this idea might capture the various cases we have discussed here. The three types of presuppositions mentioned in Section 6.1 have something in common: when one acquires information about the entire event, one plausibly analyzes certain informational parts as being more stable than others. More specifically, if we write as *pp'* the conjunction of the at-issue and of the presuppositional components, considered as simple entailments, we can apply the test in (58). It asks that one assume, relative to the assumptions of the context (i.e. relative to the Context Set), that *pp'* holds true. Then it assesses the counterfactual stability of the entailment *p* by asking whether, on the counterfactual assumption that *pp'* had not been the case, *p* would still have held. As we will see, it is crucial that we apply this test with some non-monotonic analyses of counterfactuals.

(58) Stability of entailments (counterfactual test)
Assume that *pp'* holds (relative to the Context Set C). If (counterfactually) *pp'* had not been the case, would *p* still have been the case?
If $\rightarrow$ represents the counterfactual conditional, this can be represented as:
C, pp' |= (not pp') $\rightarrow$ p[38]
Yes: treat *p* as a presupposition.
No: do not treat *p* as a presupposition.

Let us apply this recipe to our three main cases.[39]

(i) Consider first the presupposed pre-existence of an object, as in *x TURN-WHEEL at t_1*. The intuition we wish to capture is that, on the assumption that x turned a wheel, if this had not been the case, the wheel would still have been in front of x. Here it is of course crucial that the counterfactual should not mean that if *pp'* had not been the case, it would *necessarily* have been the case that *p*, as this requirement would be far too strong. But the non-monotonic counterfactual explored in semantics by Stalnaker (1967), Lewis (1973) and others is far weaker: it only asks that we consider the *closest* worlds in which *pp'* fails to be the case, and determine whether in those worlds *p* still holds. The desirable answer - that the wheel would still have been in front of the agent - is intuitively plausible in this case.

(ii) The pre-existence of an initial state works in a similar fashion, as in pro-speech constructions like *x TAKE-OFF-ROTATING at t_1*, or in classifier predicates involving a helicopter take-off. Assuming that a helicopter take-off happened, we can ask, counterfactually: had this not been the case, would the

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[36] One might want to test what the event time is by modifying the sentence so as to include a precise temporal modifier – for instance one meaning *at 5:05pm sharp* – and determining whether it unambiguously specifies the time of the subevent (the pause, or the deviation) rather than of the entire event. But it might well be that for independent reasons a modifier would be constrained to modify the at-issue component of the predicate, in which case a positive result (to the effect that the precise modifier provides information about the time of the pause, or of the deviation) would not be informative. We leave this question for future research.

[37] 'Elementary' is crucial: we want to predict a presupposition for the elementary expression *stopped* in *John stopped smoking*, but not for the complex conjunction in *John smoked and stopped*.

[38] This should be read as follows: in each world w that is in C and satisfies the (classical, non-presuppositional) meaning of *pp'*, w makes true the counterfactual conditional (not pp') $\rightarrow$ p.

[39] We discuss what we take to be plausible results of the counterfactual tests. Importantly, these could be more rigorously assessed independently from the presuppositional data that we seek to derive.

helicopter still have been initially on the ground? Here too the answer is plausibly positive, which is the result we want.

(iii) The case of the unexpected changes of a trajectory is particularly interesting. As discussed, an orthogonal deviation and a pause to hover on a helicopter's trajectory are at-issue, but the fact that the global movement (upwards, or from Boston to New York) tends to get presupposed. Here too, our counterfactual test yields plausible results, especially if the modifications of the trajectory are viewed as unexpected, as in the abrupt orthogonal deviation from a path, which yielded some of the strongest results. Specifically, on the assumption that the helicopter went from Boston to New York with an abrupt orthogonal deviation, one would understand that the trip from Boston to New York was planned but that the deviation wasn't. Assuming that the trip took place with the deviation, we can reason counterfactually that if this proposition hadn't been true, this would likely have been because the deviation didn't occur, while the global displacement would still have happened. If the deviation is less abrupt and thus plausibly more planned, the effect might be expected to be weaker, which is compatible with our data. Finally, a pause to hover which is not particularly expected given the rest of the discourse might have the same status as the unexpected deviation.

(iv) It is also important to ask why curved deviations and manner modifications of a movement do not yield a presupposition that the displacement takes place (but rather a cosupposition - a case to which we turn below). Importantly, these modifications are plausibly viewed as being of a piece with the movement itself, and not particularly unexpected given the rest of the event. This might yield a very different result for the relevant counterfactual test. For instance, on the assumption that the helicopter moved along the curved path, we can ask what would have happened, counterfactually, if the movement had not taken place in this way. Here the answer is less clear: maybe the movement would have taken place along some other path, but maybe the movement would not have taken place at all because the curved path was the normal one taken by the helicopter, as nothing in its shape indicates that it involved an unexpected deviation. The same remark can be made about manner of motion modifications involving a circling or an undulating motion: a helicopter that moves in this way might be expected to do so with some regularity.

While these remarks aren't a full solution to the Triggering Problem, we hope that outlined a further possible direction, to be explored in parallel with those reviewed above.

8   Consequences for cosupposition theory

We turn to the consequences of our findings for the analysis of cosuppositions. There are three possible directions, which we discuss in turn. One is to take all cosupposition-like inferences discussed here to be varieties of supplements, as in Ebert and Ebert's (2014) analysis of co-speech gestures. A second one is to take all these inferences to be genuinely cosuppositional. A third possibility is to take co-speech/sign gestures to trigger genuine cosuppositions, and pro-speech/ASL classifier cosupposition-like inferences to be standard presuppositions that have been misanalyzed as having a conditionalized component.

8.1   Supplemental theories

Ebert and Ebert 2014 argued that co-speech gestures trigger supplements, the kind of contribution made by appositive relative clauses (Potts 2005). The cosuppositional analysis of co-speech gestures was developed to address purported inadequacies of this theory, and in particular the fact that co-speech gestures differ from appositives (and also from post-speech gestures) in being acceptable in the scope of negative expressions:

(59)   a. One/None of these 10 guys UP **helped** his son.

b. One/#None of these 10 guys helped his son, which (by the way) he did by lifting him.
c. One/#None of these 10 guys helped his son – UP.
(Schlenker 2018b)

In addition, Tieu et al. 2017, 2018 argue that the inferential patterns they find (in particular the existence of 'local accommodation') make a supplemental analysis difficult. Without revisiting this debate, we

note that a supplemental analysis could in principle be extended to pro-speech gestures and ASL classifiers that trigger cosupposition-like inferences. This would leave a question open: why do some pro-speech gestures and ASL classifiers trigger presuppositions, while others trigger supplements?

On the other hand, the fact that some of these inferences can be disregarded under ellipsis could be given a relatively natural explanation. The reason is that it was observed in the literature that appositive relative clauses can be ignored under ellipsis, as in (60), whose second sentence does not imply that the violin that Mary sold to Perlman had once belonged to Nathan Milstein.

(60) John sold a violin, which had once belonged to Nathan Milstein, to Itzhak Perlman, and Mary did too. (McCawley 1998)

McCawley 1998 offered a syntactic analysis of this fact (he postulated that appositives can be attached very high, outside the constituent which is the antecedent of the elided VP). Potts 2005 gave a semantic account instead: he posited that supplements are attached *in situ*, but that ellipsis resolution is a *semantic* operation that can disregard supplements (further argument that some non-at-issue material can be disregarded under ellipsis was provided in Potts et al. 2009: expressives, which are not thought to 'attach high', can be disregarded in a similar fashion under ellipsis[40]). These observations could explain the ellipsis component of our data: what we categorized as cosuppositions triggered by co-speech gestures might in fact be supplements, hence their 'disappearing act' under ellipsis.[41]

8.2   Cosuppositional theories

We turn to theories that take the inferences triggered by some modulations of ASL classifier predicates and some English pro-speech gestures to be genuine cosuppositions. These theories come in several varieties. One takes these expressions to include incorporated gestures – an extension of Aristodemo's (2017) theory for LIS. On this view, all cosuppositions are due to co-speech or co-sign gestures, but it lacks plausibility for pro-speech gestures (Section 8.2.1). Another theory unifies the phenomena from a different angle: starting the observation that *some* cosuppositions are not due to co-speech/sign gestures, it seeks to take all cosuppositions (including co-speech/sign ones) to be conceptual in nature. This fails to account for crucial contrasts (Section 8.2.2). Our preferred theory takes cosuppositions to have a unifying property (as entailments that can be disregarded because they follow from the modified expression) but two sources: some can be disregarded because they are triggered by secondary or 'parasitic' material (co-speech/sign gestures); others can be disregarded for conceptual reason, because they don't answer the 'Question Under Discussion' (Section 8.2.3). This theory has a near-notational variant on which covert words are 'guessed' and modified by iconic constructions (*qua* co-speech gestures), but we take it to lack plausibility (Section 8.2.4).

8.2.1   Cosuppositions due to incorporated gestures?

The simplest way to unify all the cases we have discussed so far is to treat cosupposition-inducing modulations of classifier predicates and pro-speech gestures to be – well, co-sign and co-gesture gestures. This would generalize the analysis of Aristodemo 2017 from some LIS lexical verbs to ASL classifier predicates; the resulting theory explains the cosuppositional nature of the inferences triggered, but like other theories it fails to explain why in our ASL data they cannot be disregarded under ellipsis, as in Appendix II. It is hard to see what independent evidence there is for taking some modulation of iconic paths (such as a curved path) to be gestures while others (an orthogonal detour) are not. The

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[40] Potts et al. 2009 contrast the case of the underlined expressive in (i)A, which can be ignored under ellipsis in (i)B, to the prenominal modifier in (ii)A, which cannot be ignored in a similar fashion in (ii)B.

(i)   A: I saw your <u>fucking</u> dog in the park.
       B: No, you didn't—you couldn't have. The poor thing passed away last week. (Potts et al. 2009)

(ii)   A: I saw a shaggy dog in the park.
       B: I did too. #The one I saw/It had no hair. (Potts et al. 2009)

[41] This theory would not explain the difference between our ellipsis data for ASL classifier predicates and for English pro-speech gestures, but at this point this a mystery for every analysis.

problem is even more severe for English pro-speech gestures *LIFT-difficult* and *TAKE-OFF-difficult-accelerating*, as the cosupposition-triggering part of the gesture is not easily separable from the rest of the gesture. We shall thus consider some alternative theories.[42]

8.2.2 *A purely conceptual theory of cosuppositions?*

Our Aristodemian theory sought to treat all cosuppositions as arising from co-speech and co-sign gestures. Going to the other extreme, we could seek a unification by positing that it is for purely conceptual reasons (due to their truth-conditional contribution) that all of these constructions (i.e. standard co-speech/sign gestures, some pro-speech gestures, some classifier predicates) trigger cosuppositions. If so, there is nothing in the manner of production of co-speech/sign gestures that is responsible for their cosuppositional behavior.

We find this purely conceptual theory very implausible, for the following reason: in (61)a, the co-speech gesture *PUNCH* co-occurs with a VP (*act*, or *do something*, or *take action*) that adds nothing to it: it is clear that if one punches, one acts/does something/takes action. Still, a clear cosupposition is triggered, to the effect for instance that *if one took action, this would involve punching the boss*. No such inference is present in (61)b, where it is left entirely open that are other ways of taking action, for instance by criticizing (rather than by punching) the boss.

(61) [Talking to one's close colleagues]
I am sure tomorrow our boss will once again hurl insults at us, and none of us will

a. PUNCH_ **act / [do something] / [take action]**.

b. PUNCH_ .

(picture from Schlenker and Chemla 2018)

The contrast is expected on standard theories of cosuppositions induced by co-speech gestures: in (61)a, the predicted cosupposition is that for each of us, if s/he were to take action, s/he would punch. No such inference is triggered in (61)b, as desired. But the VP (with the gesture) has essentially the same global meaning (and conceptual contribution) in (61)a and (61)b, so a purely conceptual theory isn't feasible.

8.2.3 *A more abstract unification*

We believe that a more abstract unification is called for. In a nutshell, the idea is that, in all cases, a cosupposition p' is presented as an unimportant component of the meaning of an expression pp' (where as before the semantic meaning of pp' is just the conjunction of p and p'). For this reason, the global context of the conversation should guarantee that, relative to its local context, it should make no difference whether the relevant word is evaluated with or without p', as is stated in (62)a. This definition immediately derives the standard definition of cosuppositions reviewed in Section 2.1, as shown in (62)b. Importantly, all co-speech/sign gestures discussed in this piece are presented as unimportant because of their form, presumably because they are parasitic on the expressions they modify, as discussed in Schlenker 2018b. By contrast, only some entailments that are not triggered by co-speech gestures (i.e. in the case of classifier predicates and pro-speech gestures) are presented as unimportant:

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[42] A different but formally related theory was suggested by an anonymous reviewer. Maybe cosupposition-inducing iconic expressions are syntactically decomposed into a verbal element, and a manner adverbial that is high enough to be ignored under ellipsis. This theory seems to us strictly worse than the incorporated gesture analysis, for two reasons: (i) it fails to explain why these manner adverbials trigger cosuppositions; this is all the more striking since explicit manner adverbials fail to trigger them, both in our ASL and in our English data; (ii) one would need to posit that a manner modifier corresponding to a shape modulation realized throughout or in the middle of the iconic expressions (as was the case in our cosupposition-inducing classifiers and pro-speech gestures) is syntactically attached high, and there is no evidence for this.

this crucially depends on their content and on the nature of the context, as stated in (62)c.[43]

(62) A unified theory of cosupposition generation
a. A cosupposition is triggered when an elementary expression (possibly including a co-speech/sign gesture) pp' has an entailment p' which is presented as being unimportant, and for this reason the global Context Set C should guarantee that, relative to its local context c', pp' should be equivalent to p, i.e.

(i) c' $\models$ pp' $\Longleftrightarrow$ p

b. (i) is equivalent to the standard definition of cosuppositions in (ii):

(ii) c' $\models$ p $\Longrightarrow$ p'

c. An entailment p' might be presented as unimportant for different reasons:
(i) for reasons of manner, in case p' is contributed by a co-speech or co-sign gesture (which is parasitic and thus should not make an essential contribution);[44]
(ii) for conceptual reasons, in case p' is understood not to matter given the context of the conversation.

[d. Because cosuppositions are presented as unimportant, they can to some extent be disregarded under ellipsis resolution. (This does not preclude the possibility that co-speech/sign cosuppositions are more easily ignored for syntactic reasons.)]

It is worth noting that this analysis could very naturally be supplemented with the clause in (62)d, according to which all cosuppositions can to some extent be ignored under ellipsis because they are presented as unimportant. As we noted, this behavior seems to be displayed not just by co-speech gestures, but also by some cosuppositions triggered by pro-speech gestures; but as things stand, our ASL classifier predicate data do not bear this out, possibly for lack of a sufficiently strong context. If this theory is on the right track, it might make it possible to re-analyze Aristodemo's cosuppositional data from a new perspective. These might not involve any co-sign gestures, but rather conceptual cosuppositions. Whether this is on the right track remains to be seen, however.

The conceptual reason for taking an entailment to be unimportant (62)c(ii)) could fit rather well within theories of 'Questions Under Discussion', and it would predict that conceptual cosuppositions are very sensitive to the implicit QUD. The reasoning could go as follows. Take for instance the sentence *This child, I won't LIFT-difficult* (modified from (35)b). The QUD is plausibly whether the speaker (abbreviated as *S*.) will lift the child. As shown in (63), the pro-speech gesture provides overly specific information, to the effect that the child will be lifted *as depicted*, with difficulty. This makes the negative statement irrelevant to the QUD, as it is compatible with the hatched area of the left-hand cell, and also the right-hand cell. The cosupposition *if the speaker lifts the child, this will be as depicted* guarantees that the hatched cell is excluded (as it refutes the cosupposition). As a result, the answer given can be optimally informative. This mechanism does not take the entailment *something happened with difficulty* to be presupposed, as it would be on Simons et al.'s theory: this would derive a standard presupposition, and an incorrect one. On the other hand, a cosupposition works well, as can be seen.[45]

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[43] Thanks to M. Esipova (p.c.) for noticing a typo in an earlier formulation. (Esipova 2019 discusses a more general statement of the equivalence, for the case in which the modifiers are not intersective.)

[44] An anonymous reviewer suggests that some cases of co-speech gestures that give rise to local accommodation (hence no cosupposition in the end) could be treated differently, by positing that their content is treated as important, for instance for reasons of focus (as in Esipova 2017). If so, these are not cases of accommodated cosuppositions, but rather cases in which the cosuppositional inference isn't generated to begin with. Note that on this variant of our analysis, one still needs a presumption that co-speech gestures provide unimportant information, or else we would not derive the crucial contrast in (61).

[45] In greater detail, let us write *I will lift the child* as p and *I will lift the child as depicted* as pp'. In order to guarantee that the question under discussion is addressed by a 'no' (as well as a 'yes') answer in (63), we need a presupposition that we are not in the hatched area, correspoding to (p $\wedge\neg$ pp'), hence: $\neg$(p $\wedge\neg$ pp'), which simplifies to ($\neg$p $\vee$ pp'), i.e. p $\Rightarrow$ p'; this is the desired cosupposition.

(63) *This child, I won't* LIFT-difficult in a plausible Question Under Discussion

S. **will** lift the child.	S. **won't** lift the child.
S. will lift the child but not as depicted.	
S. will lift the child as depicted.	

This analysis predicts that the cosupposition could disappear upon a different QUD (*Will the speaker lift the child with difficulty?*), which might explain why pro-speech cosuppositions are somewhat unstable. We leave this, as well as a full integration with QUD theories, for future research (see also Schlenker 2019c,d for related cosuppositions that might be triggered by pro-speech pictures and even by pro-speech music).[46]

8.2.4   A near-notational variant with covert words

We should mention one last cosuppositional direction, which is technically very close to the abstract unification proposed in the previous section, but is conceptually rather different. On this view, *all* cosuppositions arise from co-speech gestures. But there are no incorporated gestures, as in the extension of Aristodemo's view discussed in Section 8.2.1. Rather, in the case of pro-speech gestures one tries to 'guess' which covert word is present, and we treat the gesture as being a co-speech gesture modifying that covert word. The QUD is expected to help guess the word. For (63), it makes sense to take the covert word to be *lift*, and thus the sentence is analyzed as *Your son, I won't* LIFT-difficult **lift**. When no cosupposition is triggered, this is because the covert word is as specific as the gesture.[47] General facts about co-speech gestures under ellipsis explain why the cosuppositions can be disregarded.

This analysis has the drawback of positing covert words without any direct evidence. For English pro-speech gestures, positing that one is trying to guess the missing spoken word might not seem outlandish. But the cosuppositional inferences triggered by ASL classifier predicates would presumably require the same measure. But why should one posit a covert word when an overt one (namely the classifier predicate) is already present in the same modality? This isn't very plausible.[48]

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[46] We also leave for future research an investigation of demonstratives referring to gestures, as in (i). Our impression is that this construction *fails* to trigger the expected cosuppositions, possibly because the demonstrative highlights that all aspects of the iconic representation are important and thus at-issue.

(i) At 12:05, our company's helicopter won't do this: TAKE-OFF-difficult-accelerating

[47] M. Esipova (p.c.) made a related remark in a slightly different context.

[48] We have another worry. On the proposed theory, the at-issue content of the pro-speech gesture should be entailed by the covert word. Examples such as (i) might pose a problem because gesture is hard to paraphrase.

(i) *Context:* While a painter is away, two of her friends are discussing an unfinished painting of hers. In order to complete this abstract painting, do you think our friend will DRAW-ABSTRACT-SHAPE_deliberate?

We believe that this pro-speech gesture can have an at-issue component that indicates a specific abstract shape, one that could not be described in gesture-free words. Simultaneously, one can realize the gesture in a very slow and deliberate way so as to suggest, arguably in a cosuppositional fashion, that *if our friend were to draw this shape, a slow and deliberate movement would be involved*. It is hard to see which covert word could ensure that the shape is at-issue but the manner of painting is not. (We would have to posit a covert expression that makes demonstrative reference the gesture, e.g.: ~~draw this~~. The shape could then be at-issue because it is entailed by the covert expression, while the manner of painting could be cosuppositional because it isn't so entailed…)

8.3 Presuppositional theories

The unified theory of cosupposition outlined in (62) must still posit two sources of cosupposition generation, one based on considerations of manner (*how* an enrichment is contributed), and one based on conceptual considerations (as stated in (62)c). For this reason, one might ask whether a better theory could be obtained by treating the 'conceptual' cosuppositions as triggered by whatever mechanism is responsible for *standard* presupposition generation. Since cosuppositions are a species of presuppositions, this possibility is in principle open; the question is whether more general algorithms will turn out (once they are stated precisely!) to derive 'conceptual' cosuppositions as a special case.

If we write as *pp'* an iconic expression with at-issue contribution *p'* and cosupposition *p'=>p*, the challenge is to explain how *p'=>p* could follow as a standard presupposition. For instance, *x GO-helicopter-up_circling* is analyzed as having the at-issue contribution (= *p'*) *x goes up*, and the cosupposition (= *p'=>p*) *if x goes up, x has a circling motion*. For several triggering mechanisms, we have a chance of treating the cosupposition as a standard presupposition if we take it to follow from an inherent, pre-existing property of the relevant object – to the effect that the helicopter *tends* to take off by way of a circling motion, not just in the described event but quite generally. For brevity, we just discuss two triggering mechanisms that seemed reasonably accurate and predictive for the (non-cosuppositional) iconic presuppositions discussed above: Abrusán's theory, and the analysis of presuppositions as counterfactually 'stable' entailments.

Abrusán's theory could posit that the conceptual cosuppositions we observed are in fact general properties of the object and/or of the situation rather than just of the event time. For this reason, these entailments are not about the event time, and end up being presupposed. For instance, *x GO-helicopter-up_circling* could trigger the inference that *the helicopter has a tendency to take off with a circling motion*, or that the situation is one in which there is much wind, leading to the same consequence. This is plausible enough, and since these entailments are not about the main event time, they should be presupposed, and the conditionalized inference we saw should follow; for instance, on the assumption that the helicopter tends to take off with a circling motion, it follows that *if the helicopter were to take off, it would do so with a circling motion*. Things are less clear for the 'curved path' cosupposition in *x GO-helicopter-large_⌒_smooth*, but maybe one could posit that there was probably *a pre-existing plan that the helicopter would fly with a curved path*. One would still need to derive the fact that the same plan couldn't be posited for the orthogonal detour conditions (which triggered a presupposition that the movement will in fact take place, rather than a cosupposition).

We can make use of the same idea if we view presuppositions as counterfactually 'stable' entailments, as we suggested in (58). Take the case of *x GO-helicopter-up_circling*. On the assumption that helicopter x took off with a circling motion, we infer that this type of movement is an inherent property of x, and thus that if it hadn't taken off, it would still have had this property.[49] To extend this analysis to the case of *x GO-helicopter-large_⌒_smooth*, we need to posit that, on the assumption that the helicopter took that path, it was pre-ordained, possibly as part of a regular plan, and thus that even if the helicopter hadn't made the trip from Boston to New York, the plan would have remained (here too, the contrast with the orthogonal detour condition would need to be derived).

This general attempt to reduce conceptual cosuppositions to standard presuppositions leaves many questions open. And it is worth noting that treating cosuppositions triggered by predicate classifiers and pro-speech gestures as normal presuppositions leads one to expect that they should also display a standard behavior under ellipsis. This does not seem correct for pro-speech gestures.

9 Conclusion

9.1 Main findings

Our first finding is that presuppositions (be they standard or cosuppositional in nature) can be triggered by iconic pro-speech gestures and classifier predicates, including ones whose precise shape may not have been encountered before. This highlights the need for a triggering algorithm. Iconic constructions

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[49] Things are more complicated if we take the circling motion to be due to the situation rather than to the helicopter, as this entailment might not be counterfactually stable any more.

offer a new tool to investigate its form, for two reasons: they generate new meanings that require a productive rule, and they can be modified in minimal ways so as to provide fine-grained information about the precise shape of the algorithm (e.g. to derive the effects of different path modifications).

Our second finding is that the presuppositions triggered by pro-speech gestures and classifier predicates are of two kinds: besides standard presuppositions that may have a counterpart in spoken words (such as the 'on the ground' presupposition of a pro-speech gesture or classifier predicate representing a take-off), they may induce cosuppositions that resemble those triggered by co-speech/sign gestures. Under ellipsis, cosuppositions generated by pro-speech gestures (but possibly not by ASL classifier predicates) display the same 'disappearing act' as standard cosuppositions.

Our third finding pertains to the consequences of our data for analyses of the Triggering Problem. Abusch's and Abrusán's theories can naturally account for some but not necessarily all of our cases. Abusch's theory requires sets of lexical alternatives that sometimes seem *ad hoc*, especially when it comes to distinguishing presuppositions from cosuppositions. Abrusán's theory can very naturally account for the presuppositional status of entailments that pertain to pre-existing conditions (for instance the presence of a 2-rotored helicopter, or an initial state), but the case of presuppositions triggered by unexpected deviations from a trajectory is currently difficult to explain. Simons et al.'s theory could account for some of the data provided the 'right' Questions under Discussion were posited, but motivating such QUDs wasn't always easy. We sketched a fourth theoretical direction, according to which the most 'stable' entailments get presupposed, which might offer a unified account of our various presuppositional cases, but it has yet to be developed.

Our fourth finding is more tentative, and pertains to the triggering of cosuppositions. While there are several alternatives, our preferred theory takes all cosuppositions to originate in entailments that are presented as unimportant, but this may be for reasons of manner (because they are contributed by syntactically parasitic enrichments) or for conceptual reasons (in the case of pro-speech and classifier predicate cosuppositions). One might expect that cosuppositions can be disregarded under ellipsis because they are presented as unimportant, which accounts for our data pertaining to cosuppositions induced by pro-speech gestures.

9.2   Questions for future research

There are three main issues we leave for future research. First, several empirical improvements should be made: data could be collected from further consultants/informants in sign and spoken language; experiments could be conducted when necessary; and stimuli could be improved and made more minimal, for instance by 'splicing' videos, i.e. by inserting the same video snippet in different contexts, in particular under different operators.

Second, the data pertaining to ellipsis should be further explored and better understood, and possibly extended to contexts involving *only*, since in many cases one can disregard in the 'focus dimension' under *only* whatever elements can be disregarded under ellipsis.

Third, detailed formal work is needed to define precise and predictive algorithms to trigger standard presuppositions and cosuppositions. If this article is on the right track, iconic data could constrain and inform these algorithms.[50]

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[50] Finally, as mentioned in Section 3.6.2, it should be kept in mind that, as in all studies of presuppositions, the inferential *contrasts* we obtain are due to the difference between the target constructions and the at-issue controls, which typically come with *anti*-presuppositions. This could pave the way for accounts based on general pragmatic reasoning: pragmatic enrichment might be plausible in all cases (e.g. one raises the possibility that pp' because p is generally the case), but defeated in the controls (in case p is presented as non-trivial). We leave this issue for future research.

Appendix I. Comparing lexical triggers and iconic triggers in ASL

We provide below some details about the paradigms discussed in Section 3. As in the main text, we boldface inferential strengths that are at or above 5.

❑ *Going from Boston to New York: embedding under DOUBT, MAYBE, IF, and NONE*

We start with details about our paradigm involving horizontal movement of a helicopter from New York to Boston. We do not repeat the inferential questions, introduced in (19) and (20) in the text (see also the Supplementary materials, where all inferential questions are copied).

The inferential data for embedding under *DOUBT* in (64), under *MAYBE* in (65) and under *IF* in (66) all lead to the same general conclusions. First, the 2-rotored representation of the helicopter triggers a presupposition (in all cases), as does *CONTINUE* (to the effect that the helicopter has been on its way from Boston to New York). Contrary to our initial hypothesis, the 'swaying movement' condition does not trigger a cosupposition (or any presupposition besides the 2-rotored one). By contrast, the 'smooth detour' condition triggers a cosupposition to the effect that if the helicopter were to go from Boston to New York within the next hour, this would involve a smooth detour. Finally, the 'abrupt detour' condition triggers a presupposition that the helicopter will in fact go from Boston to New York within the next hour.

Data pertaining to embedding under *NONE* are harder to assess. First, we only have two judgments in this case. Second, several cases give rise to much variability. Still, *CONTINUE* does seem to trigger the expected presupposition, whether one uses existential projection or universal projection as a criterion. The same conclusion holds of the 'smooth detour' cosupposition. Using existential projection as a criterion, the 2-rotored presupposition emerges in some but not in all cases, and the presupposition that the helicopter will in fact go from Boston to New York in the next hour does emerge in the 'abrupt detour' condition.

(64) **DOUBT**
  Context: our company has one helicopter and one airplane.
  WITHIN 1-HOUR OUR COMPANY BIG HELICOPTER BOSTON$_a$ NEW-YORK$_b$ DOUBT ___ .
  'I doubt that within an hour our company's big helicopter will … from Boston to New York.' (ASL, 34, 3530; 3 judgments)

Condition (ASL, **34, 3530**; 3 judgments)	Words (replacing ____) and acceptability	Translation (replacing …)
a. neutral path	6.3 GO-helicopter-large_	fly
b. CONTINUE	7 CONTINUE GO-helicopter-large_	continue to fly
c. swaying movement	5.7 GO-helicopter-large_/\/\/_	fly with a swaying movement
d. smooth detour	7 GO-helicopter-large_∩_smooth	fly (with the assumption that this would involve a smooth detour)
e. abrupt detour	6.7 GO- helicopter-large__/__abrupt	make an abrupt detour on its way

Target sentence / Inferences (ASL, **34, 3530**; 3 judgments)	Inference type	1. Helicopter has 2 rotors	2. Helicopter has been on its way from B to NYC within the next hour	3. Helicopter will go from B to NYC	4. If the helicopter goes from B to NYC within the next hour, ____ (= strongest conditional inference)
a. neutral path	2-rotored presupposition	**5.7**	2	1	1
b. CONTINUE	lexical presupposition [+ 2-rotored presupposition]	7	**6.3**	2	1
c. swaying movement	at-issue? cosupposition? [+ 2-rotored presupposition]	**5.7**	3.3	3.7	3.3 (2, 3, 5) (swaying-like motion)

d. smooth detour	cosupposition [+ 2-rotored presupposition]	**6.3**	1	1.3	**6** (smooth detour)
e. abrupt detour	presupposition [+ 2-rotored presupposition]	**6**	4.7 (7, 4, 3)	**6.3**	1.3 (abrupt detour)

(65) **MAYBE**
   Context: our company has one helicopter and one airplane.
   WITHIN 1-HOUR OUR COMPANY BIG HELICOPTER BOSTON$_a$ NEW-YORK$_b$ MAYBE ___ .
   'Within an hour, maybe our company's big helicopter will … from Boston to New York.' (ASL 34, 3540; 4 judgments)

Condition (ASL **34, 3540**; 4 judgments)	**Words** (replacing _____) **and acceptability**	**Translation** (replacing …)
a. neutral path	[7]GO-helicopter-large_	fly
b. CONTINUE	[7] CONTINUE GO-helicopter-large_	continue to fly
c. swaying movement	[6.3] GO-helicopter-large_/\\/_	fly with a swaying movement
d. smooth detour	[7] GO-helicopter-large_∩_smooth	fly (with the assumption that this would involve a smooth detour)
e. abrupt detour	[6.8] GO- helicopter-large__/__abrupt	make an abrupt detour on its way

Target sentence / Inferences (ASL **34, 3540**; 4 judgments)	**Inference type**	**1. Helicopter has 2 rotors**	**2. Helicopter has been on its way from B to NYC within the next hour**	**3. Helicopter will go from B to NYC**	**4. If the helicopter goes from B to NYC within the next hour, ____ (= strongest conditional inference)**
a. neutral path	**2-rotored presupposition**	**7**	2.3	1.8	1
b. CONTINUE	**lexical presupposition** [+ 2-rotored presupposition]	**6.8**	**6.5**	2	1
c. swaying movement	**at-issue? cosupposition?** [+ 2-rotored presupposition]	**7**	2.8 (3, 6, 1, 1)	3.5 (4, 6, 2, 2)	3.8 (3, 2, 5, 5) (swaying-like motion)
d. smooth detour	**cosupposition** [+ 2-rotored presupposition]	**7**	1.3	1.8	**6** (smooth detour)
e. abrupt detour	**presupposition** [+ 2-rotored presupposition]	**7**	2.5	**5.5**	2 (abrupt detour)

(66) **IF[51]**
   Context: our company has one helicopter and one airplane.
   WITHIN 1-HOUR OUR COMPANY BIG HELICOPTER BOSTON$_a$ NEW-YORK$_b$ IF ___, 2-E-MAIL-1 .
   'If within an hour our company's big helicopter … from Boston to New York, e-mail me.' (ASL, 34, 3518 3 judgments)

Condition (ASL, **34, 3518**; 3 judgments)	**Words** (replacing _____) **and acceptability**	**Translation** (replacing …)
a. neutral path	[7]GO-helicopter-large_	flies
b. CONTINUE	[6.7] CONTINUE GO-helicopter-large_	continues to fly
c. swaying movement	[6.3] GO-helicopter-large_/\\/_	flies with a swaying movement
d. smooth detour	[7] GO-helicopter-large_∩_smooth	flies (with the assumption that this

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[51] As shown in the Supplementary Materials, initial questions did not ask for quantitative inferential judgments; for uniformity with the other paradigms discussed in this piece, only the judgment tasks that included quantitative inferential questions are taken into account here.

		would involve a smooth detour)
e. abrupt detour	6.7 GO- helicopter-large__/__abrupt	makes an abrupt detour on its way

Target sentence / Inferences (ASL, 34, 3518; 3 judgments)	Inference type	1. Helicopter has 2 rotors	2. Helicopter has been on its way from B to NYC within the next hour	3. Helicopter will go from B to NYC	4. If the helicopter goes from B to NYC within the next hour, ____ (= strongest conditional inference)
a. neutral path	2-rotored presupposition	6	2	2	1
b. CONTINUE	lexical presupposition [+ 2-rotored presupposition]	5.7	6.3	2	1
c. swaying movement	at-issue? cosupposition? [+ 2-rotored presupposition]	6	2	2.3	4.7 (swaying-like motion)
d. smooth detour	cosupposition [+ 2-rotored presupposition]	6.3	1.7	1.7	6 (smooth detour)
e. abrupt detour	presupposition [+ 2-rotored presupposition]	6.7	2.7	5.7	2 (abrupt detour)

(67) **NONE**
Context: our company has four helicopters and one airplane.
WITHIN 1-HOUR OUR COMPANY 4 BIG HELICOPTER BOSTON$_a$ NEW-YORK$_b$ NONE IX-arc[52] ___.

'Within the next hour, none of our company's 4 big helicopters will … from Boston to New York.' (ASL, 34, 3552; 2 judgments)

Condition (ASL, 34, 3552; 2 judgments)	Words (replacing ____) and acceptability	Translation (replacing …)
a. neutral path	6.5 GO-helicopter-large_	fly
b. CONTINUE	7 CONTINUE GO-helicopter-large_	continue to fly
c. swaying movement	6.5 GO-helicopter-large_/\\/\\/_	fly with a swaying movement
d. smooth detour	7 GO-helicopter-large_∩_smooth	fly (with the assumption that this would involve a smooth detour)
e. abrupt detour	7 GO- helicopter-large__/__abrupt	make an abrupt detour on their way

Target sentence / Inferences (ASL, 34, 3552; 2 judgments)	Inference type	1. __helicopter has 2 rotors		2. __ helicopter has been on its way from B to NYC within the next hour		3. __ helicopter will go from B to NYC		4. For__ helicopter, if it goes from B to NYC within the next hour, ____ (= strongest conditional inference)	
		Each	At least one	Each	At least one	Each	At least one	each	at least one
a. neutral path	2-rotored presupposition	3.5	4	1	1	1	1	1	1
b. CONTINUE	lexical presupposition [+ 2-rotored presupposition]	4.5	5.5	5	6.5	1	1	1	1
c. swaying movement	at-issue? cosupposition? [+ 2-rotored presupposition]	4.5	5	2.5	3	3 (1, 5)	3.5 (1, 6)	3 (5, 1)	3.5 (6, 1) (swaying-like motion)
d. smooth detour	cosupposition [+ 2-rotored	5	5.5	1	1	1	1	6.5	6.5 (smooth detour)

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[52] *IX-arc* appears to be signed in a neutral position, so no locus is assigned to it.

	presupposition]								
e. abrupt detour	presupposition [+ 2-rotored presupposition]	**5.5**	**5.5**	2.5	3.5	4	**5.5**	1	1 (abrupt detour)

❑ *Taking off: embedding under DOUBT, MAYBE, IF, and NONE*

Under *DOUBT* and *MAYBE*, we obtain the expected pattern of projection: *CONTINUE* triggers a lexical presupposition (to the effect that the helicopter is currently taking off); all constructions except *CONTINUE* trigger a presupposition that the helicopter is currently on the ground (the presupposition triggered by *CONTINUE* is nearly incompatible with it: if the helicopter continues to take off, it is probably not on the ground any more). The 'circling motion' and 'undulating motion' conditions trigger a cosupposition, to the effect that if the helicopter were to take off in the next five minutes, this would involve a circular/undulating motion. Finally, the 'abrupt detour' condition triggers a presupposition that the helicopter will in fact take off in the next five minutes.

For reasons we do not understand, the iconic cosuppositions involving a circling motion and an undulating motion are weakened under *IF*, as is the presupposition that the helicopter will in fact take off in the 'abrupt detour' condition. And under *NONE* (where we only have two judgments, and quite a bit of variation), only the presupposition triggered by *CONTINUE* and the cosuppositions involving a circular/undulating motion give rise to reasonably strong inferences.

(68) **DOUBT**
      Context: our company has one helicopter and one airplane.
      WITHIN 5-MINUTES OUR COMPANY HELICOPTER DOUBT _____ .
      'I doubt that within the next five minutes our company's helicopter will ….' (ASL, 34, 3562; 2 judgments)

Condition (ASL, 34, 3562; 2 judgments)	**Words** (replacing _____) **and acceptability**	**Translation** (replacing …)
a. neutral path	[7] GO-helicopter-up_	take off
b. CONTINUE	[7] CONTINUE GO-helicopter-up_	continue to take off
c. circling motion	[7] GO-helicopter-up_circling	take off (with the assumption that this would involve a circular motion)
d. undulating motion	[6.5] GO-helicopter-up_undulate_smooth	take off with an undulating motion
e. abrupt detour	[7] GO-helicopter-up__/__abrupt	make an abrupt detour during take off

Target sentence / Inferences (ASL, 34, 3562; 2 judgments)	**Inference type**	**1. Helicopter is currently on the ground**	**2. Helicopter is currently taking off**	**3. Helicopter will take off in the next 5 minutes**	**4. If the helicopter takes off in the next five minutes, _____ (= strongest conditional inference)**
a. neutral path	on ground presupposition	**6.5**	1	2	1
b. CONTINUE	lexical presupposition [+ on ground presupposition]	2	**6**	2	1
c. circling motion	cosupposition [+ on ground presupposition]	**5**	1	2	**5** (circular motion)
d. undulating motion	cosupposition [+ on ground presupposition]	**5**	1.5	2	**5.5** (undulating motion)
e. abrupt detour	presupposition [+ on ground presupposition]	4.5	2.5	**5**	2.5 (abrupt horizontal displacement)

(69) **MAYBE**
   Context: our company has one helicopter and one airplane.
   WITHIN 5-MINUTES OUR COMPANY HELICOPTER MAYBE _____ .
   'Within the next five minutes, maybe our company's helicopter will ….' (ASL, 34, 3556; 3 judgments)

Condition (ASL, 34, 3556; 3 judgments)	Words (replacing ____) and acceptability	Translation (replacing …)
a. neutral path	[7] GO-helicopter-up_	take off
b. CONTINUE	[7] CONTINUE GO-helicopter-up_	continue to take off
c. circling motion	[7] GO-helicopter-up_circling	take off (with the assumption that this would involve a circular motion)
d. undulating motion	[7] GO-helicopter-up_undulate_smooth	take off with an undulating motion
e. abrupt detour	[6.7] GO-helicopter-up__∧__abrupt	make an abrupt detour during take off

Target sentence / Inferences (ASL, 34, 3556; 3 judgments)	Inference type	1. Helicopter is currently on the ground	2. Helicopter is currently taking off	3. Helicopter will take off in the next 5 minutes	4. If the helicopter takes off in the next five minutes, ____ (= strongest conditional inference)
a. neutral path	on ground presupposition	6.3	1.3	2.3	1
b. CONTINUE	lexical presupposition [+ on ground presupposition]	2	6	3	1
c. circling motion	cosupposition [+ on ground presupposition]	5.7	1.3	2.3	5.7
d. undulating motion	cosupposition [+ on ground presupposition]	5.7	1.3	2.7	5.3
e. abrupt detour	presupposition [+ on ground presupposition]	5.7	1.7	5	2[53]

(70) **IF**
   Context: our company has one helicopter and one airplane.
   WITHIN 5-MINUTES OUR COMPANY HELICOPTER IF _____, 2-CALL-1.
   'If within the next five minutes our company's helicopter …, call me.' (ASL, 34, 3568; 3 judgments)

Condition (ASL, judgments)	Words (replacing ____) and acceptability	Translation (replacing …)
a. neutral path	[7] GO-helicopter-up_	takes off
b. CONTINUE	[7] CONTINUE GO-helicopter-up_	continues to take off
c. circling motion	[7] GO-helicopter-up_circling	takes off (with the assumption that this would involve a circular motion)
d. undulating motion	[7] GO-helicopter-up_undulate_smooth	takes off with an undulating motion
e. abrupt detour	[7] GO-helicopter-up__∧__abrupt	takes off with an abrupt detour

Target sentence / Inferences	Inference type	1. Helicopter is currently on the	2. Helicopter is currently taking	3. Helicopter will take off in the next	4. If the helicopter takes off in the next

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[53] As seen in the Supplementary Materials, in judgment [JL 17.10.22] the consultant picked option '(d)', which was not offered; we believe he meant the last option offered, i.e. (c), which is also the option he picked in other judgment tasks for the same sentence. The inference strength is extremely low and thus this point is immaterial to the present discussion.

(ASL, 34, 3568; 3 judgments)		ground	off	5 minutes	five minutes, ____ (= strongest conditional inference)
a. neutral path	on ground presupposition	**6.3**	1.7	2	1
b. CONTINUE	lexical presupposition [+ on ground presupposition]	2.3	**5.3**	2	1
c. circling motion	cosupposition? at-issue? [+ on ground presupposition]	**5.7**	1.7	2	4.3 (circular motion)
d. undulating motion	cosupposition? at-issue? [+ on ground presupposition]	**6**	1.7	2	4.7 (undulating motion)
e. abrupt detour	presupposition? at-issue? [+ on ground presupposition]	**6**	2	4	1.7 (abrupt horizontal displacement)

(71) **NONE**

Context: our company has four helicopters and one airplane.

WITHIN 5-MINUTES OUR COMPANY 4 HELICOPTER NONE IX-arc _____.
'Within the next five minutes, none of our company's 4 helicopters will ….' (ASL, 34, 3570; 2 judgments)

Condition (ASL 34, 3570; 2 judgments)	Words (replacing ____) and acceptability	Translation (replacing …)
a. neutral path	[7] GO-helicopter-up_	takes off
b. CONTINUE	[7] CONTINUE GO-helicopter-up_	continues to take off
c. circling motion	[6.5] GO-helicopter-up_circling	takes off (with the assumption that this would involve a circular motion)
d. undulating motion	[6.5] GO-helicopter-up_undulate_smooth	takes off with an undulating motion
e. abrupt detour	[6] GO-helicopter-up__/__abrupt	makes an abrupt detour during takeoff

Target sentence / Inferences (ASL, 34, 3570; 2 judgments)	Inference type	1. __ helicopter is currently on the ground		2. __ helicopter is currently taking off		3. __ helicopter will take off in the next 5 minutes		4. For __ helicopter, if it takes off in the next five minutes, ____ (= strongest conditional inference)	
		Each	At least one	Each	At least one	Each	At least one	each	at least one
a. neutral path	on ground presupposition	3 (1, 5)	3.5 (2, 5)	1	1	1	1	1	1
b. CONTINUE	lexical presupposition [+ on ground presupposition]	1.5	2	4.5	**6**	1	1	1	1
c. circling motion	cosupposition? at-issue? [+ on ground presupposition]	3 (1, 5)	3.5 (2, 5)	1	1	1.5	1.5	**5**	**6** (circular motion)
d. undulating motion	cosupposition? at-issue? [+ on ground presupposition]	3 (1, 5)	3.5 (2, 5)	1	1	2	2	4.5	**5.5** (undulating motion)

| e. abrupt detour | **presupposition? at-issue?** [+ on ground presupposition] | 3.5 (2,5) | 5 | 1.5 | 1.5 | 3 | 4.5 | 1[54] | 1 (abrupt horizontal displacement) |

[54] As seen in the Supplementary Materials, in judgment [JL 17.10.21] our consultant picked option '(d)', which was not offered, for sentence e. He may have meant '(c)', which was the last option offered, and the one he picked in other judgments for the same sentence. In any event, the inference strength is extremely weak and this has not import.

Appendix II. The behavior under ellipsis of cosuppositions triggered by ASL classifier predicates

In this Appendix, we seek to determine whether our ASL consultant can ignore iconic cosuppositions of classifier predicates under ellipsis. According to the 'revisionist hypothesis' mentioned in Section 5, this should be possible. Our results do not bear this out: in an initial judgment task, our consultant disregarded cosuppositions under ellipsis; in two further judgment tasks, he didn't. We discuss possible reasons for this.

In order to assess the behavior of cosuppositions under ellipsis, we focus on a version of our earlier paradigms involving embedding under *MAYBE* with an elided clause. Because the elided clause included an overt *WILL* but no VP, it is plausible that this is an instance of VP-ellipsis.

❑ *Horizontal movement with ellipsis*

Our horizontal paradigm is illustrated in (72) and included a condition with *CONTINUE* in order to assess the behavior of a standard presupposition trigger.

(72) *Context:* the signer's company has one helicopter and the the addressee's company also has one helicopter.
WITHIN 1-HOUR POSS-1 COMPANY BIG HELICOPTER BOSTON$_a$ NEW-YORK$_b$ **MAYBE** WILL a-____-b . POSS-2 COMPANY HELICOPTER DEFINITELY WILL.
'Within the next hour, maybe my company's big helicopter will … from Boston to New York. Your company's helicopter definitely will.' (ASL 34, 3693; 3 judgments)

Condition (ASL 34, 3693; 3 judgments)	**Words** (replacing ____) **and acceptability**	**Translation** (replacing …)
a. CONTINUE	[7] CONTINUE GO-helicopter-large__	continue to fly
b. swaying movement	[7] GO-helicopter-large__/\/\/__very_light	fly (with the assumption that this would be with a swaying motion)
c. at-issue control of swaying movement	[6.7] GO-helicopter-large__ WITH MOVEMENT __/\/\/__very_light	fly with a swaying motion
d. curved path	[7] GO-helicopter-large_⌒_smooth	fly (with the assumption that this would be with a curved path)
e. at-issue control of curved path	[6.7] GO-helicopter-large__ WITH PATH _⌒_smooth	fly with a curved path
f. orthogonal detour	[6.7] GO-helicopter-large__|__ no_acceleration_smaller	make a detour on its way
g. at-issue control of orthogonal detour	[6.3] GO-helicopter-large__ WITH PATH __|__ no_acceleration_smaller	fly with a detour
h. pause in the middle	[7] GO-helicopter-large- __ __	make a pause to hover on its way
i. at-issue control of pause	[7] GO-helicopter-large__ WITH PAUSE __ __	fly with a pause to hover on its way

As in our earlier paradigms, the strength of relevant inferences was assessed in a quantitative fashion by way of the questions in (73).

(73) Quantitatively assessed inferences for the paradigm in (72)
Does the sentence suggest that any of the following is the case? (1 = no inference; 7 = strongest inference).
Answer separately for a. the signer's company's helicopter b. the addressee's company's helicopter.
Meaning 1: the helicopter has 2 rotors
Meaning 2: the helicopter has been on its way from Boston to NYC
Meaning 3: the helicopter will go from Boston to NYC within the next hour

Meaning 4a: **About the signer's company's helicopter:**
if the helicopter were to go from Boston to NYC within the next hour, it would
a. have a swaying-like motion
b. have a curved path

c. make an orthogonal detour
d. stop and hover on its way
(only pick the strongest inference among a, b, c, d)

Meaning 4b: **About the addressee's company's helicopter:**
within the next hour, the helicopter <u>will</u>
a. have a swaying-like motion
b. have a curved path
c. make an orthogonal detour
d. stop and hover on its way
(only pick the strongest inference among a, b, c, d)

The consultant was asked to provide separate answers to questions about the signer's company's helicopter, and about the addressee's company's helicopter; this was crucial to assess differences between the antecedent clause and the elided clause. As a result, inferential questions systematically came in two versions (labelled a. and b. for the signer and addressee respectively). The antecedent was embedded under *MAYBE* so as to assess the difference between at-issue, presuppositional and cosuppositional inferences. Our goal was to see which of these inferences survived under ellipsis, and for this reason the elided clause was not embedded under *MAYBE*, in order to obtain sharper inferences, not involving modal reasoning.[55] This required a modulation of the fourth question: under *MAYBE*, it makes sense to test cosuppositional inferences in a conditional fashion (e.g. 'if the company's helicopter were to go from Boston to New York, would it have a swaying-like motion'), but without *MAYBE*, the relevant inference becomes unconditional (e.g. 'the company's helicopter will go from Boston to New York with a swaying-like motion'). This explains why there are two separate columns for question 4a and question 4b in the table in (74).

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[55] To see why we made this decision, consider the condition in (72)b, involving a swaying movement. On the basis of the inferences triggered by the antecedent clause (about the signer's company's helicopter), we can determine that the 'swaying movement' inference is a cosupposition. The question is whether it is preserved under ellipsis. If the elided clause included *MAYBE*, there would be two potential reasons why this inference could fail to arise: (i) because it just isn't preserved under ellipsis; (ii) because it gives rise to local accommodation (and is thus treated as part of the at-issue component) in the scope of *MAYBE* within the elided clause. Possibility (ii) is a significant worry because cosuppositions are often taken to be weak presuppositions (which means that they are easily turned into part of the at-issue component). It is to avoid this attenuation of the effects that we did not include *MAYBE* the clause with the elided VP: whether there is local accommodation or not, the 'swaying' inference should show up if it is preserved under ellipsis. (With more fine-grained data, one could include *MAYBE* in the elided clause and assess the *difference* between the strength of the cosuppositional inference in the elided clause and in the antecedent, with the assumption that local accommodation should target both conditions in comparable ways.)

(74) Horizontal, *MAYBE*, with ellipsis added: inferential results for the paradigm in (72)

Target sentence / Inferences (ASL 34, 3693; 3 judgments)	Inference type	1. Helicopter has 2 rotors		2. Helicopter has been on its way from B to NYC		3. Helicopter will go from B to NYC		4a. If the signer's company's helicopter goes from B to NYC, ____ (= strongest conditional inference)	4b. The addressee's company's helicopter will ____ (= strongest inference)
		a. Signer	b. Addressee	a. Signer	b. Addressee	a. Signer	b. Addressee	a. Signer	b. Addressee
a. CONTINUE	lexical presupposition [+ 2-rotored presupposition]	**6.3**	2.7	**7**	**6.7**	2	**6.7**	1	1
b. swaying movement	cosupposition [+ 2-rotored presupposition]	**6.7**	2.3	1.7	2.3	2.7	**7**	5 (swaying)	6 (4, 7 , 7) (swaying)
c. at-issue control of swaying movement	at-issue [+ 2-rotored presupposition]	**6.7**	2.7	1	1.7	2.7 (3, 4, 1)	**7**	3 (swaying)	7 (swaying)
d. curved path	cosupposition [+ 2-rotored presupposition]	**7**	3.3	1.3	2	2	**7**	6 (curved)	6.3 Note: (5, 7, 7) (curved)
e. at-issue control of curved path	at-issue [+ 2-rotored presupposition]	**6**	2.3	1	1.7	3.3 (5, 3, 2)	**7**	3.3 (curved)	7 (curved)
f. orthogonal detour	presupposition [+ 2-rotored presupposition]	**7**	2.7	2	2	**6**	**7**	2 (orthogonal detour)	7 (orthogonal detour)
g. at-issue control of orthogonal detour	at-issue [+ 2-rotored presupposition]	**6.3**	2.3	1	1.7	2.3	**7**	3 (orthogonal detour)	7 (orthogonal detour)
h. pause in the middle	presupposition [+ 2-rotored presupposition]	**6.3**	2.3	1.7	2	**5.7**	**7**	2 (stop and hover)	7 (stop and hover)
i. at-issue control of pause	at-issue [+ 2-rotored presupposition]	**6.7**	2.7	1	1.7	2.7	**7**	3.7 (stop and hover)	7 (stop and hover)

Several conclusions can be drawn.

(i) The initial sentence with *MAYBE* (and without ellipsis) allows us to assess whether we managed to trigger the inferences we wanted. We did: the results strengthen the conclusions reached in the main text:

–In Column 4a, cosuppositions are obtained in the target sentences in the 'swaying movement' and 'curved path' conditions in b. and d. (= if the helicopter were to go from Boston to New York within the next hour, this would involve a swaying movement/a curved path), but not in the corresponding at-issue controls in c. and e.

–In Column 3a, presuppositions are obtained in the target sentences in the 'orthogonal detour' and 'pause in the middle' conditions in f. (= the helicopter will go from Boston to New York within the next hour), but not in the corresponding at-issue controls in g. and i.

(ii) The at-issue controls behave as expected, both under *MAYBE* and in the elided clause: they clearly must be copied under ellipsis.

(iii) The presupposition triggered by *CONTINUE* is as expected in the sentence with *MAYBE*. It is not preserved in the elided clause, and the reason might be quite simple: *DEFINITELY WILL* is missing a Verb Phrase, which can be resolved *CONTINUE GO-helicopter-large__* or just as *GO-helicopter-large__*. The inferential data suggest that the latter option is strongly preferred in this case.

(iv) Crucially, Column 4b suggests that cosuppositional inferences *are* inherited under ellipsis, since inferential scores are high for sentence b. and sentence d.

Thus the main conclusion is that the revisionist hypothesis according to which cosuppositions can be ignored under ellipsis is not at all confirmed. Two remarks must be made, however. First, judgments varied: the first judgment obtained (after right after the video was made) suggests that the cosupposition can to some extent be ignored. The latter two judgments disconfirm this. Second, nothing in the context really encouraged a reading without the cosupposition in the elided sentence. Thus it is conceivable that with a more inviting context the effect found in the first set of judgments could re-emerge - but we do not know this.

(v) By contrast, and perhaps surprisingly, the '2-rotored' presupposition triggered by the two-handed nature of the classifier is easily ignored under ellipsis. We come back to this point at the end of this Appendix.

❑ *Vertical movement with ellipsis*

We turn to a paradigm with vertical movement depicting a helicopter take off, with the paradigm in (75).

(75) *Context:* the signer's company has one helicopter and the the addressee's company also has one helicopter.
WITHIN 5-MINUTES POSS-1 COMPANY HELICOPTER **MAYBE** WILL ___ .
POSS-2 COMPANY HELICOPTER DEFINITELY WILL.
'Within the next five minutes, maybe my company's helicopter will … . Your company's helicopter definitely will.' (ASL 34, 3697; 3 judgments)

Condition (ASL 34, 3697; 3 judgments)	**Words** (replacing _____) **and acceptability**	**Translation** (replacing …)
a. neutral take-off	[7] GO-helicopter-up__	take off
b. swaying movement	[7] GO-helicopter-up__/\/\/__light	take off (with the assumption that this would be with a swaying motion)
c. at-issue control of swaying movement	[7] GO-helicopter-up__ WITH MOVEMENT _/\/\/__light	take off with a swaying motion
d. curved path	[7] GO-helicopter-up_∩_smooth	take off (with the assumption that this would be with a curved path)
e. at-issue control of curved path	[6,7] GO-helicopter-up__ WITH PATH _∩_smooth	take off with a curved path
f. orthogonal detour	[7] GO-helicopter-large__|__ no_acceleration_smaller	make a detour during take off
g. at-issue control of orthogonal detour	[6,7] GO-helicopter-up__ WITH PATH __|__ no_acceleration_smaller	take off with a detour
h. pause in the middle	[7] GO-helicopter-up__ __	make a pause to hover during take off
i. at-issue control of pause	[6,7] GO-helicopter-up__ WITH PAUSE __ __	take off with a pause to hover

We provide judgments of inferential strength in (76). Because the helicopter predicate classifier is now a standard one, the '2-rotored' inference from the preceding paradigm is replaced with one to the

effect that the helicopter is currently on the ground (Column 1). By parallelism with the preceding paradigm, we preserved the inference that would have been triggered by *CONTINUE* ('the helicopter continues to take off'), namely that the helicopter is currently taking off (Column 2); since it is not triggered by anything, it should be at floor. Column 3 tests the existence of a presupposition to the effect that the helicopter will take off within the next 5 minutes. Finally, Columns 4a and 4b test two versions (depending on the presence or absence of *MAYBE*) of a cosuppositional inference to the effect that if the helicopter were to take off, it would have a swaying-like motion, or have a curved path, or make an orthogonal detour, or hover on its way (the consultant was to pick the strongest inference and assess its strength).

(76) Vertical, *MAYBE*, with ellipsis added: inferential results for the paradigm in (75)

Target sentence / Inferences (ASL 34, 3697; 3 judgments)	Inference type	1. Helicopter is currently on the ground		2. Helicopter is currently taking off		3. Helicopter will go take off		4a. If the signer's company's helicopter goes from B to NYC, ____ (= strongest conditional inference)	4b. The addressee's company's helicopter will ____ (= strongest inference)
		a. Signer	b. Addressee	a. Signer	b. Addressee	a. Signer	b. Addressee		
a. neutral take-off	'on the ground' presupposition	6	6.3	1	1.3	2	7	1	1
b. swaying movement	cosupposition + 'on the ground' presupposition	5.7	6.3	1.3	1.7	2	7	6 (swaying)	6 (4, 7, 7) (swaying)
c. at-issue control of swaying movement	at-issue + 'on the ground' presupposition	6.3	6.7	1.3	1.7	2.7	7	3 (swaying)	7 (swaying)
d. curved path	cosupposition + 'on the ground' presupposition	6.3	6.7	1	1.3	2	7	6.7 (curved)	5.7 (3, 7, 7) (curved)
e. at-issue control of curved path	at-issue + 'on the ground' presupposition	5.7	6.7	1	1.3	2.7	7	3.7 (curved)	7 (curved)
f. orthogonal detour	presupposition?? + 'on the ground' presupposition	5.7	6.3	1.3	1.7	4.7	7	2.7 (orthogonal detour)	7 (orthogonal detour)
g. at-issue control of orthogonal detour	at-issue + 'on the ground' presupposition	6	6.7	1	1.3	2.7	7	3.3 (orthogonal detour)	7 (orthogonal detour)
h. pause in the middle	presupposition?? + 'on the ground' presupposition	5.3	6.3	1.3	1.7	**5**	7	2.3 (pause and hover)	7 (pause and hover)
i. at-issue control of pause	at-issue + 'on the ground' presupposition	5.7	6.3	1	1.3	2.7	7	3.7 (pause and hover)	7 (pause and hover)

On the basis of these inferential judgments, a slightly weakened version of the main conclusions from the preceding paradigm can be drawn.

(i) The initial sentence with *MAYBE* (and without ellipsis) allows us to assess once again whether we managed to trigger the inferences we wanted. We did, although in slightly weaker from than in the horizontal paradigm (in (72)) for iconic presuppositions.

–In Column 4a, cosuppositions are obtained in the target sentences in the 'swaying movement' and 'curved path' conditions in b. and d. (= if the helicopter were to take off in the next five minutes, this would involve a swaying movement/a curved path), but not in the corresponding at-issue controls in c. and e.

–In Column 3a, weak presuppositions are obtained in the target sentences in the 'orthogonal detour' and 'pause in the middle' conditions in f. (= the helicopter will go from Boston to New York within the next hour, with endorsements rates of 4.7 and 5 respectively), but not in the corresponding at-issue controls in g. and i. (with endorsements rates of 2.7 and 2.7 respectively).

(ii) Here too, the at-issue controls behave as expected, both under *MAYBE* and in the elided clause: they clearly must be copied under ellipsis.

(iii) The presupposition that the first helicopter is currently on the ground is triggered as expected under *MAYBE*, and it is (rather unsurprisingly) preserved under ellipsis.

(iv) Crucially, Column 4b suggests that cosuppositional inferences *are* inherited under ellipsis, since inferential scores are high for sentence b. and sentence d. The same remarks hold as in the preceding horizontal paradigm: the revisionist hypothesis according to which cosuppositions can be ignored under ellipsis is not at all confirmed. But here too, judgments varied: the first judgment obtained suggests that the cosupposition can to some extent be ignored, the last two judgments disconfirm this. And one would need to determine whether a more inviting context could lead one to ignore the cosupposition under ellipsis.

❑ *The '2-rotored' inference under ellipsis*

We noted above the surprising fact that the '2-rotored' inference can easily be disregarded under ellipsis. We do not know why this is: since it has the hallmarks of a presupposition rather than of a cosupposition, even the revisionist hypothesis (according to which cosuppositions can be ignored under ellipsis) couldn't immediately explain this.

Still, it is important to test whether in other cases, the object-related information provided by the predicate classifier shape (as opposed to the path traced by the classifier) can be ignored under ellipsis. While judgments were not entirely stable, they suggest that ignorance of object shape under ellipsis is possible, as shown by the paradigm in (77).

(77)   Helicopter - plane
       YESTERDAY POSS-1 COMPANY BIG HELICOPTER BOSTON$_a$ NEW-YORK$_a$ ____. POSS-1
       COMPANY PLANE SAME   ….
       'Yesterday my company's big helicopter flew from Boston to New York. My company's plane did too.'
       a. $^{6.3}$ __ = a-GO-helicopter-b   … = Ø
       b. ^{2} __ = a-GO-helicopter-b   … = a-GO-helicopter-b
       c. ^{7} __ = a-GO-helicopter-b   … = a-GO-plane-b
       d. $^{5.7}$ __ = a-GO-helicopter-large-b   … = Ø (4, 6, 7)
       e. $^{2.7}$ __ = a-GO-helicopter-large-b   … = a-GO- helicopter-large-b
       f. $^{6.7}$ __ = a-GO-helicopter-large-b   … = a-GO-plane-b
       (ASL, 34, 3502; 3 judgments)

The predicate classifier used in the antecedent clause corresponds to a normal helicopter (in (77)a-c) or to a 2-rotored helicopter (in (77)d-f). In all cases, the shape of this predicate classifier is inappropriate to represent the movement of an airplane, as is seen in the unelided controls (77)b and (77)e, which are very degraded: an airplane predicate classifier must be used instead, as seen in (77)c and (77)f. The crucial conditions are those with ellipsis in (77)a and (77)c: they are relatively acceptable. We leave it for future research to determine why this 2-rotored component can be disregarded in this way.[56]

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[56] The following general directions could be explored.

Supplementary Materials. Raw data

Supplementary Materials A
Link to the raw ASL data:
https://drive.google.com/file/d/1L8dzpNeUi6o_WyiLPOV2qswUiBFPKApv

Supplementary Materials B
Link to the raw data of the survey (3 native informants) on inferences triggered by pro-speech gestures:
https://drive.google.com/file/d/1DatjOaUW7M_o6yCpk1tojaU49guTK-u8

(i) There could be a kind of agreement relation between the noun *HELICOPTER* and the predicate classifier. But this explain (77)d, where there is a mismatch between the noun *HELICOPTER* (which is neutral) and the predicate classifier, which is 2-rotored.

(ii) Another possibility is that, for our consultant at least, ellipsis is very liberal and allows for any material that is redundant to be disregarded under ellipsis. This proposal was made for ASL in Schlenker 2014 and Schlenker, to appear f.

(iii) Yet another possibility is that the inference about object shape is in fact a cosupposition, but that it gets strengthened due to world knowledge. The idea would be as follows: suppose we obtain an inference to the effect that *if the helicopter flies, it will have two rotors*. The only plausible way to justify this condition is to assume that the helicopter has two rotors, whether it flies or not. But this analysis only helps if classifier predicates cosuppositions can in fact be ignored under ellipsis, which isn't clear for our ASL consultant.

(iv) Finally, we find it plausible that the helicopter path is really decomposed (whether syntactically or just conceptually) as being made of two parts: one corresponds to the object shape, and the other to the path. Under this decompositional view, it is relatively unsurprising that one can to some extent recover the path without the object shape under ellipsis.

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