

# Gestural Cosuppositions within the Transparency Theory\*

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*Abstract:* It has been argued that the sentence *None of these 10 guys LIFT\_helped his son* (where *LIFT* is a lifting gesture co-occurring with the verb) triggers a presupposition that *for each of these 10 guys, if he had helped his son, lifting would have been involved* (Schlenker 2015, 2017, 2018). We argue that the conditional nature of this presupposition might be derived within an extension of the Transparency Theory (Schlenker 2008), one in which the target sentence competes with an 'articulated' competitor of the form: *None of these 10 guys helped his son like LIFT\_this*.

## 1 New debates on co-speech gesture semantics

Following initial formal work on the semantic integration of gestures in discourse (e.g. Lascarides and Stone 2009), and on iconic aspects of gestural semantics (Giorgolo 2010), there has recently been a resurgence of interest in the formal and experimental semantics of co-speech gestures. It was motivated on three fronts: co-speech gestures have become crucial to understand whether spoken language has similar means of iconic enrichment as sign language (Goldin-Meadow and Brentari 2017); co-speech gestures have become the topic of new debates in theoretical semantics, pertaining to their proper place in the inferential typology (Ebert and Ebert 2014, Schlenker 2018); and experiments have been conducted to try to adjudicate these new debates (e.g. Tieu et al. 2017, to appear).

First, co-speech gestures became crucial to conduct a proper comparison between the semantics of signed and spoken languages. Iconic modulations (i.e. modifications of a lexical sign to represent aspects of the denoted object or events) are a notoriously rich means of semantic enrichment in sign language, but they are more impoverished in spoken language. For instance, in ASL (American Sign Language) the movement of the hands realizing verb *GROW* can be made faster or broader to denote a growth process that is quicker or of greater amplitude (Schlenker et al. 2013). In English, the vowel of the adjective *long* can be modulated to refer to a very long process (Okrent 2002), as in *The talk was looong* (see also Fuchs et al. 2018). But it is clear that intrinsic limits of vocal iconicity make this a relatively limited process. By contrast, co-speech gestures afford a rich means of iconic enrichment of speech, one which is *prima facie* comparable to iconicity in sign. This motivated Goldin-Meadow and Brentari's (2017) intimation that sign with iconicity should be compared to speech with co-speech gestures rather than to speech alone.

The question, however, is whether iconic modulations in sign are genuinely similar to iconic enrichments of speech by way of co-speech gestures. With respect to the iconic information which is conveyed, the similarity might be real. But on another front, results from the recent literature on signs and gestures highlights an important difference: Schlenker 2017 argues that iconic modulations (i.e. the modification of a sign or words rather than its enrichment by an external addition) can often make an at-issue

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contribution. Thus the sentence *If the talk is looooong, I'll leave before the end* can be understood to make the same kind of (at-issue) claim as: *If the talk is very long, I'll leave before the end*. Similar claims were made about iconic modulations of *GROW* in ASL. By contrast, researchers suggested in different ways that co-speech gestures do not make at-issue contributions, at least not in the absence of a (potentially costly) process of adjustment.

Two types of non-at-issue content have played a prominent role in recent debates on co-speech gestures. *Presuppositions* are characterized by their projective behavior: they are inherited by complex sentences in ways that distinguish them from at-issue entailments as well as other pragmatic inferences. Thus *x regrets q-ing* presupposes that *x q-ed*; the presupposition is inherited by yes-no questions as in (1)a, and gives rise a universal inference under *none*-type quantifiers as in (1)b (see Chemla 2009 for experimental results).



- (1) a. Does Ann regret helping her daughter?  
       => Ann helped her daughter  
       b. None of these 10 women regrets helping her daughter  
       => each of these 10 women helped her daughter

*Supplements* are the semantic contributions of appositive relative clauses, and are thought not to interact scopally with operators, and thus to always have 'wide scope' behavior (Potts 2005), as illustrated in (2) (we will refine this point shortly).

- (2) a. Did Ann help Robin, who was taking an exam?  
       => Robin was taking an exam  
       b. None of these 10 women helped Robin, who was taking an exam.  
       => Robin was taking an exam

In pioneering work, Ebert and Ebert 2014 suggested that co-speech gestures contribute supplements. Schlenker 2015, 2017, 2018 argued instead that co-speech gestures contribute presuppositions of a special sort, called 'cosuppositions'. To illustrate, both lines argued that in (3)a the contribution of the co-speech gesture is not at-issue, whereas the modifier in (3)b does make an at-issue contribution.<sup>1</sup>

*Notation:* the gesture co-occurs with the expression that immediately follows the picture (or the capitalized transcription *LIFT*), and is connected to it by *\_*. (Pictures are taken from Schlenker 2018)



- (3) a. Did John \_help his son?  
       => **if John helped his son**, he did so by lifting him  
       b. Did John help his son like \_this / by lifting him?  
       ≠> **if John helped his son**, he did so by lifting him  
       (Schlenker 2018)

<sup>1</sup> It does not matter for theoretical purposes whether the at-issue control involves *like this* or *by lifting him*. The former has the advantage of offering a minimal pair with the co-verbal gesture in (3)a, but there is nothing particularly mysterious about the workings of the gesture in (3)b: *this* is a demonstrative elements that refers to a contextual element which, in the case at hand, happens to be a demonstration realized by a gesture.

Importantly, on the 'supplemental' view and on the cosuppositional view alike, co-speech gestures do not make an at-issue contribution, and for this reason *sign with iconic modulations does not in general yield the same results as speech with co-speech gestures*.

The next question is to determine which of these two analyses of co-speech gestures, if any, is correct. For Ebert and Ebert 2014, (3)a has a meaning akin to that of: *Will John help his son, which will/would involve lifting him?* A supplement (realized in this example, but not in the co-speech case, by an appositive relative clause) modifies the meaning of the VP and for this reason 'projects' out of the scope of the question operator. In contrast, Schlenker 2015, 2017, 2018 argues that in (3)a the lifting co-speech gesture (which we will write as *LIFT*) co-occurring with the verb triggers a presupposition of the form *if x helped, x lifted*. This presupposition is called a 'cosupposition' because it is conditionalized on the at-issue contribution of the modified expression.

An important part of the empirical debate pertains to examples such as those in (4). Proponents of the cosuppositional view argue that we obtain in this case universal inferences that are reminiscent of presupposition projection under *none*-type quantifiers, as illustrated in (1)b. This environment is particularly important because, in some cases at least, supplements are degraded in the scope of negative operators (Potts 2005), as is illustrated in (5)-(6).

- (4) a. None of these 10 guys \_helped his son.  
 => for each of these 10 guys, **if he had helped his son**, this would have involved some lifting
- b. None of these 10 guys helped his son like \_this / by lifting him.  
 ≠> for each of these 10 guys, **if he had helped his son**, this would have involved some lifting  
 (Schlenker 2018)
- (5) a. One/None of these 10 guys *LIFT*\_helped his son.  
 b. One/#None of these 10 guys helped his son, which (by the way) he did by lifting him.  
 (Schlenker 2018)
- (6) a. It's likely/It's unlikely that John *LIFT*\_helped his son.  
 b. It's likely/#It's unlikely that John helped his son, which (by the way) he did by lifting him.  
 (Schlenker 2018)

Experimental means were also brought to bear on this debate by Tieu et al. 2017 (truth value judgment and picture selection task) and Tieu et al., to appear (inferential judgments). They broadly confirmed the inferential predictions of the cosuppositional view: co-speech gestures interact with logical operators in approximately the same way as presupposition triggers do. While there were slightly different results in the two experiments<sup>2</sup>, both suggested that co-speech gestures are 'weak' triggers: the presuppositions they trigger can easily be turned into the at-issue component (in technical parlance, they are easy to 'locally accommodate'). This is not at all a final refutation of the supplemental view, however, and the debate is still ongoing.

In the rest of this squib, we argue that a pragmatic theory of presupposition projection, the Transparency theory (Schlenker 2008), can be tweaked to explain *why* gestural cosuppositions arise in the first place (Section 2); when then discuss necessary refinements and possible extensions (Section 3).

<sup>2</sup> Tieu et al. 2017 found existential projection of the cosuppositional inference under *none*. By contrast, Tieu et al. to appear found evidence for some amount of universal projection in this case.

## 2 Why cosuppositions?

### 2.1 Initial justifications

While the cosuppositional view has gained some experimental support, it leaves an important explanatory question open: if indeed a co-speech gesture as in (3)a and (4)a triggers a presupposition, why is it conditionalized on the content of the VP? Schlenker 2017, 2018 considers two options, but neither is entirely satisfactory.

One possibility is that the co-speech gesture contributes a presupposed conjunct processed after the expression it co-occurs with (let us call this Theory I). Simplifying somewhat, *help his son* with the co-speech gesture would thus contribute a representation of the form *Help & Lift*, where *Help* has the meaning *help his son*, and the underlined *Lift* contributes a presupposition akin to *lift his son*. The fact that *Lift* comes after *Help* ensures, in standard theories of presupposition projection (e.g. Heim 1983), that the final presupposition is conditionalized on *Help*, as the presupposition of the second conjunct can be satisfied by content that appears in the first conjunct. But on this view, it is a mystery why a gesture that co-occurs with the verb is processed as if it were postposed. One could attempt to argue that a gesture cannot be linearized after the expression it modifies, but this is just not true: as argued in Schlenker 2017, 'post-speech gestures' are acceptable in a variety of environments, but have a different semantic signature.<sup>3</sup>

An alternative possibility (Theory II) is that the mode of composition of co-speech gestures guarantees that (relative to its local context) the value of the VP should entail the content of the gesture – but it is unclear where *this* requirement comes from.

### 2.2 An alternative within the Transparency Theory

We shall propose instead that the conditionalized nature of cosuppositions might be made to follow from an extension of the Transparency theory (Schlenker 2008), which we will now briefly introduce.

Schlenker 2008 argues that the presupposition *d* of a (predicative/propositional) trigger *dd'* is a normal entailment that 'wants' to be articulated as a separate conjunct, as stated in (7), where we continue to underline presuppositions.

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<sup>3</sup> Specifically, Schlenker 2017, 2018 argues that they have the distribution of appositive relative clauses rather than of presupposition triggers. Thus (5) and (6) above can be complemented with the examples (i) and (ii) below, in which – *LIFT* encodes a gesture that follows the end of the sentence, and behaves like the appositives in (5)b and (6)b.

(i) One/#None of these 10 guys helped his son – LIFT.

(ii) It's likely/#It's unlikely that John helped his son – LIFT.

In fact, for Schlenker 2015, 2017, 2018, this *difference* between co- and post-speech gestures serves as an argument against the supplemental theory of co-speech gestures, which has initial difficulties accounting for this contrast.

(7) **Be Articulate**

In any syntactic environment, express ...*dd'*... as: ...(*d and dd'*)... (unless independent pragmatic principles rule out the full conjunction).

To illustrate, one should 'be articulate' and say ...*it's raining and John knows it*... (with two conjuncts) rather than ...*John knows that it's raining*... (without a conjunction). *Be Articulate* is controlled by a Gricean principle of manner, *Be Brief*, which prohibits unnecessary prolixity, and takes precedence over *Be Articulate* – thus ruling out *If it is raining, it is raining and John knows it*. In its incremental version (which takes as given linguistic information that figures before the relevant expression, but not linguistic information that follows it), *Be Brief* prohibits one from saying ... [*d and \_\_\_*] ... in case no matter what the second conjunct is, no matter what the end of the sentence turns out to be, the same semantic result could be obtained by replacing [*d and \_\_\_*] with *\_\_\_* (which means that *d* is redundant). This is stated formally in (8) (here and throughout this section, we discuss a syntax akin to English; we discuss cross-linguistic refinements in Section 3).

(8) **Be Brief - Incremental Version**

Given a context set *C*, a predicative/propositional occurrence of *d* is infelicitous in a sentence that begins with *a* (*d and* if for any expression *g* of the same type as *d* and for any sentence completion *b'*,

$$C \models a (d \text{ and } g) b' \Leftrightarrow a g b'.$$

In our example, *If it is raining, [it is raining and \_\_\_]* is in violation of the incremental version of *Be Brief*, because no matter what the second conjunct is, the first conjunct can be eliminated without informational loss (this holds even if the sentence as a whole is non-trivial, as in: *If it is raining, it is raining and it is cold*).

Putting (7) and (8) together, *dd'* is acceptable in a sentence of the form *a dd' b* just in case the attempt to be 'articulate' satisfies the boldfaced equivalence in (8), thus violating *Be Brief*. Schlenker 2007 proves that this 'Transparency theory' derives the results of Heim 1983 for a fragment with generalized quantifiers, *modulo* technical assumptions.

(7)-(8) are tailored to the case of 'articulated' competitors of the form ...(*d and dd'*).... But we propose that a further option (not explored in Schlenker 2008) explains the conditionalized nature of cosuppositions. As already suggested by (3)b and (4)b, the content of a co-speech gesture *G* modifying *d'* in ... *G\_d'*... is naturally 'articulated' as ...*d' g*..., where *g* is a post-verbal modifier with the same content as *G*. For instance, *John LIFT\_helped his son* can naturally be turned into an articulated expression as: *John helped his son like LIFT\_this*. If *d' g* is conjunctively interpreted, dynamic semantics predicts that *g*, the post-posed modifier, is redundant in its local context (and thus violates *Be Brief*) just in case the local context *c'* of *d'* guarantees that the update of *c'* with *d'* entails *g*, i.e.  $c' \models d' \Rightarrow g$ . This derives the conditionalized presupposition we observe. (While *like this* is a particularly simple means of 'articulation', all that matters to derive the desired result is that the at-issue gestural content should come right after the VP *d'*.)

Within the Transparency theory, the post-posed nature of the modifier explains why the gestural presupposition is conditional, *modulo* the extension of (7)-(8) sketched in (9)a-b. (9)b rules out the articulated competitor ...*helped his son like LIFT\_this*... just in case no matter which further modifier is added, no matter how the sentence ends, the *like this*-phrase can be eliminated without affecting the truth conditions. This means that the post-verbal modifier must be redundant *after* the verbal meaning has been computed.

- (9) Consider a sentence  $a \ G \ d' \ b$ , where  $G$  is a gesture with content  $g$ , co-occurring with a (modifier-compatible) expression  $d'$ .
- a. **Modified *Be Articulate*:** Say  $a \ (d' \ g) \ b$  rather than  $a \ G \ d' \ b$ , unless this is in violation of (b).
  - b. **Modified *Be Brief* – Incremental Version:** Given a context set  $C$ , do not say  $a \ (d' \ g) \ b$  if  $g$  is incrementally redundant (= trivial), in the sense that for any modifier  $c'$ , for any sentence completion  $b'$ ,
- $$C \models a \ ((d' \ g) \ c') \ b' \Leftrightarrow a \ (d' \ c') \ b'.$$

Assuming that the modifiers are intersective, (9)b is equivalent to the acceptability conditions predicted by (7)-(8) for  $a \ (d' \text{ and } g d^*) \ b$ , where  $d^*$  may be any at-issue component, as illustrated in (10). In particular, these are the very conditions that are predicted for  $(d' \text{ and } g)$ , where  $g$  is a purely presuppositional conjunct appearing after  $d'$ . This is precisely what Theory I above needed to stipulate, but now the result is derived from the fact that the articulated competitor has a modifier that comes after the modified expression.

- (10) Predictions of (7)-(8) for the acceptability of  $a \ (d' \text{ and } g d^*) \ b$   
 For any  $g$  of the same type as  $d'$ , for any sentence completion  $b'$ ,  
 $C \models a \ (d' \text{ and } (g \text{ and } c')) \ b' \Leftrightarrow a \ (d' \text{ and } c') \ b'.$

(As discussed in Schlenker 2018 (Appendix I), (10) predicts the same result as a conditional presupposition  $d' \Rightarrow g$  in the propositional case and under *[No NP]* – but slightly weaker inferences in other cases.)

### 3 Refinements and extensions

#### 3.1 Beyond linear order

While we have followed Schlenker 2007, 2008 in framing the discussion in terms of linear order, this is now known to be incorrect in the general case, although the 'right' notion of order is still under debate (Chierchia 2009, Ingason 2016, Mayr and Romoli 2016, Mandelkern and Romoli 2017). For our purposes, the predicted generalization should be that *gestural cosuppositions are triggered whenever the full modifier that 'articulates' the gestural content is processed after the modified words*. Whether a modifier is processed 'after' an expression (with a notion of order that *need not* be linear) can be assessed on the basis of intuitive redundancy effects that yield violations of *Be Brief*, and such data sometimes argue against linear analyses.

##### 3.1.1 Ingason 2016 on Japanese

As an example, in order to account for redundancy effects in Japanese, Ingason 2016 argues that in some cases a notion of hierarchical order is called for. The contrast in the English examples in (11) could be explained by either a linear or hierarchical order, since the noun is both hierarchically higher and to the left of the modifier. But things are different in the Japanese examples in (12), as they suggest that the hierarchical rather than the linear order is the right one for the computation of redundancy effects: *widow* is strictly more informative than *woman*, yet *woman* can appear after *widow* in (12)a, presumably because it is in a structurally higher position.

- (11) a. John met [a woman [who is a widow]].  
 b. # John met [a widow [who is a woman]]. (Ingason 2016)

- (12) a. Taro-ga [[yamome-dearu] zyosei-ni] atta.  
           Taro-Nom [[widow-cop] woman-dat] met  
           'Taro met a woman who is a widow.'  
       b. # Taro-ga [[zyosei-dearu] yamome-ni] atta.  
           Taro-Nom [[woman-cop] widow-dat] met  
           'Taro met a widow who is a woman.' (Ingason 2016)

In sum, the Japanese data argue that *Be Brief* should, in some cases at least, be stated in structural rather than linear terms. Since presuppositional inferences predicted by the Transparency theory derive from redundancy effects (through *Be Brief*), application of the theory to further constructions and languages should be conducted in tandem with an assessment of redundancy effects, with the possibility that the linear account introduced in Section 2.2 ought to be revised.

### 3.1.2 German

While we do not have data on gestural cosuppositions in Japanese, an anonymous reviewer noted that German also presents a problem for a purely linear analysis. We start from the contrast in (13), modified from one proposed by the reviewer; it repeats for German the contrast in (3), but with the difference that the adverbials that appear in the at-issue control in (13)b appear before rather than after the verb.<sup>4</sup>

- (13) a. Wird Hans seinem Sohn LIFT\_helfen?  
           will Hans his son LIFT\_help  
           'Will Hans LIFT\_help his son?'  
           => if Hans helps his son, lifting will be involved  
       b. Wird Hans seinem Sohn LIFT\_so / durch Heben helfen?  
           Hans will his son LIFT\_this\_way by lifting help  
           'Will Hans help his son like LIFT\_this / by lifting him?'  
           => if Hans helps his son, lifting will be involved

The present analysis leads one to predict that, for purposes of redundancy computation, the VP in (13)b should be processed before the PP modifier, *despite the fact that the PP linearly precedes the VP*. This prediction appears to be borne out, as is suggested by the contrasts in (14) and (15).

- (14) a. Merkel hat mit klaren/ Macrons/ ihren eigenen Worten gesprochen.  
           Merkel has with clear/ Macron's her her own words spoken.  
           'Merke spoke with clear / Macron's / her own words.'  
       b. # Merkel hat mit Worten gesprochen.  
           Merkel has with words spoken.  
       (15) a. Hans hat sich mit einer komischen Bewegung bewegt.  
           Hans has himself with a funny movement moved.  
           'Hans moved with a funny movement.'

<sup>4</sup> All acceptability and inferential judgments were confirmed by one native speaker from Germany and one native speaker from Austria. Most acceptability judgments were also discussed with one further native speaker from Germany and one further native speaker from Austria (the latter also confirmed the inferential judgments).

b. #	Hans	hat	sich	mit	einer	Bewegung	bewegt.
	<i>Hans</i>	<i>has</i>	<i>himself</i>	<i>with</i>	<i>a</i>	<i>movement</i>	<i>moved.</i>

We can reason as follows.

–If for purposes of redundancy computation the PPs were computed before the verbs, the contrasts would not be derived. Specifically, (14)a and (14)b should have the same status and should both be acceptable, since the final verb does contribute information that doesn't follow from the content of the PPs - for instance, *gesprochen* ('spoken') could be replaced with *geantwortet* ('answered'), which needn't entail *spoken*, as an answer could be written. Thus the choice between the two verbs is informative even after the PP has been processed. Similarly, (15)a and (15)b should have the same status as each other, and here both should presumably be deviant, since the final verb *moved* does not contribute information that doesn't already follow from the PP.

–By contrast, things fall into place if for purposes of triviality computation the verbs are processed before the PP's. In (14)a and (15)a, the PPs add information to the verb, but this is not the case but in (14)b and (15)b: for Merkel to speak entails that she does so in words, and similarly if Hans moves, he certainly does so with movement.

A further and largely orthogonal question is how these facts bear on recent theories of linear or hierarchical biases in the computation of presupposition projection and local redundancy (Chierchia 2009, Ingason 2016, Mayr and Romoli 2016, Mandelkern and Romoli 2017, Chung, to appear). It is an important but difficult question, as it interacts with the complex issue of the syntactic analysis of adverbials in German (e.g. Frey and Pittner 1998); we thus leave it for future research, while keeping the result that in the case at hand local redundancy patterns as is expected in view of the observed cosuppositions triggered by co-speech gestures.

### 3.2 Cosuppositions triggered by words?

One final question could be raised: could there be spoken expressions that trigger cosuppositions because their 'articulated' competitor involves a modifier? For instance, one may ask (following suggestions by Chris Kennedy and Anna Szabolcsi (p.c.)) whether this analysis extends to verbs that encode manner modifications, as in (16)a, which might compete with (16)b (the focus on *None* is intended to avoid focus on the modifier, which might suffice to trigger 'givenness' inferences that look like presuppositions, as discussed in Abrusan 2013).

- (16) a. None<sub>F</sub> of these 10 guys drove / swam to the bridge.  
 b. None<sub>F</sub> of these 10 guys got to the bridge by driving / got to the bridge by swimming.

Extending *Be Articulate* to (16)a would predict an inference that *for each of these 10 guys, if he had gone to the bridge, he would have done so by driving / swimming*. As things stand, the data do not seem sufficiently clear to us, and they would require further investigation.

## 4 Conclusion

In sum, we have argued that the conditionalized nature of gestural cosuppositions might follow from the Transparency theory of presupposition projection, combined with the assumption that the natural 'articulated' alternative to a VP with a co-speech gesture involves an explicit PP modifier (e.g. *like this*). In English, this modifier comes after the



VP. As a result, to make it trivial (and thus rule out the articulated competitor, leaving the co-speech gesture as the 'winner'), the VP must be presupposed to entail the content of the gesture - hence the conditionalization. But the linear version of the Transparency theory makes incorrect predictions when the PP modifier comes before the verb, as in German. Still, we provided independent evidence (based on redundancy effects) that this is not due to the proposed extension of the Transparency theory to co-speech gestures and PP-modifiers, but rather to the fact that, in these cases at least, processing order is not linear but structural. Finally, we speculated that cosuppositions might exist in other domains in which an expression competes with an articulated alternative that involves a PP modifier.

From a broader perspective, the non-at-issue nature of co-speech gestures suggests that these make different contributions from iconic modulations, which can be at-issue. While the iconic content of these modulations might be better expressed with gestures than with words, co-speech gestures interact in a different way with logical operators due to their cosuppositional status.

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