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 decide these new debates (e.g. Tieu et al. 2017a, b).

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 which 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. Results from the recent literature on signs and gestures suggest a negative reply: 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 contribution. Thus the sentence *If the talk is loooong, 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


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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.

Specifically, pioneering work by Ebert and Ebert 2014 suggested that co-speech gestures contribute supplements, i.e. the same kind of meaning as appositive relative clauses. 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 (1)a the contribution of the co-speech gesture is not at-issue, whereas the modifier in (1)b does make an at-issue contribution.[1]

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, to appear a.)

(1) a. Will John _help his son?
  => **if John were to helps his son**, lifting would be involved.

  b. Will John help his son like _this / by lifting him?
  ≠> **if John were to help his son**, lifting would be involved

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, (1)a has a meaning akin to that of: *Will John help his son, which will/would involving lifting him?* A supplement (realized in this example but of course 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 (1)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 conditionalized on the at-issue contribution of the modified expression and is for this reason called a 'cosupposition'.

An important part of the empirical debate pertains to examples such as those in (2). 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 studied experimentally by Chemla 2009). This environment is particularly important because, in some cases at least, supplements are degraded in the scope of negative operators (Potts 2015).[2]

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[1] 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 (1)a, but there is nothing particularly mysterious about the workings of the gesture in (1)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.

[2] Schlenker 2017 provides several examples, including those in (i) and (ii):

(i) 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 2017)

(2)   a. None of these 10 guys will _help his son.
        => for each of these 10 guys, **if he were to help his son**, lifting would have been involved

        b. None of these 10 guys will help his son like _this / by lifting him.
        ≠> for each of these 10 guys, **if he were to help his son**, lifting would have been involved

Experimental means were brought to bear on this debate by Tieu et al. 2017a (truth value judgment and picture selection task) and Tieu et al. 2017b (inferential judgments).[3] They broadly confirmed the predictions of the cosuppositional view, with slightly different results in the two experiments, and with results that suggest that, if co-speech gestures are indeed presupposition triggers, they are 'weak' triggers, which 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.

2 Why cosuppositions?

2.1 Initial justifications

While the cosuppositional view has garned some experimental support, it leaves an important explanatory question open: if indeed a co-speech gesture as in (1)a and (2)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 conjunction 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 it if 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.[4]

(ii)   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 2017)

[3] Tieu et al. 2017a found existential projection of the cosuppositional inference under *none*. By contrast, Tieu et al. 2017b found evidence for some amount of universal projection in this case.

[4] Specifically, Schlenker 2017, 2018 argues that they have the distribution of appositive relative clauses rather than of presupposition triggers. Thus the examples in (i) and (ii) in fn. 2 can be complemented with the examples below, in which – *LIFT* encodes a gesture that follows the end of the sentence, and behaves like the appositives in (i)b and (ii)b in fn. 2.

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

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

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).

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 (3), where we continue to underline presuppositions.

(3) **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 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 (4).

(4) **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 |= a (d and g) b' ⇔ a g b'.

Putting (3) and (4) 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 (4), 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.

(3)-(4) 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 (1)b and (2)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 will LIFT_help his son* can naturally be turned into an articulated expression as: *John will help his son like LIFT_this*. If *d' g* is conjunctively interpreted, dynamic semantics predicts that *g*, the post-posed modifier, is redundant (i.e. trivial) in its local context (and violates *Be Brief*) just in case the local context c' of *d'* guarantees that c'[d'] (= the update

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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.

of c' with *d'*) entails *g*, i.e. c' |= d'⇒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 (3)-(4) sketched in (5)a-b. (5)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*-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.

(5) Consider a sentence *a G_d' b*, where *G* is a gesture 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 |= a ((d' g) c') b' ⇔ a (d' c') b'.

Assuming that the modifiers are intersective, (5)b is equivalent to the acceptability conditions predicted by (3)-(4) for *a (d' and gd*) b*, where *d** may be any at-issue component, as illustrated in (6). In particular, these are the very conditions that are predicted for *(d' 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.

(6) Predictions of (3)-(4) for the acceptability of *a (d' and gd*) b*
For any *g* of the same type as *d'*, for any sentence completion *b'*,
C |= a (d' and (g and c')) b' ⇔ a (d' and c') b'.

(As discussed in Schlenker 2018 (Appendix I), (6) predicts the same result as a conditional presupposition *d'⇒g* in the propositional case and under *[No NP]* – but slightly weaker inferences in other cases.)

3 Necessary refinements and further questions

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 debated (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

Thus Ingason 2016 argues that in some cases a notion of hierarchical order is called for. The contrast in (7) could be explained by either a linear or hierarchical order, since the noun is both hierarchically higher and to the left of the modifier. Things are different in the Japanese examples in (8), which suggest that the hierarchical rather than the linear order is the right one for the computation of redundancy effects.

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

(8) 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)

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.

3.1.2 German

While we do not have data on cosuppositions in Japanese, an anonymous reviewer notes that German also presents a problem for a purely linear analysis. We start from the contrast in (9), modified from one proposed by the reviewer; it repeats for German the contrast in (1), but with the difference that the adverbials that appear in the at-issue control in (9)b appear before rather than after the verb.[5]

(9)   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 (9)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 (10) and (11).

(10) 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.

<div style="text-align:center">*Merkel   has   with   words   spoken.*</div>

(11) a. Hans   hat   sich   mit   einer   komischen   Bewegung   bewegt.
      Hans   has   himself   with   a   funny   movement   moved.
      'Hans moved with a funny movement.'

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

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, (10)a and (10)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, (11)a and (11)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 (10)a and (11)a, the PPs add information to the verb, but this is not the case but in (10)b and (11)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). 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 (12)a, which might compete with (12)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).

(12) a. None$_F$ of these 10 guys drove / swam to the bridge.
     b. None$_F$ of these 10 guys got to the bridge by driving / got to the bridge by swimming.

Extending *Be Articulate* to (12)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.

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