The at-issue status of (modified) pro-speech gestures[1]

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Abstract. Data from Schlenker (2021) suggests that modifications of pro-speech gestures—for example, a lifting gesture modified by trembling of the hands and facial expressions to convey effort—contribute not-at-issue meaning. If this is the case, modified pro-speech gestures convey information across two semantic dimensions simultaneously: the neutral pro-speech gesture contributes at-issue meaning, while the modification adds not-at-issue content. Presenting results from a rating study, I provide empirical support for this claim and offer novel experimental evidence confirming that pro-speech gestures contribute at-issue meaning.

Keywords: gesture semantics, pro-speech gestures, at-issueness, manner modification.

1. Introduction

In this paper, I provide experimental evidence showing that pro-speech gestures (gestures that replace speech) contribute at-issue meaning, whereas modifications of such pro-speech gestures contribute not-at-issue content.[2] The present study adds to a growing body of theoretical linguistic research aimed at characterizing the rich typology of gestures, with a particular emphasis on pro-speech gestures, which have so far received comparatively little attention.

Pro-speech gestures are intuitively produced less frequently than co-speech gestures, which co-occur with the speech signal, in everyday communication. They can be considered highly marked, as felicitously interpreting utterances containing pro-speech gestures crucially depends on directly integrating gestural information into the verbal message (Ladewig, 2020). By contrast, co-speech gestures merely accompany speech as an aside, providing supplementary information that could be omitted, rather than replacing essential verbal content. This complexity—or perhaps the perceived unnaturalness—of pro-speech gestures may partly explain why they have received less attention than co-speech gestures (but see Keevallik, 2013; Ladewig, 2020; Hsu et al., 2021 for descriptive discussion, and Schlenker, 2020 for some formal discussion on pro-speech gestures).

Upon closer inspection, however, pro-speech gestures appear intuitively more prevalent than commonly assumed. One frequent context of use is in quotative constructions such as (1), where the verbal expression *I see you guys go* is followed by an embodied demonstration—glossed as DEMO—of how students incorrectly performed a dance move. Here, a pro-speech enactment is evidently more efficient in depicting the complexity of the event compared to verbal description.[3]

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[2]In the more descriptive literature, pro-speech gestures are also referred to as *speech-framed* or *speech-linked* (McNeill, 2005), or gestures that replace speech in *interrupted utterances* (Ladewig, 2020). I will follow Schlenker (2018b) and use the term *pro-speech* gesture throughout this paper.

[3]When verbal expressions are enclosed in brackets, this indicates the presence of a simultaneous accompanying gesture. Gesture transcriptions appear beneath in SMALL CAPS. If the brackets do not enclose verbal material, the gesture in question is performed pro-speech.

(1) Dance teacher: Yes, I see guys go [DEMO].
Students: *laughter*

(Keevallik, 2013: 4)

(2) Bob was like [GOBBLING].

(Davidson, 2015: 489)

(3) And I approached their table and was like  . And the whole table was just like  .[4]

A similar use of pro-speech gestures occurs in *be like* constructions as illustrated in (2) and (3).[5] In (2), rather than verbally describing Bob's eating, the speaker directly depicts the action via the pro-speech gesture GOBBLING. Similarly, in (3), Jennifer Lawrence employs *be like* + pro-speech gesture during an interview on the Graham Norton Show, effectively demonstrating the event through caricature for comic effect (see also Keevallik, 2010 on bodily demonstrations used for exaggeration). Such scenarios, in which speakers use pro-speech gestures due to their ease, clarity, or comic potential, are commonplace. Therefore, I argue that pro-speech gestures are more central to the typology of gestures than previously acknowledged and merit further attention.[6] However, in this study, I specifically focus on more canonical sentence types where pro-speech gestures replace basic sentential elements such as verbs, cf. (4).[7]

(4) This box, Nina will [LIFT].

It has long been recognized that linguistic expressions contribute various types of meaning beyond standard assertions, such as conventional implicatures and presuppositions. Traditionally, these additional meanings are characterized as not-at-issue (e.g., Karttunen and Peters, 1979; Potts, 2005). Recent semantic research has increasingly focused on investigating the meaning contributions added by iconic enrichments—like iconic gestures and ideophones—and has examined the at-issue status of these iconic contributions relative to more arbitrary linguistic elements such as standard adverbials.

[4]BBC, "Is Jack Whitehall more famous than Jennifer Lawrence? | The Graham Norton Show - BBC", YouTube, May 13, 2016, 0:36 to 0:44, https://www.youtube.com/watch?v=SPiyeywT5-w

[5]For formal work on pro-speech gestures in quotative constructions, see Davidson (2015); Stokke and Ball (2025).

[6]The interested reader is referred to Hsu et al. (2021) for an excellent overview of the pervasiveness and relevance of what they call *speech-embedded nonverbal depictions* (cf. examples (1)-(3)), and the imbalance in the (descriptive) literature between work on co-speech and pro-speech gestures.

[7]LIFT denotes a gesture where the speaker holds both hands in front of their body and moves them upwards, depicting a lifting event.

While manner adverbials, cf. (5a), have been shown to contribute at-issue content (Stolterfoht and Ziegler-Rasqué, accepted), co-speech gestures, cf. (5b), contribute not-at-issue meaning (e.g., Ebert and Ebert, 2014). Furthermore, current semantic accounts generally agree that pro-speech gestures, cf. (4), contribute at-issue meaning since they substitute crucial lexical (at-issue) material, and assigning them not-at-issue status would render the utterance pragmatically infelicitous (e.g., Ebert and Ebert, 2014; Schlenker, 2018b; Barnes and Ebert, 2023). Yet, experimental validation of the at-issue status of pro-speech gestures has remained lacking.

(5) a. Nina carried the box up quickly.
b. Nina [carried] the box up.
FAST

Central to the present study is an observation by Schlenker (2021), who proposes that modifications of pro-speech gestures trigger cosuppositions, just like co-speech gestures, and thus appear to be not-at-issue. For instance, a gesture depicting lifting modified with hand-trembling and facial expressions conveys additional meaning such as difficulty or effort, as shown in (6).[8]

(6) This box, Nina will [ ].
:-/LIFT-difficult

If such modifications are indeed not-at-issue, a modified pro-speech gesture would contribute information across two dimensions: the meaning component provided by the neutral gesture in the at-issue and the information provided by the modification in the not-at-issue dimension.

The present experiment investigates this hypothesis based on Schlenker's (2021) first survey. Results show that while for modified co-speech gestures both the contribution of the neutral gesture and the modification are not-at-issue, modified pro-speech gestures contribute both at-issue (neutral gesture) and not-at-issue (modification) content. These findings raise implications for the semantics of (modified) pro-speech gestures and, more generally, contribute broadly to the discourse on linguistic modification, gesture semantics, and the interaction between iconicity and meaning composition.

In addition, my findings provide unexpected evidence that adverbials modifiers contribute not-at-issue meaning, challenging previous assumptions about their default at-issue status (Stolterfoht and Ziegler-Rasqué, to appear). This suggests a potentially closer parallel between adverbial and gestural modifiers than previously recognized, calling for a careful reexamination of adverbials' projection behavior and their information status. In general, at-issueness diagnostics developed for verbal content, such as Tonhauser's (2012) denial tests, must be carefully re-evaluated and adapted for reliably assessing the information status of gestural and multimodal content.

The paper is structured as follows: Section 2 introduces theoretical assumptions regarding the (not-)at-issue distinction in speech and gesture, outlines previous formal semantic approaches to co-speech and pro-speech gestures, and introduces the phenomenon of modified pro-speech gestures. Section 3 presents an original rating experiment designed to test the present hypothesis that modifications of pro-speech gestures contribute meaning at a distinct, not-at-issue level,

[8]This notation follows Schlenker (2021): *:-/* refers to the modification through facial expressions, while *difficult* refers to manual manner modification. Both modifications are added to a gesture LIFT.

separate from the at-issue contribution of the neutral pro-speech gesture. Section 4 discusses the theoretical implications of the results and concludes.

2. Background

2.1. The (not-)at-issue divide in speech and gesture

Central to the semantic and pragmatic analysis of gestures is the question of their information status, i.e., their at-issue status. At-issue content refers to the the main claim of the utterance that the speaker aims to focus on in conversation and is therefore directly relevant to the conversational goal. In contrast, not-at-issue content merely accompanies a speaker's utterance and is not toward the goal of the conversation (Potts, 2005). For instance, in (7a), the at-issue claim is that Charlie is at the door, while the appositive content (Charlie is a pizza delivery person) is not-at-issue.

(7) a. A: Charlie, the pizza delivery person, is at the door. (Potts, 2015: 30)
b. B_1: Yes, but he isn't the pizza delivery person.
c. B_2: #Yes, but he isn't at the door.
d. B_3: #No, he isn't the pizza delivery person.
e. B_4: No, he isn't at the door.

Example (7) shows differences in the discourse behavior of at-issue and not-at-issue content. Specifically, adversative continuations following an assent or dissent can only target not-at-issue content (Tonhauser, 2012, diagnostic #1c). This explains why the continuation in (7c), which targets at-issue content, is infelicitous.[9] Conversely, direct denial responses (Tonhauser, 2012, diagnostic #1a) can only address at-issue content, explaining why (7d) is not felicitous, while (7e) is.

By default, co-speech gestures are considered to contribute not-at-issue meaning (Ebert and Ebert, 2014; Schlenker et al., 2015). Example (8) illustrates this: the co-speech gesture content ROUND can be targeted in adversative continuations, cf. (8b), but not in direct denials, cf. (8d), while the verbal assertion (the neighbor having a swimming pool) displays the opposite pattern, cf. (8c) and (8e).[10]

(8) a. My neighbor has [a swimming pool]. (Ebert, 2024: 171)
ROUND
b. B_1: Yes, but it isn't round.
c. B_2: #Yes, but she doesn't have a pool.
d. B_3: #No, it isn't round.
e. B_4: No, she doesn't have a pool.

Is has been repeatedly confirmed that co-speech gestures are not-at-issue (e.g., Ebert et al., 2020; Walter, 2024; Antomo and Chen, to appear).

Little attention has been devoted to pro-speech gestures that replace speech entirely. Recent

[9]Note that there exist various diagnostics for (not-)at-issueness, and reliance on a single diagnostic is insufficient evidence for definitively determining the (not-)at-issue status of particular content. For detailed discussion and broader application of these diagnostics to gestures, see Tonhauser (2012) and Ebert (2024), respectively.

[10]ROUND denotes a gesture depicting a circular shape, either dynamically tracing a circle in the air or statically representing roundness with the hands.

theoretical accounts concur that they are generally at-issue since they are essential for interpreting the utterance (Ebert and Ebert, 2014; Schlenker, 2018b). Example (9) illustrates this contrast clearly. Unlike the co-speech gesture in (8), the pro-speech gesture ROUND cannot be addressed in an adversative continuation, cf. (9b), yet it can be targeted by direct denial, cf. (9c), which indicates that pro-speech gestures convey at-issue meaning.

(9) a. My neighbor's swimming pool is [ROUND]. (Ebert, 2024: 171)
b. B_1: #Yes, but it isn't round.
c. B_2: No, it isn't round.

Despite theoretical claims that pro-speech gestures contribute at-issue meaning (Ebert and Ebert 2014; Schlenker 2018b), experimental validation has remained lacking to date.

2.2. Semantic theories of (co-speech) gestures

The two most prominent formal accounts of co-speech gestures by Ebert and Ebert (2014); Ebert et al. (2020) and Schlenker (2018a) agree that they contribute not-at-issue meaning (but see Esipova, 2019). However, they differ regarding the nature of this contribution. Ebert and Ebert (2014); Ebert et al. (2020) argue that co-speech gestures are supplemental and function akin to conventional implicatures, whereas Schlenker (2018a) treats them as triggers of cosuppositions, a unique type of presupposition triggered by the gesture accompanying the speech. In what follows, the proposed approaches will be sketched out briefly. For a detailed overview and comparison of the two theories, the reader is referred to Ebert (2024).

2.2.1. Supplemental approach

According to Ebert and Ebert (2014); Ebert et al. (2020), the semantic contribution of co-speech gestures is partly determined by their temporal alignment with speech. Iconic gestures aligned with indefinite expressions (e.g., *a pool*) yield interpretations of similarity, while those aligned with definites (e.g., *the pool*) or NP complements alone (*pool*) yield interpretations of identity or exemplification, respectively.

To formalize this, Ebert and Ebert extend the system by AnderBois et al. (2015), which uses propositional variables to distinguish at-issue (p) from non-at-issue ($p*$) content. They refine this system by introducing a relativized identity $=_p$, which holds only in worlds where the proposition p is true. They define the basal meaning of gestures as referring to an individual g, such as pointing to an object or depicting it iconically, establishing a discourse referent I_g for the gesture referent g. In this system, the meaning contributions of gestures depend on the aligned verbal item. For example, an indefinite article plus gesture expresses similarity ($\mathrm{SIM}_{p*}(x,y)$), while a definite article plus gesture expresses identity ($x =_p *z$). Temporal alignment of gestures and noun phrases indicates exemplification ($N_p * (z)$), meaning the noun's property must hold for the gestural concept.

The sentence in (8a) makes the at-issue contribution that the speaker's neighbor has a swimming pool. As the not-at-issue contribution, in this approach it would be that the pool under discussion is similar to the pool depicted by the iconic gesture ROUND. This yields the semantics in (10).

(10) $[x] \wedge \text{swimmingpool}_p(x) \wedge [y] \wedge \text{my\_neighbor}_p(y) \wedge has_p(y,x) \wedge [z] \wedge z = \mathbf{I_B} \wedge \text{SIM}_{p^*}(x,z) \wedge \text{swimmingpool}_{p^*}(z)$

The formula in (10) introduces an individual concept x that is assigned the at-issue property of being a swimming pool and an individual concept y, which is ascribed the at-issue property of being the speaker's neighbor. The individual concept z is introduced which is assigned the value of the rigid designator denoted by the gesture. The alignment of the gesture to the indefinite article triggers a not-at-issue similarity interpretation, which expresses that x and z are similar in relevant respects.

In essence, Ebert and Ebert (2014) argue that gestures behave like conventional implicatures and that the semantic contribution of a gesture is determined by its accompanying speech expression.

2.2.2. Cosuppositional approach

Schlenker (2018a, b) proposes that gestures act as weak presupposition triggers and trigger special kinds of presuppositions, so-called *cosuppositions*. For an expression p with co-speech gesture g, it is required that p entails g. The sentence given in (11) triggers the cosupposition that if John helps his son, he does so by lifting him.

(11) John [helped] his son.
LIFT

(adapted from Schlenker, 2018a)

Schlenker compares this to ordinary presupposition triggers *pp*' with presupposition p and at-issue semantics p', where the local context must entail the presupposition. Similarly, when a gesture G with content g accompanies speech p', the local context must entail the cosupposition that if p' holds, then also g must hold: $lc(Gp') \models p' \Rightarrow g$. In example (11), the common ground (CG) is required include the proposition that if John helped his son, he did so by lifting him. This cosupposition is added to the local context and the CG if not already present, making the sentence mean that John helped his son by lifting him.

2.3. Approaches to pro-speech gestures

Formal semantic analyses of pro-speech gestures are currently limited. A plausible reason is their seemingly straightforward interpretative role: since pro-speech gestures replace entire spoken constituents, their content directly contributes at-issue meaning, analogous to similar verbal counterparts, cf. (12).

(12) a. My neighbor's swimming pool is [ ]. (Ebert, 2024: 171)
ROUND

b. My neighbor's swimming pool is round.

Support for this straightforward interpretative approach comes from Schlenker (2018a), who argues that pro-speech gestures can trigger the full range of inferential phenomena associated with their verbal counterparts. That is, pro-speech gestures are not limited to triggering cosuppositions; they may also give rise to standard presuppositions and scalar implicatures, to name just a few. Experimental validation for this claim has been provided by Tieu et al. (2019). As for presuppositions, for example, TURN-WHEEL in (13a) presupposes that Mary is currently

behind a wheel. By contrast, (13b), TURN-WHEEL ends up not presupposing anything since the respective presupposition is explicitly satisfied in the preceding conjunct.

(13) a. Is Mary going to [TURN-WHEEL]?
⇝ Mary is currently behind a wheel
b. Is Mary going to get behind the wheel and [TURN-WHEEL]?
⇝ Mary is currently behind a wheel

(adapted from Schlenker, 2019: 758)

Yet, despite such parallels, pro-speech gestures differ crucially from spoken lexical items due their iconic nature. Specifically, iconic gestures such as ROUND or TURN-WHEEL inherently encode visual-spatial information beyond mere lexical equivalence. For example, the gesture TURN-WHEEL may depict additional details such as the size or manner of turning a wheel, information not conventionally encoded in a corresponding verbal expression *turn wheel*.

Indeed, Schlenker (2019) explicitly argues against two seemingly intuitive, yet ultimately implausible, analyses of pro-speech gestures. The first possibility he discusses—that pro-speech gestures merely modify covert spoken words—fails because the hypothetical covert words would need to be extraordinarily specific, matching the rich iconic detail of the gestures. Similarly, Schlenker rejects the alternative analysis that pro-speech gestures serve simply as codes for spoken words, pointing again to their iconic specificity. Thus, Schlenker concludes that pro-speech gestures cannot be adequately analyzed as either co-speech gestures modifying covert words or as mere codes for spoken expressions. Instead, their meaning contributions inherently include enriched iconic specifications not captured by standard lexical semantics. This iconic potential is precisely why existing theoretical frameworks, initially developed for co-speech gestures, require significant extensions to account for pro-speech gestures, and of course visual as well as iconic meaning in general.

Building upon Schlenker's argumentation, the current study adds to this theoretical challenge by empirically testing and demonstrating the dual contribution of modified pro-speech gestures: roughly speaking an at-issue lexical-replacement function and a not-at-issue iconic enrichment. A formal semantic account capturing this intricate interplay between lexical and iconic dimensions remains to be developed and presents an avenue for future research.

2.4. Modifications of pro-speech gestures

A speaker uttering (14) can perform either a neutral lifting gesture, glossed as LIFT, or a modified version that conveys additional information about the manner in which the action is performed. For instance, the speaker might communicate effort or difficulty by trembling their hands and employing relevant facial expressions, glossed as :-/LIFT-difficult, following the notation introduced by Schlenker (2021). The contrast between the neutral LIFT and its manner modified counterpart :-/LIFT-difficult is illustrated schematically in Figure 1.

(14) This box, Nina had to [LIFT].

(15) This box, Nina had to [ ].

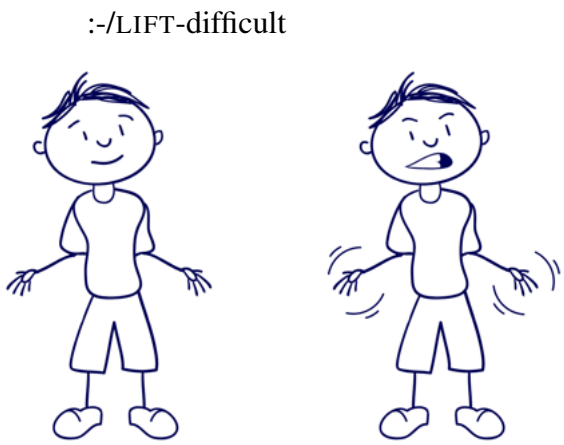

Figure 1: Schematic representation of a neutral lifting gesture (left) and a modified lifting gesture with trembling hands and facial expressions (right).

Schlenker (2021) looked into the meaning contributions provided by such modifications of pro-speech gestures in a small-scale acceptability and inference rating study. Three linguist informants, native speakers of American English, judged acceptability and inferential strength on a 7-point scale (with 7 indicating maximum acceptability and strongest inference). Informants were presented two different modified gestures, a TAKE-OFF gesture mimicking the take-off of a helicopter and a LIFT gesture similar to (14), which shall suffice here for illustration. Three manner variations of the lifting gesture were examined, illustrated in (16):

(16) This child, will you
  a. [ ]?
     LIFT
  b. [ ]?
     LIFT-difficult
  c. [ ]?
     :-/LIFT-difficult
  d. lift with difficulty?

(Schlenker, 2021: 245)

These variations included a neutral manual lifting gesture glossed as LIFT, cf. (16a), a manual lifting gesture performed with difficulty (trembling hands), glossed as LIFT-difficult, cf. (16b), and a manual lifting gesture performed with difficulty accompanied by a facial expression indicating effort, glossed as :-/LIFT-difficult, cf. (16c). Example (16d) refers to a gesture-free at-issue control. The focus was on the inferences triggered by these examples. Schlenker tested these gestures under various embedding operators, including polar questions, negation, modal contexts (*might*), and quantificational structures (*none*), as shown in (17). The goal was to observe whether these embeddings yield projection patterns consistent with cosuppositions—specifically, conditional inferences of the form: *if the speaker lifts x, effort/difficulty would be involved*.

(17) Conditions and inferences, illustrated with condition (16a).
  a. Question: This child, will you [ ]?
     LIFT

Table 1: Summary of acceptability and inferential ratings for LIFT in Schlenker (2021). Acc = acceptability ratings, cosupp = inferential ratings (with 7 = best for acceptability, and 7 = strongest inference for inferential strength).

Conditions	**Question**		**Negation**		**Might**		**None**	
	Acc	Cosupp	Acc	Cosupp	Acc	Cosupp	Acc	Cosupp
LIFT	6	1	5.67	1	6	1	5.67	1
LIFT-difficult	5.33	4.67	5.33	5.33	5.33	5	5.33	5.67
:-/LIFT-difficult	6.33	6.67	6.33	6.67	6.33	6.67	6	5.33
lift with difficulty	5	1.33	5.67	1.33	6.67	2.5	6.33	1

b. Negation: You son, I won't [ ].
LIFT

c. Might: You son, I might [ ].
LIFT

d. None: None of these children I will [ ].
LIFT

Cosupposition tested in a-c: *if the speaker were to lift the child, effort/difficulty would be involved.*; cosupposition tested in d: *for each of these children, if the speaker were to lift him/her, effort/difficulty would be involved.*

Results (summarized in Table 1) showed strong projection of conditional inferences triggered by the condition with facial and manual modifications (:-/LIFT-difficult), supporting Schlenker's hypothesis that these modifications function analogously to co-speech gestures relative to a neutral pro-speech gesture, thus conveying not-at-issue meaning. Even the purely manual modification (LIFT-difficult), though weaker than facial expressions combined with manual modifications (:-/LIFT-difficult), displayed projection patterns clearly distinct from controls.

Schlenker's findings thus offer preliminary evidence that modifications of pro-speech gestures, similar to co-speech gestures, trigger cosuppositions and therefore likely contribute not-at-issue meaning. However, due to the small number of informants and limited items, further rigorous experimental validation is necessary. The present study aims precisely to provide such empirical evidence.

3. Experiment

Given the theoretical considerations and preliminary evidence laid out above, I formulate the following research question:

(18) **Research question:** Do modifications of pro-speech gestures contribute not-at-issue information per default as suggested by Schlenker (2021)?

If such modifications are indeed not-at-issue, then a modified pro-speech gesture should contribute to two dimensions of meaning, which is articulated in the following hypothesis.

(19) **Hypothesis:** Modifications of pro-speech gestures contribute not-at-issue meaning. Thus, modified pro-speech gestures convey information across two dimensions: the at-issue meaning provided by the neutral pro-speech gesture and the not-at-issue meaning

contributed by its modification.

The aim of the present experiment was to test the hypothesis stated above. An experimental rating study was designed to tease apart the (not-)at-issue status of the modifications from the meaning contribution of the neutral gesture. The study was conducted in German.

3.1. Method

3.1.1. Participants

60 native speakers of German were recruited as participants via Prolific (2023) and received 6£ reimbursement. They were naive with respect to the purpose of the experiment.

3.1.2. Materials

Participants viewed short video recordings of sentences produced by a speaker, containing either a modified pro-speech gesture, a modified co-speech gesture, or a purely verbal control condition containing an equivalent modifying adverbial (factor: GESTURE), cf. the minimal pairs in example (20) (English translation of the example in (20')).[11]

(20) a. **modified pro-speech gesture:**
Nina ist in eine Wohnung im vierten Stock gezogen. Allerdings musste sie alle Kisten alleine nach oben [ ].
:-/LIFT-difficult

b. **modified co-speech gesture:**
Nina ist in eine Wohnung im vierten Stock gezogen. Allerdings musste sie alle Kisten alleine nach oben [befördern].
:-/LIFT-difficult

c. **modifying adverbial:**
Nina ist in eine Wohnung im vierten Stock gezogen. Allerdings musste sie alle Kisten unter großer Anstrengung alleine nach oben tragen.

(20') a. **modified pro-speech gesture:**
Nina moved into an apartment on the fourth floor.
However, she had to [ ] all the boxes upstairs alone.
:-/LIFT-difficult

b. **modified co-speech gesture:**
Nina moved into an apartment on the fourth floor.
However, she had to [transport] all the boxes upstairs alone.
:-/LIFT-difficult

c. **modifying adverbial:**
Nina moved into an apartment on the fourth floor.
However, she had to lift under great effort all the boxes upstairs alone.

The gesture modification always involved a modification of the manual gesture part (e.g., trembling hands to indicate effort for the lifting gesture) and corresponding facial expressions. Following Schlenker (2021), this combination was selected due to its strong inferential effect in his survey and higher naturalness compared to purely manual modifications.

[11] Most items were adapted with permission from Walter (2024).

Each utterance was followed by a written response. These responses were designed based on the adversative continuation diagnostic by Tonhauser (2012) (diagnostic #1c) introduced in Section 2, cf. example (7). Specifically, two types of continuations were employed (factor: DENIAL TYPE): a *modification denial*, targeting the presumed not-at-issue modification meaning in the adversative continuation, and an *assertion denial*, targeting the hypothesized at-issue proposition (the neutral gesture meaning), as illustrated in (21):

(21) a. **modification denial**: Ja, das stimmt, aber so anstrengend war es für sie doch auch nicht. ('Yes, that's true, but it wasn't that exhausting for her either.')
b. **assertion denial**: Ja, das stimmt, aber sie hat die Kisten doch nicht getragen. ('Yes, that's true, but she didn't lift them.')

The study was thus of a 3x2-design (GESTURE: pro-speech vs. co-speech vs. adverbial; DENIAL TYPE: modification vs. assertion denial). 18 items were distributed across six lists according to a Latin square design. Each list contained exactly one version of each item and an equal number of items in each condition. 60 filler items were interspersed among the experimental items to distract the participants from the experimental design. These filler items were experimental items from two unrelated gesture studies.

3.1.3. Procedure

The experiment was run online via Sosci Survey (Leiner, 2023). Participants first viewed the videotaped utterances of the items (cf. (20)) together with the denial responses that were to be viewed as responses to the utterance they have just perceived in the video, cf. (21). Their task was to rate the acceptability of each continuation as a response to the video utterance on a 7-point Likert scale (1 = completely unacceptable, 7 = completely acceptable). The entire experiment took approximately 40 minutes. Figure 2 illustrates a representative trial.

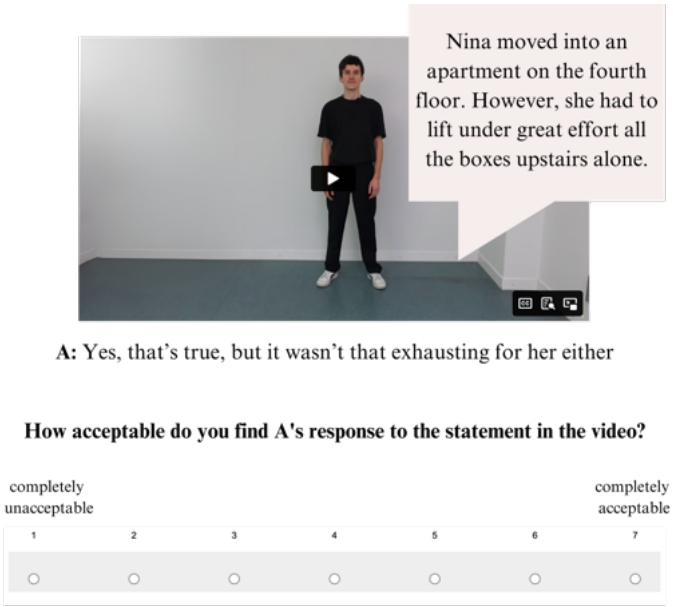

Figure 2: Sample item, translated into English. The speech bubble provides a transcription of the utterance in the video.

3.1.4. Predictions

A significant difference in DENIAL TYPE for modified pro-speech gestures was predicted, evidencing that the modification contribution (the hypothesized not-at-issue contribution) may be targeted in adversative continuations, but not the contribution of the neutral pro-speech gesture (the hypothesized at-issue contribution).

Furthermore, a significant difference in DENIAL TYPE for the adverbial condition was predicted, but in the opposite direction since manner adverbials have been found to render the prejacent they modify not-at-issue (Stolterfoht and Ziegler-Rasqué, to appear). Therefore it should be felicitous to target the content of the prejacent in the adversative continuation, but not the content of the adverbial modification.

No difference was predicted for the modified co-speech gesture condition, since co-speech gestures are per default not-at-issue (therefore any contribution should be not-at-issue).

3.2. Results

All statistical analyses were conducted using the statistics software R (R Core Team, 2023) version 4.3.1, inside the integrated development environment RStudio (Posit team, 2023) 9.0.463.[12] The package 'tidyverse' 2.0.0 (Wickham et al., 2019) was used for data processing and visualization. The package 'ordinal' 11.16 (Christensen, 2022) was used for fitting an ordinal mixed-effects model onto the data. All data and code are available in the following Open Science Framework repository: https://osf.io/m9zkc/.

Figure 3 shows the mean acceptability ratings and standard deviations across conditions. An ordinal mixed-effects model with random slopes and intercepts for items and subjects yielded a significant difference in assertion denial for the modified pro- and co-speech conditions (cf. Table 2) in that assertion denial received higher ratings in the co-speech conditions compared to pro-speech (co-speech: $M = 4.66$, $SD = 2.01$; pro-speech: $M = 4.21$, $SD = 2.16$). Note that this also encloses a significant difference in assertion denial between co-speech and verbal. Modification denial did not vary across conditions (verbal: $M = 4.89$, $SD = 1.74$; pro-speech: $M = 4.96$, $SD = 1.91$; co-speech: $M = 4.91$, $SD = 1.86$, cf. Table 2).

A second ordinal mixed-effects model with random slopes and intercepts for items and subjects was fitted to the data to look at the effect of denial type per gesture condition. It yielded significant effects of denial type for the pro-speech and verbal conditions, but not for the co-speech conditions, cf. Table 3.

Table 2: Ordinal mixed-effects model with denial type and gesture:denial type as fixed effects and participants and items as random effects. Contrast coded.

	Estimate	Std. Error	z value	Pr(>|z|)
Denial type	-0.765	0.115	-6.648	2.97e-11***
Modification denial - verbal vs. pro-speech	0.138	0.197	0.702	0.483
Assertion denial - verbal vs. pro-speech	0.221	0.195	1.136	0.256
Modification denial - pro-speech vs. co-speech	0.075	0.198	0.379	0.705
Assertion denial - pro-speech vs. co-speech	-0.599	0.195	-3.073	0.002**

[12]I would like to thank Sebastian Walter for providing his R script, which was adapted for the present analysis.

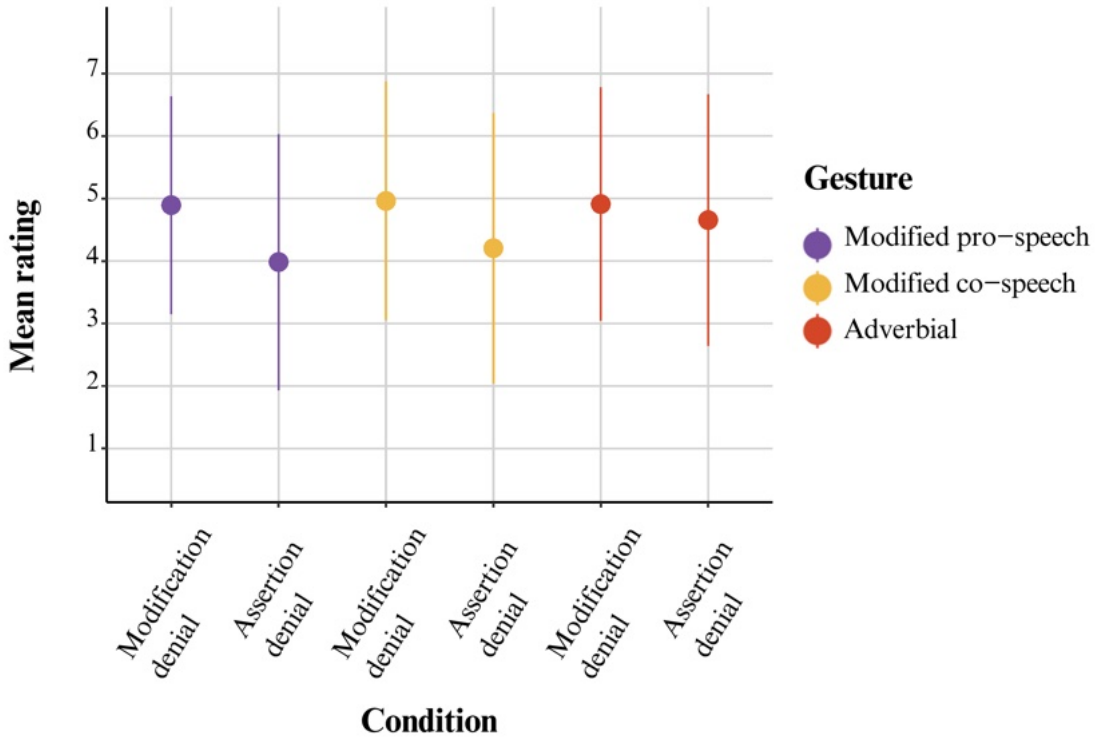

Figure 3: Mean acceptability ratings and standard deviations per condition in the experiment.

Table 3: Ordinal mixed-effects model with gesture and gesture:denial type as fixed effects and participants and items as random effects. Contrast coded.

	Estimate	Std. Error	z value	Pr(>|z|)
Verbal vs. pro-speech	0.180	0.139	1.295	0.195
Pro-speech vs. co-speech	-0.262	0.139	-1.887	0.059
Verbal - denial type	-1.045	0.196	-5.335	9.54e-08***
Pro-speech - denial type	-0.963	0.201	-4.800	1.59e-06***
Co-speech - denial type	-0.288	0.195	-1.480	0.139

3.3. Discussion

The results provide empirical support for a difference between modified co-speech and pro-speech gestures in their respective discourse behavior. As expected, no significant difference was observed between the two types of denial responses (*modification denial* vs. *assertion denial*) for co-speech gestures. This aligns with prior theoretical and empirical findings, confirming that the semantic contribution of modified co-speech gestures—both the neutral gesture content and the modification—is consistently not-at-issue (e.g., Ebert and Ebert, 2014; Schlenker, 2018a).

Crucially, the significant effect of DENIAL TYPE observed in the pro-speech gesture condition demonstrates that, unlike co-speech gestures, modified pro-speech gestures contribute meaning across two separate dimensions. Specifically, the neutral gesture (e.g., the lifting action itself) contributes at-issue meaning, while the modification (e.g., expressing difficulty or effort)

conveys not-at-issue meaning. These findings corroborate the hypothesis presented in (19) and support Schlenker's (2021) observation that pro-speech gesture modifications trigger cosuppositions by showing that they behave as not-at-issue modifiers.

Interestingly, the results from the (verbal) adverbial control condition unexpectedly mirrored those of the pro-speech gestures, rather than showing the predicted reversed pattern. While it was hypothesized that the adverbial modifier would behave oppositely to pro-speech gestures—with the modification content at-issue and the content of the prejacent not-at-issue—the present data instead revealed a similar pattern to modified pro-speech gestures: the modification denial received higher ratings, indicating a not-at-issue interpretation, while assertion denial received significantly lower ratings. These findings stand in contrast with the results from Stolterfoht and Ziegler-Rasqué (to appear) and should therefore receive more attention. I will pick up the discussion in Section 4.

As a general remark, the observed effects for the gestural material align with the predicted direction, and for the sake of statistical rigor, we will limit our interpretation accordingly and not interpret absolute values. This is further justified by the fact that the diagnostic used is an established tool in the domain of at-issue diagnostics, at least for spoken material. However, an examination of the absolute rating values suggests that diagnostics for gestural-visual material may need to be adjusted. For instance, it remains puzzling why assertion denial receives an average rating of >4 across conditions, although assertional content should not be able be targeted in adversative continuations. I will revisit this issue in Section 4.

4. General discussion and conclusion

The primary aim of this paper was to provide empirically grounded insights into the at-issue status of (modified) pro-speech gestures. This investigation builds on an established semantic typology: co-speech gestures contribute content at the not-at-issue level, while pro-speech gestures, fully substituting verbal elements, contribute at-issue content. Evidence supporting this distinction comes primarily from their differing behavior in discourse contexts, e.g., co-speech gesture content can be targeted by adversative continuations following agreement, whereas pro-speech gestures, being at-issue, cannot. Until now, however, experimental evidence explicitly testing these claims for (modified) pro-speech gestures has been lacking.

The present study aimed precisely to fill this empirical gap by experimentally investigating the at-issue status of (modified) pro-speech gestures. Following pioneering but limited initial evidence by Schlenker (2021), I tested the hypothesis (cf. (19)) that modified pro-speech gestures should contribute meaning along two separate dimensions: the neutral gesture meaning in the at-issue dimension and the modification meaning in the not-at-issue dimension.

The experiment at hand supported this hypothesis. Results showed that, unlike co-speech gestures—where both neutral and modification components uniformly contribute not-at-issue meaning—modified pro-speech gestures exhibit a hybrid semantic behavior. Specifically, their neutral core conveys at-issue meaning, whereas their modifications contribute not-at-issue content. This empirical finding thus provides the first robust experimental validation of the long-standing theoretical claim that pro-speech gestures contribute at-issue meaning. Furthermore, the results demonstrate that modifications of pro-speech gestures convey not-at-issue meaning, which is compatible with Schlenker's (2021) observation that such modifications trigger

cosuppositions.

These findings have direct implications for the semantic analysis of (modified) pro-speech gestures. One potential avenue to analyze such modified pro-speech gestures is similar to *mixed items* (see Gutzmann, 2011 for expressives) due to their twofold contribution to both the at-issue and the not-at-issue dimension. Following Barnes (2024) in her analysis of ideophones as iconic mixed items, modified pro-speech gestures may be treated in a similar vein due to the fact that they contribute two different meaning components, one rather descriptive component (the neutral gesture) and an iconic depictive contribution (the iconic modification). The at-issue contribution provided by the pro-speech gesture allows the sentence to be interpreted, while the not-at-issue modification contribution contains additional iconic information. In this respect, these modified gestures are similar to mixed items, such as the expressive *Köter* 'cur' in German, which contributes $\lambda x.dog(x)$ (at-issue), as well as the information that the speaker holds a negative attitude toward said dog (not-at-issue). Similarly, it is suggested that in the at-issue domain modified and neutral pro-speech gestures make a similar contribution as the spoken word they replace (here something along the lines of *lift* to interpret the VP). In the not-at-issue domain, the performance of a modification alongside a gesture triggers a similarity relation between the modification and the actual event in a relevant aspect (cf. Walter et al., to appear). The exact formal implementation of this proposal remains to be spelled out explicitly in future work, be it in a supplemental framework like above or any other. In a cosuppositional approach, pro-speech gestures merit an iconic semantics that can precisely capture their potential to simultaneously contribute at-issue assertion-like meaning as well as not-at-issue presuppositional and cosuppositional content. As Schlenker (2018b: 929) emphasizes, "[t]he formal study of pro-speech gestures is just in its infancy".

An unexpected but intriguing observation was that verbal adverbials in the experiment behaved similarly to pro-speech gesture modifications. Contrary to the predictions and earlier experimental evidence by Stolterfoht and Ziegler-Rasqué (to appear), the current data suggests that adverbial modifiers contribute not-at-issue meaning while the prejacent remains at-issue. This divergence might reflect differences in contextual framing and corresponding Question Under Discussion (QUD) inferred by participants. In the present study, sentences were preceded by an introductory context, cf. (20), likely prompting participants to construe a more general QUD (e.g., *What happened?*), thus rendering the prejacent, rather than the adverbial, at-issue (following QUD-based accounts to at-issueness, e.g., Simons et al., 2010). By contrast, in Stolterfoht and Ziegler-Rasqué's (to appear) materials, sentences were presented in isolation (e.g., *Peter hat das Gedicht laut vorgetragen* 'Peter recited the poem loudly'). The absence of context may have led participants to interpret the adverbials themselves as directly addressing a narrower, implicit QUD (e.g., *How did Peter recite the poem?*). If this were the case, then the adverbial *laut* ('loud') would be a direct answer to the QUD and therefore at-issue. Explicitly controlling for the QUD in future experiments would be crucial to clarify the default at-issue status of adverbials, as the current study suggests they are not-at-issue.

From a broader theoretical perspective, the unexpected parallels between pro-speech gesture modifications and adverbial modifiers raise an intriguing possibility: Could adverbials themselves be triggers of cosuppositional inferences, just like co-speech gestures or pro-speech gesture modifications? Although Schlenker's (2021) informants suggested otherwise—potentially influenced by modality impact between verbal and gestural realizations—the present findings

motivate a reconsideration of the semantic-pragmatic status of adverbial modifications as candidates for cosupposition triggers of the sort *if the speaker lifts x, effort would be involved*. Indeed, adverbials might behave analogous to gesture modifications, introducing not-at-issue meaning closely tied to their host verbal predicates. This perspective may also involve a gradient notion of at-issueness (Barnes and Ebert, 2023), where adverbial modifiers might be not-at-issue after all but necessarily more at-issue than gestural modifications due to their degree of conventionalization (which is higher than for gestures) and modality (primary rather than secondary gestural modality). This may also explain why ratings for the inferential strength of cosuppositions triggered by adverbial modifiers were lower than those for gestural modifiers—but not zero—in Schlenker's (2021) first survey (cf. Table 1).

Finally, the present study raises an important methodological consideration: linguistic diagnostics such as Tonhauser's (2012) denial tests—initially developed for assessing verbal expressions—might require careful reconsideration or adaptation to reliably apply to visual and multimodal material. A particular concern arises from the fact that gestural content is always verbalized in denial responses (e.g., *No, you didn't lift it* to protest against the content of a LIFT gesture), potentially misrepresenting the semantic contribution of the gesture itself. Thus, future research should systematically test whether established diagnostics adequately capture the semantics of visual and gestural content when responses remain purely gestural versus when they are verbalized. Additionally, since at-issueness judgments may be affected by the QUD that is construed by participants, future work should also experimentally manipulate QUDs to determine how robustly at-issue distinctions apply to gestures in different discourse contexts, and to precisely determine the 'default' at-issue status of an expression.

In conclusion, this study provides the first experimental evidence demonstrating that modified pro-speech gestures simultaneously contribute meaning to two distinct semantic dimensions. These findings paint a clearer picture of the the information status of pro-speech gestures and highlight the necessity of integrating iconic modifications systematically into formal semantic and pragmatic theories of gesture. Beyond pro-speech gestures, future work should take a closer look at other 'marginalia' (Dingemanse, 2017) in the gestural typology, specifically, gesture types that may be more common and theoretically significant than previously assumed. In particular, pre- and post-speech gestures (gestures that precede speech or follow it, respectively) warrant deeper investigation, as their information status remains underexplored despite various theoretical assumptions about their at-issue status (e.g., Schlenker, 2018a; Ebert, 2017 for post-speech gestures). A more nuanced account of multimodal meaning requires a comprehensive understanding of the full typology of gestures.

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