Gesture type matters: Encoding path and manner in space

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Our goal

- **Investigate the informativity of gestures**: How do gestures that depict different event components (path vs. manner) vary in their contribution to the meaning?
- **Examine the grammaticalization of gestures**: Do gestures differ in their grammaticalization, particularly in their compatibility with negation?
- **Understand the gestural component of sign language classifiers**: Does the asymmetrical behavior observed in the movements related to different event components under negation persist in gestures accompanying spoken language?

Previous research in the field

On the lexicalization of concepts

- Typological differences across languages related to motion verbs, which can encode the path (the direction of movement) and/or the manner (how the motion is performed) related to an action (Talmy 1985; 2000)

On the gestures

- The important role of gestures in languages (Kendon 2004, McNeill 1992; ao)
- Manual gestures and speech as an integrated system: They cannot be separated from each other (Goldin-Meadow & Alibali 2013; ao).
- Co-speech gestures adhering the language-specific constraints on information packaging in accompanying speech (Kita & Özyürek 2003)

On the compositionality of gestures

- Incompatibility of logical operators such as negation with gestures (Ebert & Ebert 2016, Tieu et al. 2017, Zlogar et al. 2019; ao) and iconic depictions (Davidson 2023)

Motivations for the current study

⑩ **Path** as a motion event's core conceptual component (Talmy 2000, Ünal et al. 2023)

Any discernible differences between gestures targeting different components of an event?

⑩ A special construction in sign languages – **Classifier constructions**

MAN TABLE BOOK a b

~'The man puts the book on the table.'

Why relevant?: Occurring with spatial and motion events, they provide information about the movement, location, and/or physical properties of the argument(s) via **a clear iconic mapping** differing from lexical signs (Supalla 1986, Emmorey et al. 2019)

▼HANDSHAPE as linguistic element with descriptive iconicity, MOVEMENT and LOCATION as **gestural elements** (Emmorey & Herzig 2003) with depictive iconicity (Davidson 2023)

≫ A strong degradation in acceptability under negation for classifiers conveying manner information in Turkish Sign Language, unlike path-related information:

a. MAN FORWARD.CL:☝ NOT b. ?? MAN FORWARD+IN_CIRCLE.CL:☝ NOT

'The man is not moving *like this*.'

Any similar asymmetries in gestures accompanying spoken languages under negation?

Methodology

- Motion verbs: go, move, fly, float, fall
- **Manipulations:** i) gesture type accompanying the sentence, ii) motion types presented in the event, and iii) polarity (affirmative (A), negative (N)):

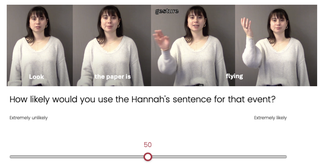
i. Gesture type in the video

Path only (P) Manner only (M) Conflated (P&M)

ii. Event type in the GIF

Path only Manner only Conflated (P&M)

- Within-subject design using a Latin square
- Acceptability judgment task, evaluating the naturalness of utterances in the video based on given events presented as GIFs:



- Participants: 200 native English speakers (103 female, M_{age} = 38; 97 male, M_{age} = 36.4; age range 25-50) recruited through Prolific

❁To have a better understanding of gestures and their interaction with negation, a 'No gesture' written English version of this design conducted with 120 native English speakers through Prolific:

i. Modifier type in the sentence

'The paper is (not) flying...'

a. ... in an upward direction. (P)

b. ... in a circle pattern. (M)

c. ... in an upward direction in a circle pattern. (P+M)

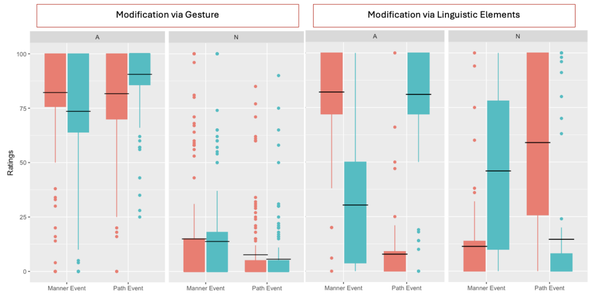
ii. Event type in the GIF

Path only Manner only Conflated (P&M)

Results

Two analyses conducted on the data*:

Analysis 1: Only path and only manner modifications in (in)congruent cases (2X2X2):



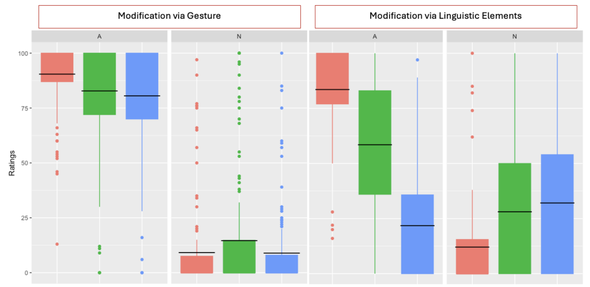
❢ Significant effect of gesture type ($p<0.001$) in affirmative case

❢ No significant interaction of negation and gesture type

❢ However, a cumulative significant interaction of three variables ($p<0.001$)

❢ In contrast, significant interaction of negation and modification type in the non-gestural written English version of the experiment

Analysis 2: Conflated modifications with different event types and polarity (3X2):



Considering the ratings with the conflated event type as the reference value:

❢ Significant effect of event type ($p<0.001$) in affirmative case

❢ A different picture with the non-gestural written English version of the experiment

❢ Significant effect of manner event type ($p<0.001$) in negative case while no significant effect of path event type

*The plots of generalized linear regression models' results. For further reference, we present the results of the gesture and written English experiments together.

Findings and discussion

Methodology: The feasibility of acceptability judgment tasks in the gesture domain

❊ As the results indicate, Participants in this study demonstrated attention to both videos featuring co-speech gestures and GIFs depicting the event.

Gesture vs. linguistic elements: A crucial difference between the results of the gestural and linguistic experimental in the incongruent cases, where the event type in the GIF and the modification type in the sentence mismatch:

❊ The overall ratings of the participants show the difference between the contribution of gestural modification and linguistic modification where we do not observe any contrastive effect of the modification presented with a gesture.

A close-up to the results of the gesture data: The participants do not completely ignore the gestural elements as can be seen in the conflated modification results (Analysis 2); furthermore, they pay attention to the gesture types, especially in the incongruent cases (Analysis 1) even in the absence of an accompanying linguistic cue with an identical meaning.

Uncovering the differences:

❊ When a manner gesture occurs in an incongruent condition, the sentence is not rated as unfavorably as when the path gesture is incongruent.

❊ While no significant effect when the path event cooccurs with manner gesture in affirmative case

Even this small difference in acceptability indicates a difference in their contribution to the meaning.

Any grammaticalization effects: Unlike the subtle difference between the gesture types in the affirmative cases, we do not observe any effect of negation on gestures overall which is in line with the previous studies.

Conclusion

- English speakers prioritize linguistic information over gestures in requiring information match, and within gestures prioritize path over manner.
- Limited contribution of gestures in negative linguistic contexts, consistent with prior literature showing lack of interaction with negation.
- Prioritization of gesture over linguistic encoding contrasts with sign language classifiers, indicating a nuanced distinction between gestural components in these two domains.

≫ The next step is to investigate the nature of the movement in sign language classifier constructions to better understand their 'gestural' properties and to examine whether sign languages grammaticalize certain movement types differently.

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Selected references

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