Why Do We Gesture When We Speak?
Robert M. Krauss

What evidence do we already have that gesture is important to language *production*?

What functions do you think gesture might play for *speakers*?
Why Do We Gesture When We Speak?
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- Examines the role of gesture in speech production

- **Main claim**: “gestures help speakers formulate coherent speech by aiding in the retrieval of elusive words from lexical memory.” (55)

- **How?** Knowledge is “multiply encoded in more than one representational format” – “Our conjecture is that gestures reflect spatio-dynamic features of concepts, and that they participate in retrieval via a process of cross-modal activation.” (55)

- Clarification: “lexical gesture” = representational gesture (iconic, metaphoric); “motor gesture” = beat

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Why Do We Gesture When We Speak?
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**Claim:** Lexical gestures help speaker retrieve items from lexical memory

Evidence from four kinds of data:

(1) Differences in gesture between rehearsed and spontaneous speech
(2) The temporal relation of speech and gesture
(3) Influence of speech content on gesturing
(4) Effects of preventing gesture on speech
Nonjuncture Pauses

“I explained to Amanda, we already have everything we need for the party.”

Nonjuncture pause

Juncture between clauses

Nonjuncture pauses are associated with difficulties in lexical retrieval.

Claim: Lexical gestures help speaker retrieve items from lexical memory

Evidence (1): Differences in gesture between rehearsed and spontaneous speech

Study: Actors first produce spontaneous speech, then receive “script” from another participant to memorize and perform.

Findings:
• Same amount of gesture in spontaneous and rehearsed speech, but rehearsed speech contained more motor gestures (beats), while spontaneous speech contained more lexical gestures
• Positive correlation ($r = 0.47$) between probability of nonjuncture pauses and proportion of time spent on lexical gestures
Evidence (2): Temporal relationship between speech and gesture

**Claim:** Lexical gestures help speaker retrieve items from lexical memory

**Study:** Examined speech-time asynchronies of 60 lexical gestures produced by speakers describing pictures and photographs.

**Findings:**
- Onset of all 60 gestures either preceded or were co-timed with onset of lexical affiliate
- Positive correlation ($r = 0.71$) between gesture length and asynchrony

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Evidence (3): Influence of speech content on gesturing

**Claim:** Lexical gestures help speaker retrieve items from lexical memory

**Study:** Examine gestures of speakers defining 20 words.

**Findings:**
- More time spent gesturing for words that are active, concrete, and spatial
Claim: Lexical gestures help speaker retrieve items from lexical memory

Evidence (4): Effects of restricting gesture on speech

Study: Examine speech of participants in 3x2 design: obscure speech/constrained speech/natural speech x gesture/no gesture.

Hypotheses?

Findings:
- Speakers spoke more slowly in obscure/constrained conditions, and when not allowed to gesture (only when content was spatial)
- More dysfluencies in obscure and constrained speech conditions; for spatial content, inability to gesture resulted in more dysfluencies
- Hesitations (filled nonjuncture pauses) were more likely when participants couldn’t gesture

Claim: Lexical gestures help speaker retrieve items from lexical memory

Conclusion: “These results indicate that preventing speakers from gesturing makes lexical access more difficult, and support the hypothesis that lexical gestures aid in lexical access.”
**Q: Why Do We Gesture When We Speak?**

Krauss: It helps us retrieve items from lexical memory.

Why else might a speaker produce gestures?

How would you design a study to test these hypotheses?

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Diagram:

- **Language** (speech, gesture, etc.)
- **Comprehension**
- **Production**

Krauss: Gestures help us produce coherent speech by helping us retrieve items from lexical memory.
Offering a Hand to Pragmatic Understanding: The Role of Speech and Gesture in Comprehension and Memory

Kelly, Barr, Breckenridge Church, Lynch

What is “pragmatics”?

Main claim: Gesture contains information that help us figure out intended meaning of an utterance.

Experiments 1-3: Deictic gestures (pointing) and indirect requests
Experiment 4: Iconic gesture and event recollection

Experiment 1: Does presence of deictic gesture (pointing) make it more likely that we interpret an utterance as an indirect request?

Each participant watched 12 scenes:

Scene
Adam and Bill are returning home and meet in the street in front of their apartment. Adam is on his bicycle, and Bill is walking.

Dialogue
Adam: Hey, did you get the burgers?
Bill: Oh no, I forgot!
Adam: Well, the guests are going to be here soon. You better go get the burgers.

Target sentence
Bill: But the store is clear across town!

Results:

<table>
<thead>
<tr>
<th></th>
<th>Speech Only</th>
<th>Speech + Gesture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speech only</td>
<td>0.42</td>
<td></td>
</tr>
<tr>
<td>Speech + gesture</td>
<td>0.71</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: “The deictic gestures used in this experiment make it easier to understand the specific intentions that underlie the indirect requests.” (581-582)

Q: What is the respondent (Adam) going to do next?
**Experiment 2:** Is it gesture *by itself* which causes the effect?

Same setup, but introduced a “gesture only” condition ( = gesture video, on mute when target sentence is uttered)

Some

_Bill is sunning himself on the porch. After Bill swats at a couple of flies, Adam (who is inside) opens the screen door (which he does not close) and enters the porch area._

Dialogue

_Adam: I found that book I was looking for. (Pause) Man, it’s hot out here._

_Target sentence_ 

_Bill: Yeah, and the flies are out._

Results:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speech Only</td>
<td>0.58</td>
</tr>
<tr>
<td>Gesture Only</td>
<td>0.42</td>
</tr>
<tr>
<td>Speech + Gesture</td>
<td>0.72</td>
</tr>
</tbody>
</table>

Conclusion: **“Speech and gesture combine to determine the meaning of indirect requests.”** (583)

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**Experiment 3:** How do speech and gesture combine to determine meaning?

*Additive Contribution Hypothesis:*

The meanings of speech and gesture are computed *separately:* the two meanings are then combined to determine intended meaning of utterance.

*This would predict…*

There should be NO DIFFERENCE in responses between gesture only and speech+gesture conditions

*Interactive Contribution Hypothesis:*

The meanings of speech and gesture are computed *interactively:* speech provides the context for gesture, and gesture provides the context for speech.

*This would predict…*

Participants’ answers should **vary** between gesture only and speech+gesture conditions

Study: Same as Experiment 2 (gesture only & speech+gesture conditions), but participants are asked “What object did the person point at?”
Experiment 3: How do speech and gesture combine to determine meaning?

Results:

```
          1.00  0.91  0.89
Open-ended 0.67  0.63  0.67
          0.63  0.67  0.63
Forced-choice
```

Conclusion: “This experiment demonstrates that the referent of the pointing gestures in our scenarios is determined, in part, by the speech that accompanies them. This finding allows us to reject the idea that speech and gesture contribute to meaning in a strictly additive fashion.” (585)

Experiment 4: Is information conveyed through iconic gestures incorporated into the intended meaning of a message?

Each participant watched 10 videos (5 speech only, 5 speech+gesture)

*Target sentence*
*My brother went to the gym.*

After watching all 10 videos, participants had a recall test – “The woman talked about her brother; what did she say?” *(Encouraged to remember her words verbatim)*
**Experiment 4:** Is information conveyed through iconic gestures incorporated into the intended meaning of a message?

**Results:**

![Graph showing reproducibility and traceability of information conveyed through speech and speech + gesture.]

**Conclusion:** “Information conveyed through iconic gesture is incorporated in what participants consider an utterance’s intended meaning...Moreover, when probed in an exit interview, participants rarely remembered having received the information through gesture.” (587)

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**Language**
(speech, gesture, etc.)

**Comprehension**

Kelly, et al.: Gestures contain information that we use to compute intended meaning of utterances

**Production**

Krauss: Gestures help us produce coherent speech by helping us retrieve items from lexical memory
Midterm Review

Types of Nonverbal Communication:

- Gesticulation (Spontaneous Co-Speech Gesture)
- Emblems
- Pantomime
- Sign Language

Types of gesticulation:
- Representational
  - Iconic
  - Metaphoric
- Deictic
- Beat

Midterm Review

Practice with types of gestures – you need a partner!

**Partner 1:** Produce a particular type of gesture
(You may need to produce speech as well!)

**Partner 2:** Explain why that gesture is of the given type
Midterm Review

Partner 1: Produce an emblem in center-center
   (Partner 2 – verify it’s an emblem)

Partner 2: Produce an iconic gesture in periphery
   (Partner 1 – How do you know it’s iconic?)

Partner 1: Produce a bimanual metaphoric gesture
   (Partner 2 – How do you know it’s metaphoric?)

Partner 2: Produce a deictic gesture in extreme periphery
   (Partner 1 – How do you know it’s deictic?)

Midterm Review

For the following motion...

   Partner 1: Use the motion as an iconic gesture
   Partner 2: Use the motion as a metaphoric gesture

For the next motion...

   Partner 1: Use the motion as a metaphoric gesture
   Partner 2: Use the motion as an iconic gesture
Midterm Review

Can a gesture belong to more than one category? If so, which ones can overlap?

Midterm Review

Friend: What’s that Cogs 155 class you’re taking?
You: It’s about gesture.
Friend: Gesture?
You: Yeah, like, what people do with their hands when they talk.
Friend: Oh! So you’re studying sign language!
You:
Midterm Review

Friend: What’s that Cogs 155 class you’re taking?
You: It’s about gesture.
Friend: Gesture?
You: Yeah, like, what people do with their hands when they talk.
Friend: Oh! So you’re studying sign language!
You: (Excellent, informative answer)
Friend: Huh. Why would you study that?
You:
gestures? why gestures?  
... some excellent reasons

- speech-accompanying gesture is universal
  - It provides a remarkable "back door" to linguistic real-time cognition (McNeill, 1992; Kita & Essegbey, 2001; Iverson & Thelen 1999).
- less monitored than speech; largely unconscious
  - Speakers are often unaware that they are gesturing at all (McNeill, 1992).
- astonishing synchronicity with speech
  - Millisecond-precise gesture-to-speech synchronicity, in patterns which are specific to a given language.
- coupled with environment and real-world context
  - highly sensitive to environmental settings (Goodwin, Labaron, Srasck)

development

- gesture and speech develop closely linked (Iverson & Thelen 1999; Bates et al, 2001)
- provide complementary content to speech content
  - speakers synthesize and subsequently cannot distinguish information taken from the two channels (Kendon, 2000)
- co-produced with abstract metaphorical thinking
Midterm Review

We only recently began to study gesture scientifically. Why did it take so long?