Gesture, metaphor, and spatial language

Sotaro Kita
University of Warwick (UK)

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Co-speech Gesture

- When we speak, we often spontaneously produce gestures.

Co-speech Gesture

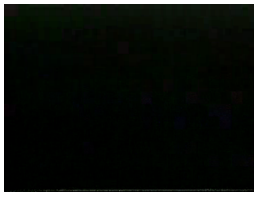
- Where there is speech, there is gesture.

- When talking on the phone
- No culture with a spoken language without co-speech gesture
- Infants in the one-word stage (Caprici, et al., 1996)
- Congenitally blind children (Iverson & Goldin-Meadow, 1997)

- Gesture as a window into the speaker's mind (McNeill, 1992).
- Gesture as representational action.

- Linguistic communication is inherently multimodal.
- Language is grounded in embodied imagery.

Gestures for spatio-motoric concepts



Recording by Asli Özyürek (2002)

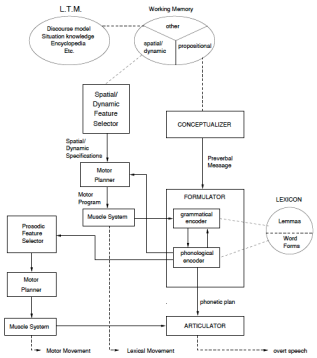
- "Iconic gestures" reflect spatio-motoric images activated at the moment of speaking.
- We focus on "iconic gestures".

Speech-gesture production

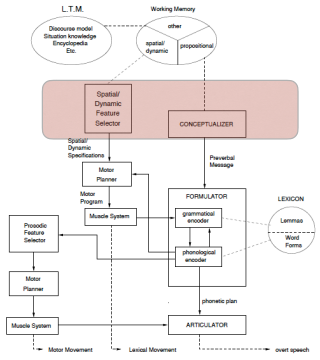
- What is the relationship between gesture and language?
- Are gestures merely "non-verbal"?

View 1: Language-free gesture generation

- Gestures are not part of the lexicon and grammar, in the narrow sense.
- Different semiotics
  - Gesture: iconicity, deixis
  - Language: arbitrariness
- The content of gestures are generated independently of speech production.



Krauss, Chen, Chawala's (1996) model, from de Ruiter (1998)



Krauss, Chen, Chawala's (1996) model, from de Ruiter (1998)

View 2: speech-gesture co-generation

- Gestures are generated at the interface of spatio-motoric thinking and speaking.
- The content of gestures and speech are generated interactively (McNeill, 1992; Kita & Özyurek, 2003).

McNeill, 1985

Psychological Review
1985, Vol. 92, No. 3, 350–371

0033-295X/85/$00.75

So You Think Gestures Are Nonverbal?

David McNeill
University of Chicago

In this article I argue that gestures and speech are parts of the same psychological structure and share a computational stage. The argument is based on the very close temporal, semantic, pragmatic, pathological, and developmental parallels between speech and referential and discourse-oriented gestures. Most of the article consists of a description of these parallels. A concept that unites outer speech and gesture is the hypothesis of inner speech.

Demonstrating co-generation

- Language influences gesture.
- Gesture influences speech.

Speech-gesture production

Language ↔ Gesture

→ **The Interface Hypothesis** (Kita & Özyürek, 2003, JML)

← **Gesture-for-Conceptualisation Hypothesis** (Kita, Alibali & Chu, 2017, Psych Review)

Language-gesture links in two domains

- Motion event
- Metaphor

Motion events

Language-to-gesture influence

Language-to-gesture influence

- Cross-linguistic differences in motion event gestures
- Japanese, Turkish, and English speakers narrated an animated cartoon.

Kita & Özyürek, 2003, *JML*

Lexical gap

- If a language has a lexical gap, gesture should also show an expressive gap.

Kita & Özyürek, 2003, *JML*

Kita & Özyürek, 2003, *JML*

- English: "swing"
  - All English speakers encoded the arc trajectory in speech.
- Turkish and Japanese: no word for "swing"
  - No Turkish and Japanese speakers encoded the arc trajectory in speech.
  - More general verbs: "jump/fly", "go"

Kita & Özyürek, 2003, *JML*

- Two types of gestures, depicting the Swing Event
  - Arc gesture
  - Straight gesture

Kita & Özyürek, 2003, *JML*

Results

- Japanese and Turkish speakers were more likely to use "straight gestures".
- English speakers mostly used just "arc gestures".
- Information packaging in speech is reflected in that for gesture.

Kita & Özyürek, 2003, *JML*

English arc gesture

- "Swinging over to Tweety's"

Kita & Özyürek, 2003, *JML*

Japanese straight gesture

- "with little moment, he tries to go to the next apartment, but"

Kita & Özyürek, 2003, *JML*

Turkish straight gesture

- "(He) jumps/ flies."

Kita & Özyürek, 2003, *JML*

- Linguistic conceptualisation of the event goes hand-in-hand with gestural conceptualisation.

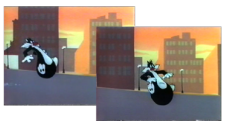
Clausal packaging

- If a language expresses Information A and B in a "compact" grammatical structure, gesture should express A and B in a compact package.
  - Processing units
  - What information can be conceptualised together within a processing unit

Kita & Özyürek, 2003, *JML*

Clausal packaging

- Manner and Path in motion events
  - Manner = Roll
  - Path = Down



- Clausal packaging varies cross-linguistically.

Kita & Özyürek, 2003, *JML*

Syntactic packaging of Manner and Path

- In line with linguistic typology by Talmy (1985)....
- English
  - He ***rolls*** ***down*** the street
- Turkish and Japanese
  - a. Japanese
    - ***korogat***-te saka-o ***kudaru***
      roll-Connective slope-Accusative descend:Present
      "(it) descends the slope, as (it) rolls."
  - b. Turkish
    - ***yuvarlan***-arak cadde-den ***iniyor***
      roll-Connective street-Ablative descend:Present
      "(it) descends on the street, as (it) rolls."

Kita & Özyürek, 2003, *JML*

- Three types of gestures:
  - Manner gesture
  - Path gesture
  - Manner-Path Conflated gesture

Kita & Özyürek, 2003, *JML*

Results

- English =>
  Manner-Path Conflated gestures
- Japanese, Turkish =>
  Manner gestures, Path gestures.

Example: Manner-Path Conflated Gesture (English)

"He rolls down a street into a bowling alley."

Kita & Özyürek, 2003, *JML*

Example: Manner gesture and Path gesture (Japanese)

- "As (it) somehow rotates like a ball, it rolls, descends."

Kita & Özyürek, 2003, *JML*

Example: Manner gesture and Path gesture (Turkish)

- "As (it) keeps rolling, (it) goes."

Kita & Özyürek, 2003, *JML*

- Linguistic conceptualisation of the event goes hand-in-hand with gestural conceptualisation.

Speech-gesture production

Kita & Özyürek, 2003

Motion events

Gesture-to-language influence

Gesture's self-oriented function: Packaging

- Gesture packages information into units that are useful for speaking or thinking.

Kita, Alibali, Chu, 2017, Psych Rev

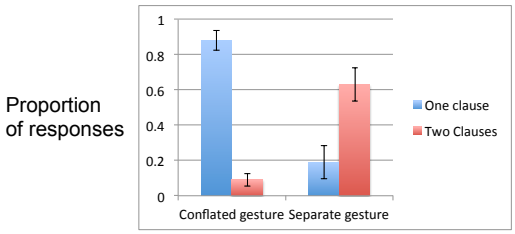
Evidence for Packaging

- Dutch speakers described motion events with manner and path.

- Instructed to produce
  - separate gestures for manner and path
  - conflated gestures
- Observed the syntactic structures used
  - one clause vs. two clauses

Mol & Kita, 2012, *Cog Sci Proceedings*

Result



Mol & Kita, 2012, *Cog Sci Proceedings*

Conclusion

- Gesture helps *package* information into units useful for speaking.

Mol & Kita, 2012, *Cog Sci Proceedings*
Kita, Alibali, Chu, 2017, Psych Rev

Speech-gesture production

Mol & Kita, 2012, *Cog Sci Proceedings*
Kita, Alibali, Chu, 2017, Psych Rev

Metaphor

Language-to-gesture influence

Metaphor and gesture

- Metaphor allows us to understand abstract concepts based on concrete spatio-motoric imagery (Lakoff & Johnson, 1980).
  - "spill the beans" = "disclose something confidential"
- "Metaphoric gestures" (McNeill, 1992).

Gestures for abstract concepts

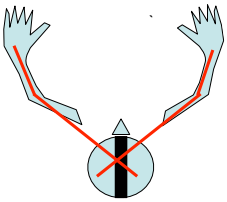
"Disclose something confidential"

Information as a manipulable object
Informing as movement away from self

Language processing in the two brain hemispheres

- Language: mainly in the left hemisphere
- Metaphor: the right hemisphere contributes

Hands are contra-laterally innervated



Language-to-gesture influence

- Manipulate the nature of speaking tasks: metaphorical vs. non-metaphorical speaking tasks
- Compare frequencies of the right-hand and left-hand gestures

(Kita, de Condappa, & Mohr, 2010, Brain & Lg)
(Kita, Chu, & Mohr, in prep.)

Tasks

- Metaphor (Explain the mapping)
  - "spill the beans"
- Concrete (Explain the meaning)
  - "spill the marbles"
- Abstract (Explain the meaning)
  - "disclose something confidential"

(Kita, de Condappa, & Mohr, 2010, Brain & Lg)
(Kita, Chu, & Mohr, in prep.)

- Linguistic tasks
  - Metaphor, Concrete, Abstract
- Available hand
  - Right hand only, Left hand only (Gesture not mentioned)
- Measured the rate of gesturing

(Kita, de Condappa, & Mohr, 2010, Brain & Lg)
(Kita, Chu, & Mohr, in prep.)

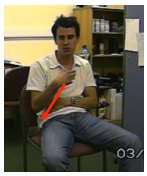
Two gestural viewpoints (McNeill, 1992)

- Iconic gestures with the "character viewpoint"
  - Enacting an action
- Iconic gesture with the "observer viewpoint"
  - motion and shape

(Kita, de Condappa, & Mohr, 2010, Brain & Lg)
(Kita, Chu, & Mohr, in prep.)

Character viewpoint
"You've got an opinion, **a way of thinking"**

Observer viewpoint
"You are **telling something"**



(Kita, de Condappa, & Mohr, 2010, Brain & Lg)
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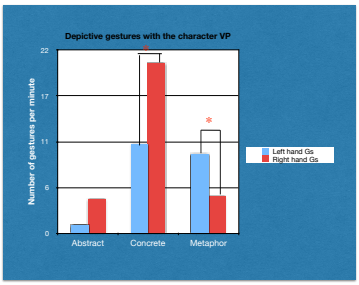
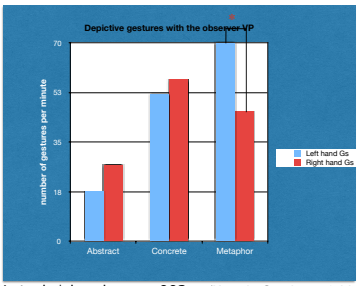
Character viewpoint



• linguistic task * hand, $p < .002$

(Kita, de Condappa, & Mohr, 2010, Brain & Lg)
(Kita, Chu, & Mohr, in prep.)

Observer viewpoint



• linguistic task * hand, $p < .003$ (Kita, de Condappa, & Mohr, 2010, Brain & Lg)
(Kita, Chu, & Mohr, in prep.)

- Metaphor processing increases left-hand iconic gestures

(Kita, de Condappa, & Mohr, 2010, Brain & Lg)
(Kita, Chu, & Mohr, in prep.)

Speech-gesture production

Language → Gesture

(Kita, de Condappa, & Mohr, 2010, Brain & Lg)
(Kita, Chu, & Mohr, in prep.)

Metaphor

Gesture-to-speech influence

Gesture's self-oriented function: Activation

- Gesture *activates* new spatio-motoric representations and changes the content of speech or thought (e.g., Alibali & Kita, 2010, *Gesture*).

Evidence for activating new representation

- Gesture activates image schemas underlying linguistic metaphor.

The question and the basic idea

- Does gesturing lead to better metaphor processing?
  - Especially left hand gestures, given the right-hemisphere metaphor processing?
- Manipulated which hand is available for spontaneous gesturing.
- Measured quality of metaphor explanation.

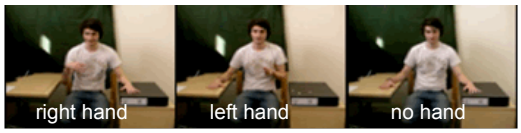
Argyriou, Mohr, & Kita, 2017, JEP: LMC

Scoring quality of metaphor processing

- Explain the meaning and motivation for "Spill the beans"
  - beans => secrets
  - spilling => telling
- Quality of explanation rated
  - the number and clarity of metaphorical mappings
  - 0 (worst), 1, 2 (best)

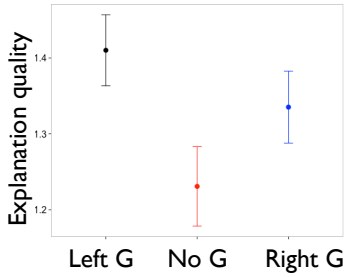
Manipulation of hands

- hand immobalization + encouraged to gesture with the free hand.



Argyriou, Mohr, & Kita, 2017, *JEP: LMC*

Effect of gesturing



Left > No, p = .007

Argyriou, Mohr, & Kita, 2017, *JEP: LMC*

Conclusion

- Metaphor processing is better when producing gestures.
- Only for the left hand.
- Left hand gesturing activates spatio-motoric imagery in the right hemisphere.
- This facilitates metaphor processing in the right hemisphere.

Argyriou, Mohr, & Kita, 2017, *JEP: LMC*

Conclusion

- Gesture *activates* new spatio-motoric representations.

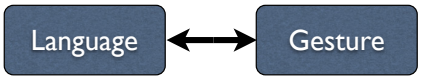
Argyriou, Mohr, & Kita, 2017, *JEP: LMC*

Speech-gesture production

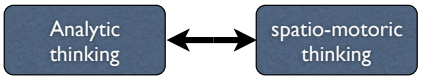
Argyriou, Mohr, & Kita, 2017, *JEP: LMC*
Kita, Alibali, Chu, 2017, Psych Rev

Gesture and speech: Two mode of thinking

Speech-gesture production



Two modes of thinking



Two qualitatively different modes of thinking interact with each other.
Cf. "Growth Point" (McNeill, 1992)

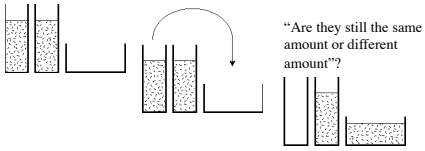
Why this architecture of mind?

- Spatio-motoric thinking grounds analytic thinking (Lakoff & Johnson, 1980; McNeill, 1992)
- Two modes of thinking enriches our conceptualisation.
  - They together cast a wider net in the conceptual landscape.
  - This helps us understand the world better.

Conceptual enrichment

- Gestural trial and error paves the way for verbal explanation of a complex idea

Piaget's conservation task



Kita, Alibali, Chu, 2017, Psych Rev

Conceptual enrichment

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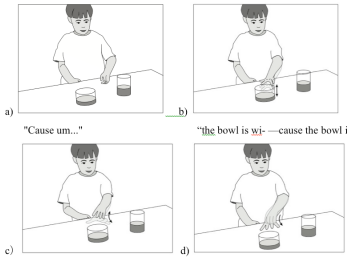


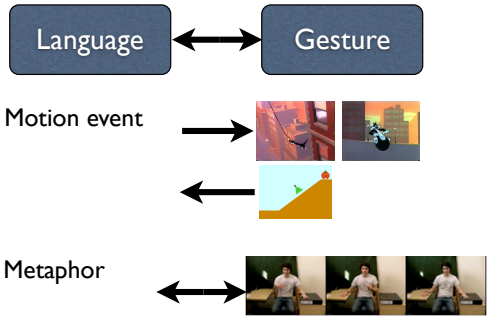
Kita, Alibali, Chu, 2017, Psych Rev

Conclusion

- Gesture can be a "conceptual trail-blazer", exploring spatio-motoric representations, via trial-and-error.
- Speech and gesture collaboratively advance thought.

Summary and overall conclusions

Speech-gesture production



The speech-gesture co-generation view

- The contents of speech and gesture are generated interactively.
- Speech and gesture shape each other.

- Speech-gesture production reflects how two modes of thinking collaboratively advance thought.

  - Analytic thinking and spatio-motoric thinking
- This collaboration enriches our conceptualisation.

Take home message

- Gesture and speech are interactively generated, and this interaction enriches our conceptualisation.

Acknowledgment

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  - Asli Özyürek
  - Martha Alibali
  - Mingyuan Chu
  - Paraskevi Argyriou
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E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

Key References

- Kita, 2000, In D. McNeill (Ed.), *Gesture and language*, Cambridge University Press.
- Kita & Ozyurek, 2003, *Journal of Memory and Language*.
- Kita, Alibali, & Chu, 2017, *Psychological Review*.

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