Co-speech Gesture

• When we speak, we often spontaneously produce gestures.

• 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)

Gestures for spatio-motoric concepts

• 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.
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.

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).
Demonstrating co-generation

- Language influences gesture.
- Gesture influences speech.

Speech-gesture production

Language \[\leftrightarrow\] 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

Language-to-gesture influence

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

Motion events

Language-to-gesture influence

Kita & Özyürek, 2003, JML
Lexical gap

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

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"

Turkish straight gesture

- "(He) jumps/ flies."

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

Clausal packaging

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

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

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."

Example: Manner gesture and Path gesture (Japanese)
"As (it) somehow rotates like a ball, it rolls, descends."

Example: Manner gesture and Path gesture (Turkish)
"As (it) keeps rolling, (it) goes."

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

Kita & Özyürek, 2003

Motion events

Gesture-to-language influence

Kita, Alibali, Chu, 2017, Psych Rev

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

- Conflated gesture
- Separate gesture
- One clause
- Two Clauses

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

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)
(Kita, Chu, & Mohr, in prep.)

Character viewpoint

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

- Depictive gestures with the observer viewpoint

- Metaphor processing increases left-hand iconic gestures

Speech-gesture production

- Language → Gesture

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.

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 immobilization + encouraged to gesture with the free hand.

Effect of gesturing

- Left > No, p = .007

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.

- Gesture activates new spatio-motoric representations.
Speech-gesture production

Language ← Gesture

Gesture and speech: Two mode of thinking

Language

Gesture

Two modes of thinking

Analytic thinking ← spatio-motoric 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

“Are they still the same amount or different amount?”

Kita, Alibali, Chu, 2017, Psych Rev
Conceptual enrichment

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

Kita, Akiba, 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 contents of speech and gesture are generated interactively.
- Speech and gesture shape each other.

The speech-gesture co-generation view

- 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.

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Key References

• Kita, Alibali, & Chu, 2017, Psychological Review.

End