

GESTURES AND LANGUAGE

TRISTAN MC LEAY

1 JULY 2010

- 1 Outline
- 2 Gestures and speech production
- 3 Gesture comprehension
- 4 Gesture and speech production II
- 5 Conclusion

GESTURES AND SPEECH PRODUCTION

A. Bangerter. (2004). Using pointing and describing to achieve joint focus of attention in dialogue. *Psychological Science*, 15, 415-419.

GESTURE, GAZE AND JOINT ATTENTION

- ▶ FLO: people

- ▶ establish
- ▶ manipul
- ▶ represent

joint attention by/with/through

- ▶ pointing/gestures
- ▶ gaze
- ▶ (actions)
- ▶ (emotional states)



GESTURE, GAZE AND JOINT ATTENTION

- ▶ FLO: people

- ▶ establish
- ▶ manipul
- ▶ represent

joint attention by/with/through

- ▶ pointing/gestures
- ▶ gaze
- ▶ (actions)
- ▶ (emotional states)
- ▶ speech/language [ME]



MULTI-MODAL INTERACTION OF INTELLIGENT AGENTS

Q: HOW DO LANGUAGE AND GESTURE INTERACT?

Q: HOW DO LANGUAGE AND GESTURE INTERACT?

HYPOTHESES:

- 1** the relative use of pointing and language varies according to the situation: As pointing becomes ambiguous, speakers will rely on it less and compensate with language
- 2** pointing is not redundant with speech: It reduces verbal effort to identify a target
- 3** pointing focuses attention by directing gaze to the target region

BANGERTER (2004): METHOD

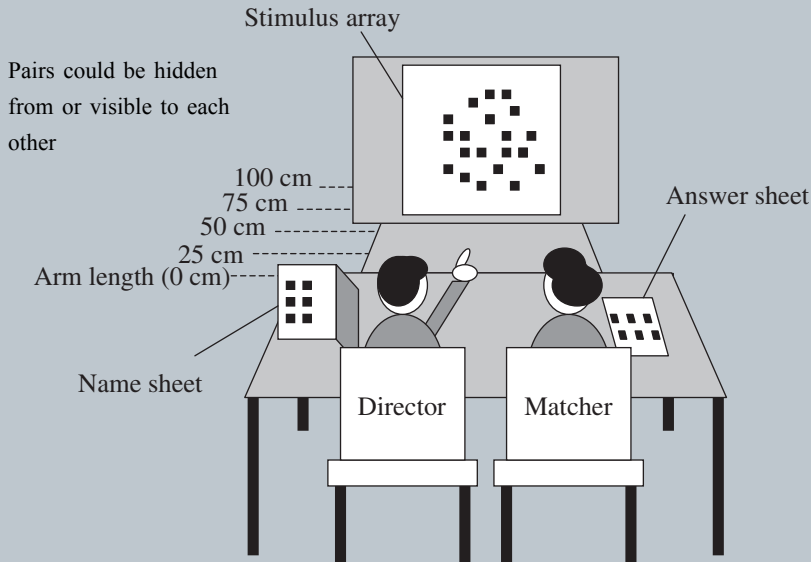


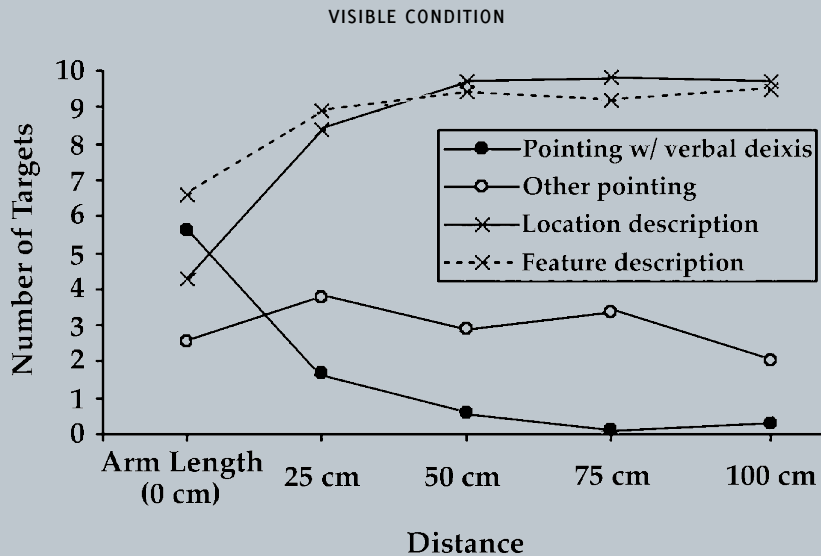
Fig. 1. Experimental setup.

- ▶ recorded:
 - ▶ verbal methods of referring to each photo:
 - location description
 - featural description
 - deictic description
 - ▶ gestural methods (pointing) to refer to a photo
 - ▶ verbal effort: number of words per array

BANGERTER (2004): RESULTS

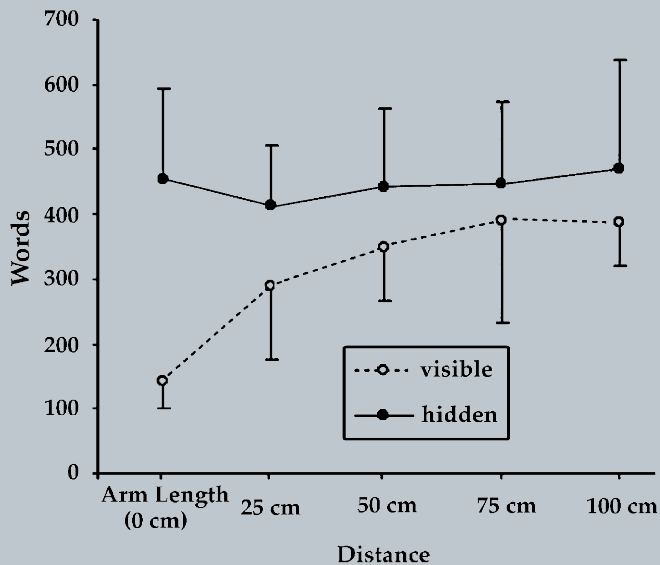
- ▶ pointing with verbal deixis (p.̄.w.d) behave differently than without (p.w.o.d)
 - ▶ p.̄.w.d drops off quickly when it would become ambiguous
 - ▶ p.w.o.d remains constant
 - ▶ p.̄.w.d inversely correlates with verbal effort ($r = -0.62$, $n = 50$, $p < 0.001$)
 - ▶ p.w.o.d is uncorrelated with verbal effort ($p = 0.56$)
- ▶ pointing essentially unused in hidden condition

BANGERTER (2004): RESULTS



BANGERTER (2004): RESULTS

CONDITION COMPARISON (VERBAL EFFORT)



DIFFERENT KINDS OF POINTING IN PRODUCTION:

- ▶ pointing with verbal deixis:
 - ▶ unambiguous
 - ▶ can reduce verbal effort
 - ▶ only used when partner is visible
- ▶ pointing without verbal deixis:
 - ▶ ambiguous
 - ▶ no influence on/of verbal effort
 - ▶ only used when partner is visible

DIFFERENT KINDS OF POINTING IN PRODUCTION:

- ▶ pointing with verbal deixis:
 - ▶ unambiguous
 - ▶ can reduce verbal effort
 - ▶ only used when partner is visible
- ▶ pointing without verbal deixis:
 - ▶ ambiguous
 - ▶ no influence on/of verbal effort
 - ▶ only used when partner is visible
- ▶ small directional gestures: [no details reported]
 - ▶ ambiguous (?)
 - ▶ no influence on/of verbal effort (?)
 - ▶ used even when partner isn't visible (!)

GESTURE COMPREHENSION

S. R. H. Langton & V. Bruce. (2000). You *must* see the point: Automatic processing of cues to the direction of social attention. *Journal of Experimental Psychology: Human Perception and Performance*, 26, 747-757.

GESTURE, GAZE AND JOINT ATTENTION

- ▶ FLO: people

- ▶ established
- ▶ manipulated
- ▶ represented

joint attention by/with/through

- ▶ pointing/gestures
- ▶ gaze
- ▶ (actions)
- ▶ (emotional states)
- ▶ speech/language [ME]

- ▶ MARIA: people

- ▶ follow
- ▶ get confused by
- ▶ make use of

robot gaze

GESTURE, GAZE AND JOINT ATTENTION

▶ FLO: people

- ▶ established
- ▶ manipulated
- ▶ represented

joint attention by/with/through

- ▶ pointing/gestures
- ▶ gaze
- ▶ (actions)
- ▶ (emotional states)
- ▶ speech/language [ME]

▶ MARIA: people

- ▶ follow
- ▶ get confused by
- ▶ make use of

robot gaze

- ⇒ people *automatically* establish pseudo-joint attention with a video of a robot *even though* they don't think it's an intentional agent

Q: (HOW MUCH) DO PEOPLE FOLLOW GESTURES?

Q: (HOW MUCH) DO PEOPLE FOLLOW GESTURES?

SUBQUESTIONS:

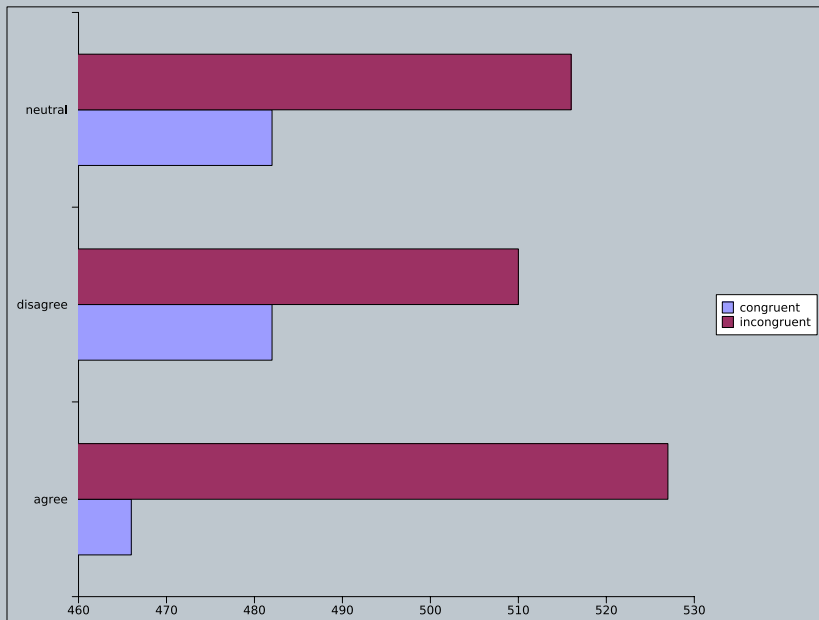
- 1 do people follow gestures/body language alongside language?
- 2 do people follow hand and head cues equally?
- 3 do people follow all *apparently* directional gestures?
- 4 do people follow non-body-related directional cues?

LANGTON & BRUCE (2004) EXP. 1: METHOD

- ▶ recording of (the word) “up” or “down”
- ▶ photo of a person with head facing neutrally/up/down, pointing up/down ($3 \times 2 = 6$ pictures)
- ▶ p⁵ answer according to the spoken word



LANGTON & BRUCE (2004) EXP. 1: RESULTS

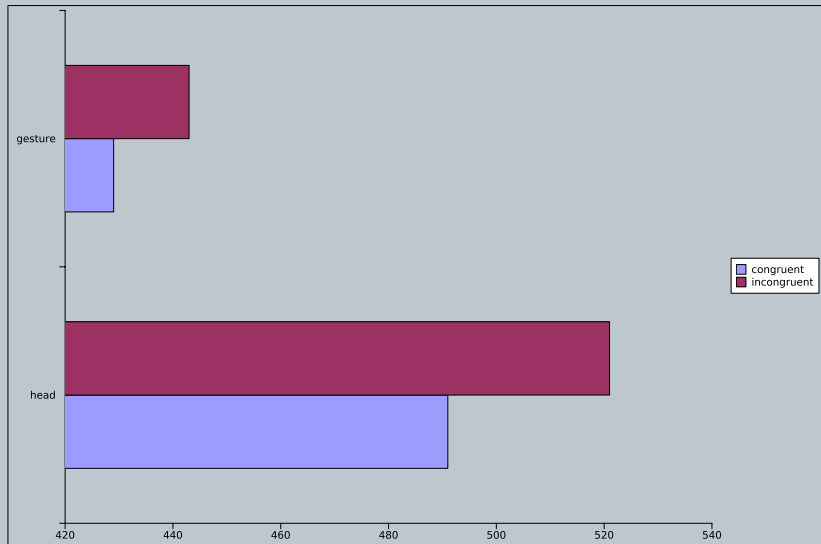


LANGTON & BRUCE (2004) EXP. 2: METHOD

- ▶ photo of a person with head facing up/down, pointing up/down
($2 \times 2 = 4$ pictures)
- ▶ p's answer according to head *or* hand



LANGTON & BRUCE (2004) EXP. 2: RESULTS

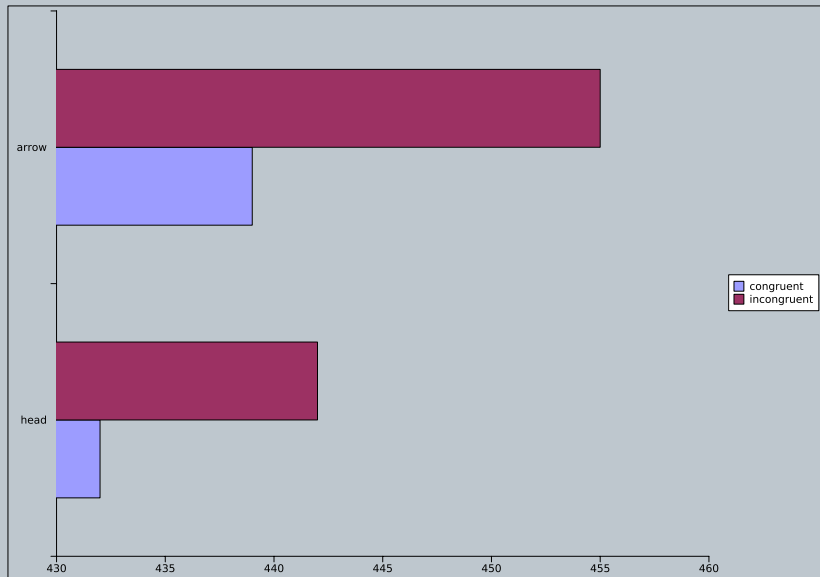


LANGTON & BRUCE (2004) EXP. 4: METHOD

- ▶ photo of a person with head facing up/down, *arrow* pointing up/down ($2 \times 2 = 4$ pictures)
- ▶ p^S answer according to head *or* arrow



LANGTON & BRUCE (2004) EXP. 4: RESULTS

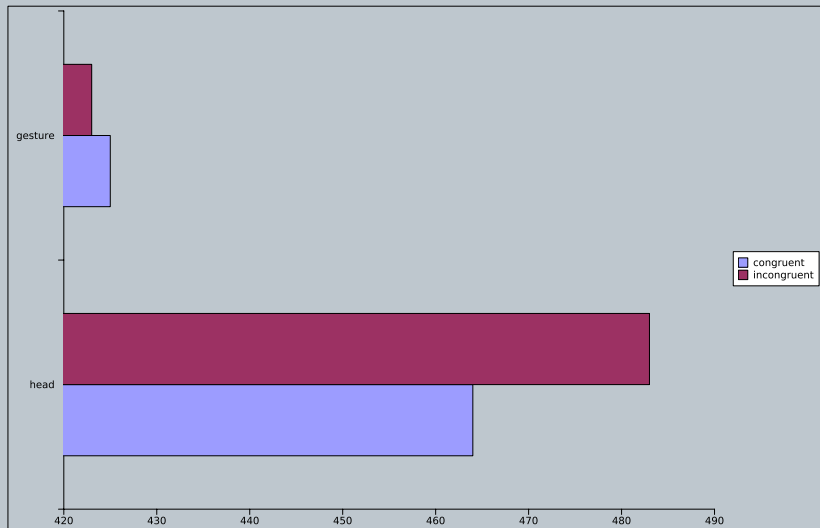


LANGTON & BRUCE (2004) EXP. 3: METHOD

- ▶ photo of a person with head facing up/down, thumbs up/down
($2 \times 2 = 4$ pictures)
- ▶ thumbs up/down is directional in appearance, non-directional in meaning
(good vs bad, rather than up vs down)
- ▶ p $\$$ answer according to head *or* thumb



LANGTON & BRUCE (2004) EXP. 3: RESULTS



- ▶ directional cues are processed automatically

- ▶ directional cues are processed automatically

⇒ not original to this study

- ▶ they cite “(e.g. Driver et al, 1999; Friesen & Kingstone, 1999; Langton & Bruce, 1999; Langton et al, 1996)”
- ▶ for us, also very similar to the data from robot gaze

LANGTON & BRUCE (2004): DISCUSSION

- ▶ directional cues are processed automatically
- ⇒ not original to this study
 - ▶ they cite “(e.g. Driver et al, 1999; Friesen & Kingstone, 1999; Langton & Bruce, 1999; Langton et al, 1996)”
 - ▶ for us, also very similar to the data from robot gaze
- ▶ they argue for their theory of social attention
- ▶ they argue against the idea that gestures are ignored

GESTURE AND SPEECH PRODUCTION II

P. Morrel-Samuels & R. M. Krauss. (1992). Word familiarity predicts temporal asynchrony of hand gestures and speech. *Journal of Experimental Psychology: Language, Memory and Cognition*, 18, 615-622.

GESTURES AND SPEECH PRODUCTION II

L&B mainstream view: gestures are “body language” and comprehended

L&B some psychologists contradict this: gestures are for the benefit of the speaker (Morrel-Samuels & Krauss, 1992; Rimé & Schiaratura, 1991)

L&B therefore, gestures would be ignored by the listener

L&B evidence disagrees with this

M-S&K mainstream view: gestures are “body language” and comprehended

M-S&K gestures largely facilitates lexical access (K:) and contribute little to the listener

M-S&K evidence agrees with this

GESTURES AND SPEECH PRODUCTION II

L&B mainstream view: gestures are “body language” and comprehended

L&B some psychologists contradict this: gestures are for the benefit of the speaker (Morrel-Samuels & Krauss, 1992; Rimé & Schiaratura, 1991)

L&B therefore, gestures would be ignored by the listener

L&B evidence disagrees with this

M-S&K mainstream view: gestures are “body language” and comprehended

M-S&K gestures largely facilitates lexical access (K:) and contribute little to the listener

M-S&K evidence agrees with this

TAM these arguments are compatible

- ▶ p^S described pictures to a confederate
- ▶ confederate could see p, but not picture

- ▶ p^S described pictures to a confederate
- ▶ confederate could see p, but not picture
- ▶ gestures which relate to a spoken word:
 - (a) always start with or before the word
 - (b) almost always finish during the word
 - (c) start longer before a word the less frequent the word is

- ▶ p^S described pictures to a confederate
- ▶ confederate could see p, but not picture
- ▶ gestures which relate to a spoken word:
 - (a) always start with or before the word
 - (b) almost always finish during the word
 - (c) start longer before a word the less frequent the word is
- ∴ gestures are used to facilitate language production
- ▶ review literature which shows that restricted hand, arm, leg movement leads to restricted speech

- ▶ this paper studied a completely different sort of gesture than the other two: the sort Bangerter explicitly ignored!
- ▶ this paper does not conclude gestures are unused

- ▶ both papers argue *the same thing*:
- ▶ there can be no modular, mono-modal psychology of language

- ▶ L&B, Bangerter:
 - ▶ language is more than a stream of soundwaves

- ▶ M-S&K:
 - ▶ there must be feedback and a relationship between the two to get the gesture results we do

CONCLUSION

- ▶ ability to point influences verbal effort (B)
- ▶ pointing influenced by social context (B)
- ▶ directional gestures are processed automatically (L&B)
- ▶ non-semantic gestures facilitate comprehension (M-S&K)
- ▶ language is heavily influenced by our physical actions at multiple levels (all three)

thanks!

GESTURES AND LANGUAGE

TRISTAN MC LEAY

1 JULY 2010