

MODELLING THE RELATION BETWEEN GESTURE AND SPEECH IN APHASIA

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PRE-ACKNOWLEDGEMENT

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De Ruiter, J.P. & De Beer, C. (2013). A critical evaluation of models of gesture and speech production for understanding gesture in aphasia. *Aphasiology*

GESTURE & APHASIA

- Two ways in which gesture and aphasia research can benefit from each other:
 - a) Gesture research helping aphasia research
 - Theories & Therapies
 - b) Aphasia research helping gesture research
 - Providing new challenges
- This talk will be mainly about b)

GESTURE MODELS

- Gesture models are create to explain certain psycholinguistic phenomena
 - Semantic ‘synchrony’
 - Temporal synchrony
 - ...
- Surprise: these models are usually able to explain the phenomena that motivated them

GESTURE MODELS

- From a strictly scientific perspective, this is not sufficient
- A model that can only explain what it was devised to explain is just a theory dressed up as a model
- Real models can predict or explain phenomena that were *not their primary motivation*

PHENOMENA

- Model tests in gesture research:
 - Stuttering (Mayberry & Jaques 2000)
 - Dysfluencies (Seyfeddinipur 2006)
- Another candidate: **Aphasia**

FOCUS

- We have been looking at individuals with “nonfluent aphasia”:
 - dysfluent speech production
 - reduced phrase length
 - pauses
 - perception less affected than production
 - coherent communicative intention, generally achieved
- We focus on iconic gestures (or equivalent)

APHASIA PHENOMENON

The central phenomena

- Relative to healthy controls:
 - The speech and gesture rate are *reduced*
 - but the gesture/word ratio is *higher*

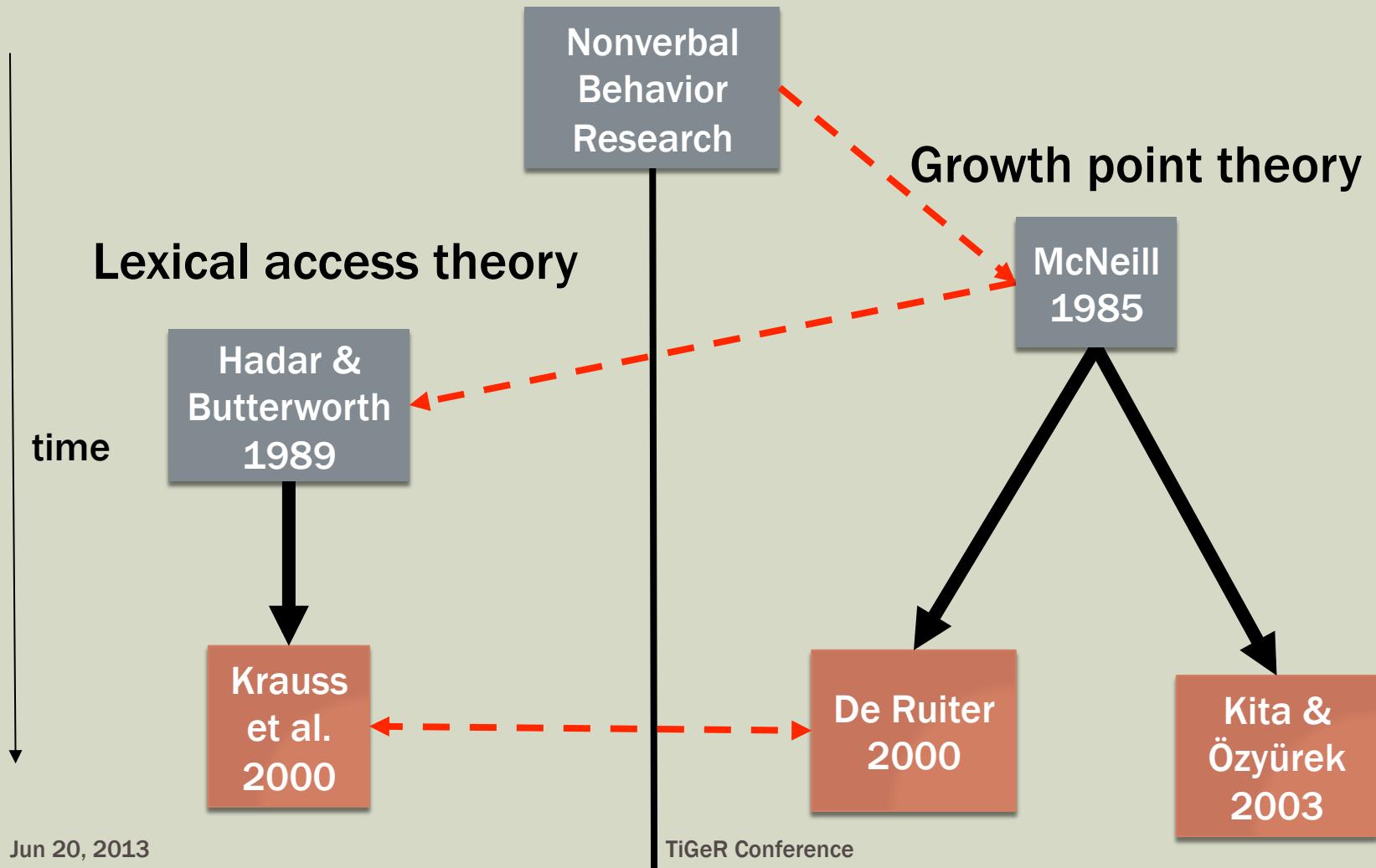
MODELS

- McNeill's (1992) "Growth Point" theory
 - Not a real computational model
 - Kendon: "The Growth Point is a poetic notion"
- Key assumptions
 - Gesture is not "nonverbal behavior" but is intricately linked to speech (McNeill 1985)
 - Gesture and speech have the same representational origin
 - A GP represents one information unit that is (somehow) expanded into both gesture and speech

MODELS

- **Butterworth & Hadar (1989)**
 - Response to McNeill (1985)
- **Assumptions:**
 - Gestures not primarily communicative
 - Function: to internally facilitate speech production

GENEAOLGY OF GESTURE MODELS



NOTE

- Comparison of Sketch Model (De Ruiter 2000) and Interface Model (Kita & Özyürek 2003)
 - Same: assume that Levelt's *conceptualiser* splits communicative intention into two modalities (verbal clause & gesture component)
 - Different:
 - how gesture and speech are semantically aligned
 - whether gesture is generated from pre-existing action schemata (Interface) or from imagery (Sketch)
 - Types of gestures incorporated

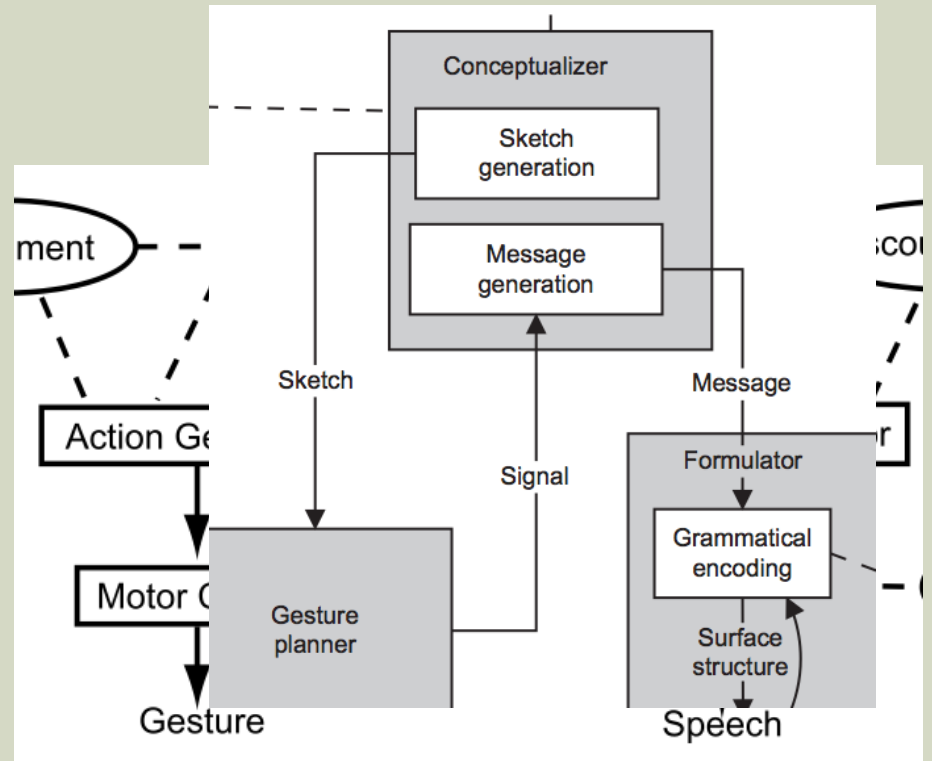
SPEECH GESTURE ALIGNMENT

■ Sketch model

- Gesture and speech are aligned by conceptualiser
- For that, conceptualiser needs to “know” about language (cf. Levelt et al. 1999)

■ Interface model

- Action generator, message generator, and formulator exchange information to incrementally adapt gesture to planned speech



ACCOMMODATING APHASIA FINDING

Repeating central finding

- In nonfluent aphasia:
 - The speech and (iconic) gesture rate are *reduced*
 - The (iconic) gesture/word ratio is *higher*

EXPLANATION FOR LEXICAL FACILITATION FAMILY

Lexical facilitation explanation:

- In nonfluent aphasia, there frequently are word finding problems
- To compensate, individuals diagnosed with aphasia produce more gestures

PROPOSED EXPLANATION GROWTH POINT FAMILY

Our new “Growth Point family” explanation:

- Due to fluency problems, conceptualiser adapts by producing smaller units (cf. Kolk & Heeschen 1990)
 - If there is one gesture per unit, and the number of words goes down, the number of gestures per word goes up.
- Sometimes, gesture is used to compensate for communication deficits in speech
 - These are often speech-replacing gestures (to the right of “Kendon’s continuum”) or interactive gestures

TWO EXPLANATIONS

- Both model types can accommodate the aphasia findings
- The explanations are very different
- It depends on what model (family) one believes in

MY PREFERENCE

- I prefer the GP type explanation because
- It is compatible with the Adaptation Hypothesis (Kolk & Heeschen 1990;
 - Controlled experiments have shown that making gestures does not help in resolving TOT states (Frick-Horbury & Guttentag 1998; Beattie & Coughlan 1999)
 - But perhaps TOT states are not comparable to aphasia-related fluency problems

CONCLUSIONS



- We should always test models on *new* phenomena
- Aphasia research provides gesture researchers with these phenomena
- There are two “families” of gesture models
 - Growth point based
 - Lexical facilitation based
- Both model types can accommodate the increased iconic gesture/word rate
- Clearly, further research is necessary
 - Different gesture types
 - Different contexts
 - Different tasks