

# A case against the Motor Theory of Speech Perception

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# Outline

1. Arguments for the Motor Theory of Speech Perception (MToSP)
2. Arguments against MToSP
3. Alternative Explanations for 1.

# The issue

- Controversy about role of Motor System (MS) in speech perception
  - Motor cortex activation

## Motor theory

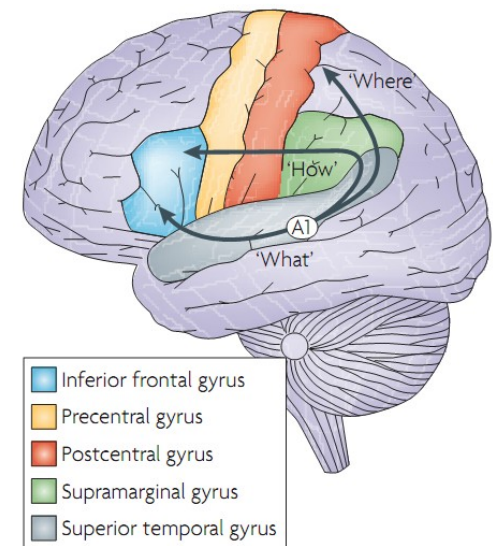
- activation of the articulatory (motor) gestures is essential for speech perception
  - perception includes production
  - Mirror neurons

## Acoustic perspective

- Activity represents a system which has an supportive role in general acoustic perception

# Motor Cortex in speech perception

- Different regions -> different phonemes
  - TMS on MS affects discrimination of phonemes
- Motor System (MS) is active during speech perception
  - Activity higher if speed higher
- Anatomical connections
  - Pathway from auditory cortex to motor cortex ("how"-pathway)

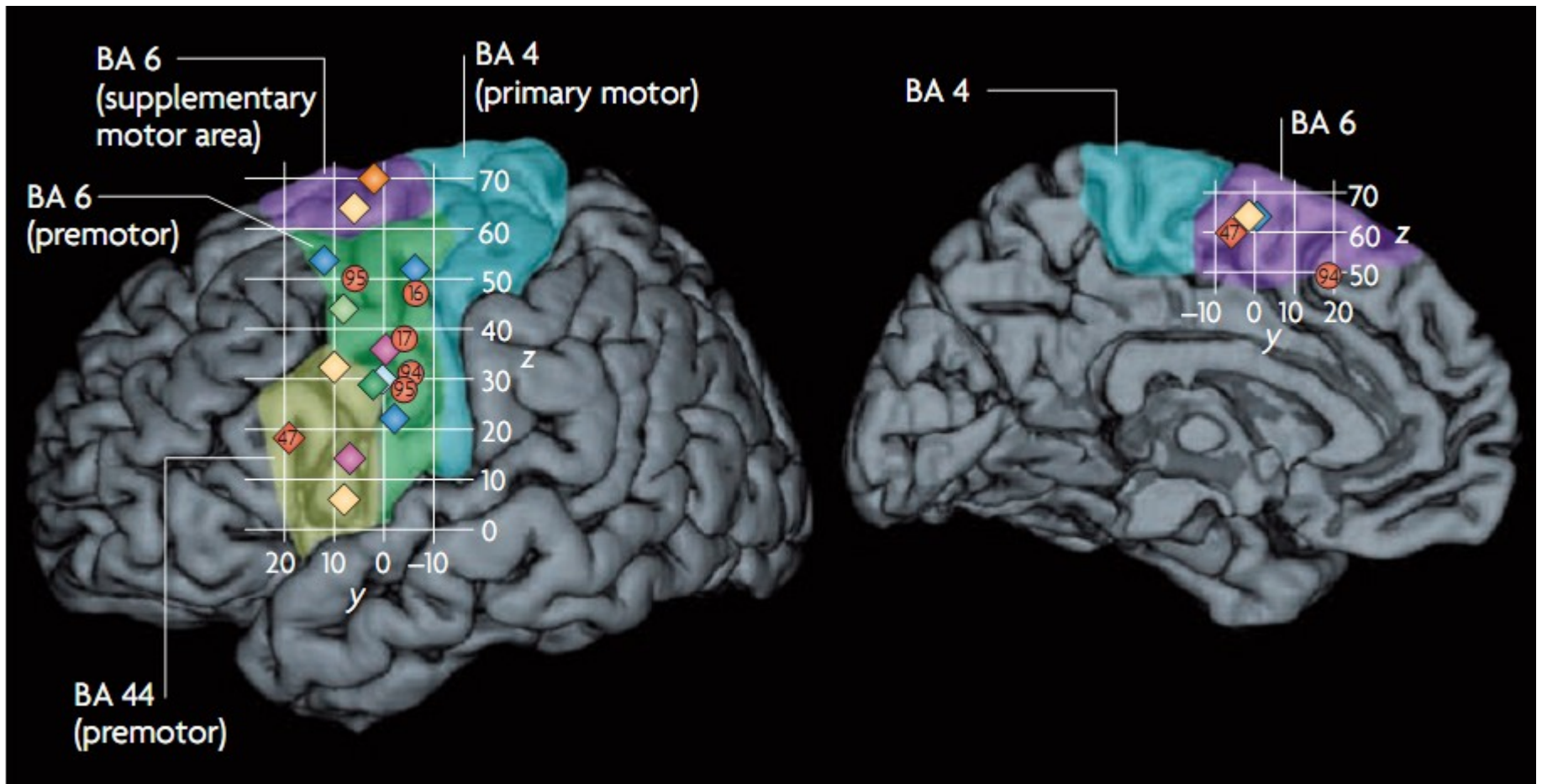


# Evidence contra Motor Theory (1)

- dissociations
  - in patients
    - double dissociation between perception and production
    - Broca's aphasics understand without discriminating between single phonemes
  - developmental
    - lack of production not necessarily affects perception
    - no correlation between speech perception skill at 21 months & production skills

# Evidence contra Motor Theory (2a)

- Methodical issues
  - Control against complex stimuli only in ROI studies
    - Activation in other regions not recoded
    - Might be associated with memory (semantic representations)
  - In whole brain studies
    - speech not discriminable from other sounds



Red = studies that found motor cortex activity in response to speech

Circle = no direct comparison with acoustic control

Diamond = contrast with suitably complex auditory control

# Evidence contra Motor Theory (2b)

- Methodical issues
  - Control against complex stimuli only in ROI studies
    - Activation in other regions not recoded
    - Might be associated with memory (semantic representations)
  - In whole brain studies
    - speech not discriminable from other sounds
    - Activity therefore might be domain general to auditory stimuli



# Evidence contra Motor Theory (3)

- MToSP builds on mirror-neurons
  - Those are controversially as well
  - Logical problems ...in the workshop

# Alternative explanations (1)

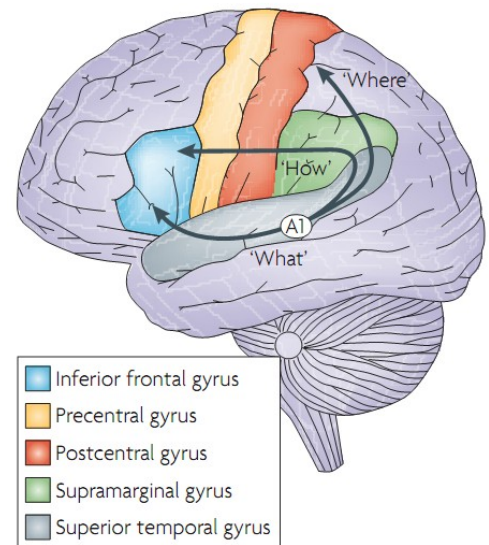
- General mechanism
  - Multiple cues used for decoding
    - E.g. visual information support auditory comprehension
  - MS activity reflects sensory cue of action perception

# Alternative explanations (2)

- Linguistic (“one, some or all”)
  - Phonemic
    - MS for distinguishing sounds in general
  - Syntactic
    - MS for processing (intention-based) sequences
  - Semantic
    - embodied semantic representations

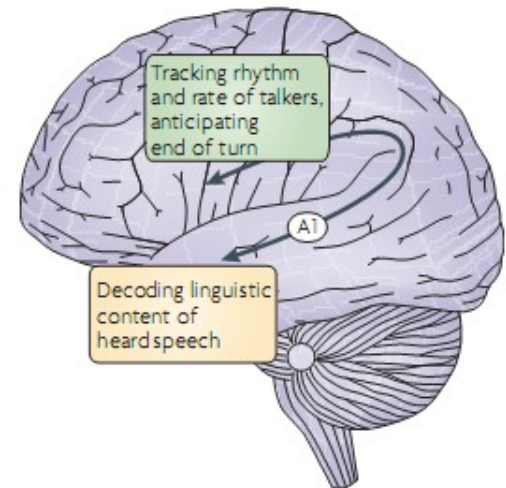
# Alternative explanations (3)

- conversational aspects of speech
  - convergence
    - people become more similar
    - posture, pronunciation, rhythm, breathing etc.
  - turn taking
- > MS for “how”, not for “what”



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# References

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