

Plan

- Developing Research Proposals
- Recognizing Words in Context
 - Samuel: Word perception influences phoneme perception
 - Van Petten: relative timing of word perception and contextual integration

DEVELOPING RESEARCH PROPOSALS

<http://www.nrf.ac.za/yenza/proposal.htm>

highly recommended

http://www.meaning.ca/articles/print/writing_research_proposal_may02.htm

Core components of research proposals

Make sure that these are
meaningful, not mechanistic

Core elements

- A description of the research question
- An indication of why the problem is important
- A review of relevant literature
- A description of the proposed methodology

Or in plain English...

- What do you want to do?
- Why do you want to do it?
- Why is it important?
- Who has done similar work?
- How are you going to do it?

Successful Proposals

- Clearly defined research question
- Appropriate literature provides a background to the problem
- Objectives clearly specified
- Conceptual framework and theoretical assumptions clearly stated
- Appropriate design and methodology
- Promotes further research

Unsuccessful Proposals

- Too long
- Poor structure, language use
- Inappropriate use of technical terms
- No literature review
- No integration of theory in literature review
- Literature review copied
- No theoretical foundation
- Methods not clear
- Methods inappropriate
- No references or bibliography

How to structure your proposal for COGS 179

- Abstract
 - 1 paragraph summary of research question, description of proposed study, and indication of what study might tell us
- Introduction
 - Literature Review
 - Define Research Question
 - Demonstrate Importance of Research Question
- Methods
 - Participants
 - Materials
 - Procedure
 - EEG Collection
- Analysis and Conclusions
 - Proposed analysis
 - Possible outcomes and what each might mean

Describing the research question

First find a research question!

- Researchers get their questions from many different places...
- Observation of the world
- Concern with theory
- Previous research
- Practical concerns
- Personal interest

Choosing a research question

- A broad research *area* is not a research *question*
- Formulate a number of possible questions, and weigh up the pros and cons
- The proposal must reflect that the issues have been thought through

Setting the limits: definitions

- Provide explicit definitions for key concepts
- Terms don't always have single meanings understood in the same way by all
- Don't under- or overestimate your readers
- Don't provide mechanistic dictionary definitions of all terms

Sample definitions

- “A dependent variable is a variable that is influenced by another variable.”
- The term “social and ethical accounting, auditing and reporting” (SEEAR) has been used to describe a variety of practices relating to corporate social responsibility. For purposes of this study, the term will be used to refer *specifically* to the formal set of procedures outlined in AccountAbility 1000, while “social audit” will be used to describe the broader set of practices.

Setting the limits: boundaries

- Specify the limits of the research in a way which makes it clear what is and is not to be studied

Setting the limits: an example

“How have South African mining regulations changed over the years, and what has been the impact of these changes?”

Setting the limits: example (cont.)

- Restrict to mining *safety* regulations
- Define “mining safety regulations” (e.g. as Acts of Parliament only)
- Restrict study to *gold* mining
- Restrict period (e.g. 1911 - 1996)
- Restrict “impact” to effect on cost of gold production

Setting the limits: the revised example

“How did Acts of Parliament regulating mine safety between 1911 and 1996 impact upon the cost of gold production in South Africa?”

Literature review

What purpose does the literature review serve?

- Provides a conceptual framework for the research
- Provides an integrated overview of the field of study
- Helps establish a need for the research
- May help clarify the research problem
- Helps to demonstrate researcher's familiarity with the area under consideration (theory and / or methods)

Skills involved in producing a literature review

- Surveying a comprehensive range of existing material and sources in the general areas of your study
- Selecting those that will be most relevant and significant for your particular project
- Understanding and analyzing the central findings and arguments
- Synthesizing the findings and integrating them into the research proposal
- A good literature review generally contains an *argument*

How to write a literature review

- Indicate the ways in which the authors you are reviewing will be relevant to your research (information, theory, methodology)
- Demonstrate that you understand the similarities and differences between these works and paradigms (Where do they stand in relation to each other? Where does your research stand in relation to them?)
- The works that you refer to should reflect recent scholarship as well as those considered of seminal importance
- If the study is cross-disciplinary or comparative you need to describe how the different areas of research can be drawn together in a meaningful way

Questions to help you in compiling a literature review

- What are the broad bodies of literature that have relevance for your research topic?
- What theoretical model/s relate to your research topic?
- What theories, methods & results have previous researchers in your field produced?
What is the history of your area of study?
(cont.)

Questions to help you in compiling a literature review (cont.)

- What are the most recent findings in your area of study?
- What gaps or contradictions exist among these findings?
- What new research questions do these findings suggest?
- What structure suits my literature review best?
- What should I leave out?

The literature review is *not*

- Part of the research project
- A bibliography
- A series of descriptions of pieces of previous research with no apparent connection to each other or your project

Significance of the research

The research must be of value, e.g.

- Practical value in solving problems
- Contribution to theory
- Contribution to body of knowledge within discipline

Methodology

What does the methodology section do? What should it contain?

- The methodology section shows the reader how you are going to set about looking for answers to the research question (including, if appropriate, materials and methods to be used)
- It must include enough detail to demonstrate that you are competent and the project is feasible
- The proposed methods must be *appropriate* to the type of research

Methodology section

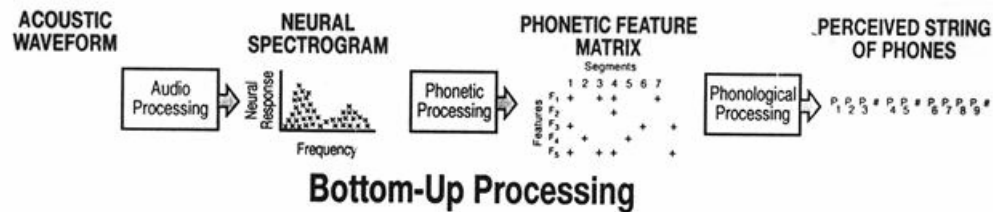
- Hypothesis
- Research design
- Materials
- Procedure
- EEG collection procedures
- Data analysis

Plan

- Developing Research Proposals
- Recognizing Speech in Context
 - Samuel: Word perception influences phoneme perception
 - Van Petten: relative timing of word perception and contextual integration

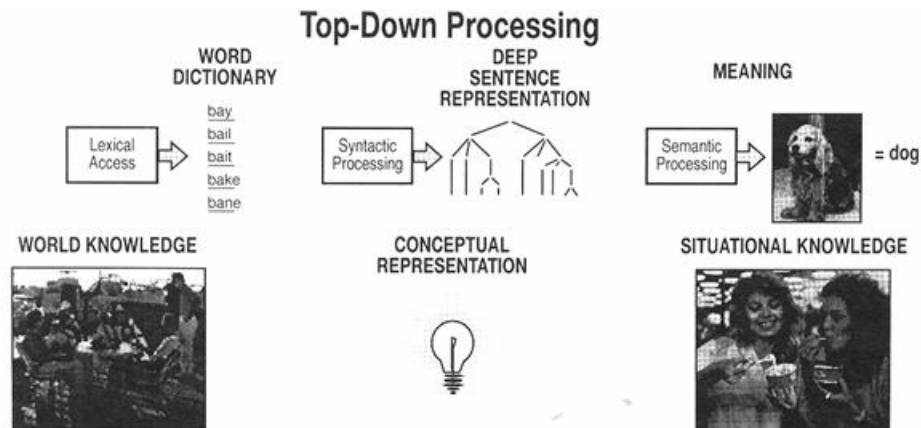
Recognizing Speech in Context

Bottom-up Processes



- Acoustic Info
- Phonetic Info
- Phonemic Info
- Words & Sentences

Top-Down Processes



- To what extent does knowledge of what speaker is saying impact processes necessary for understanding speech?

Phonemic Restoration Effect

- Legislature

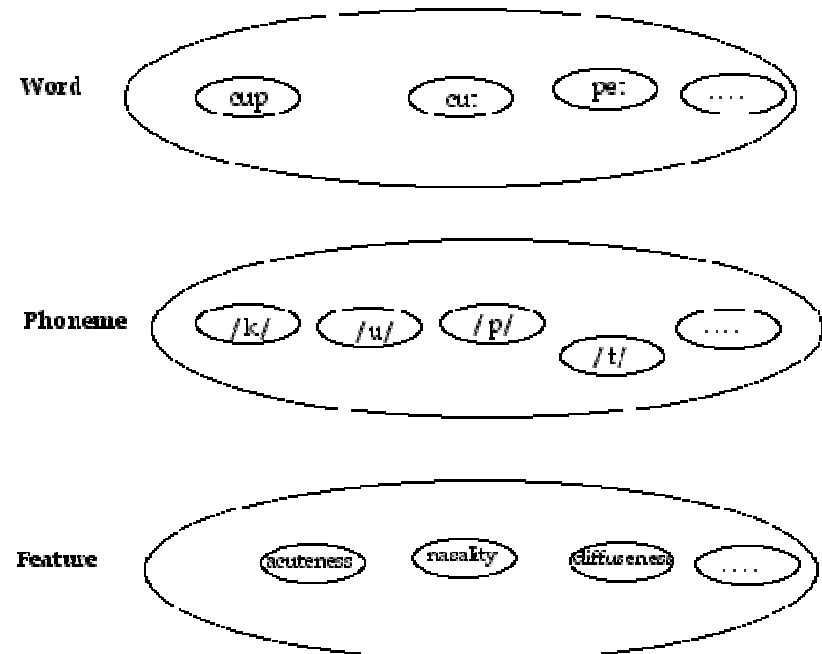


- Sentences



TRACE


- Like the interactive-activation model of printed word recognition, TRACE has three sets of interconnected detectors
 - Feature detectors
 - Phoneme detectors
 - Word detectors
- These detectors span different stretches of the input (feature detector span small parts, word detectors span larger parts)
- The input is divided into “time slices” which are processed sequentially.



TRACE - continued

- Within a set (or level) connections are inhibitory
 - E.g. evidence that a certain stretch of the input is the word “tip” is evidence that it is NOT any other word
- Between a set (or level) connections are excitatory
 - E.g. evidence that a certain stretch of the input is the sound /t/ is evidence that it might be the beginning of the word “tip”
 - Also, evidence that the word is “tip” is evidence that its parts are /t/ /i/ /p/, so there are “top-down” (feedback) effects in TRACE as in the interactive activation model
- Or inhibitory..
 - If it’s a /t/ it isn’t the beginning of “cat”

TRACE - continued

- Accounts for context effects
- Can handle (some) acoustic variability (and noise)
- Can account for phoneme restoration (Warren - “Open the  oor” heard as “Open the door”)
- Can account for co-articulation effects
- Can find word boundaries (using the possible word constraint)

Samuel

- Notes that evidence for models like TRACE largely depends on experiments where people report what words they hear
 - For example, Ganong study
 - Create sounds from /dae/ /tae/ continuum
 - Append to ambiguous sound to words
 - People report hearing
 - /dae/ when sound in 'dash' but
 - /tae/ when sound in 'task'
- However, such findings could result from context effects on either
 - initial perception of sounds, *or*
 - subsequent processes in which people determine (post hoc) what they heard
- Need to use some experimental paradigm where critical information doesn't hinge on people's decisions about what they heard
 - Selective adaptation paradigm as in Eimas & Corbett

Eimas & Corbitt Experiment

- Exploit ba-pa continuum
- VOT – time at which voicing starts relative to onset of test syllable
- Synthesize continuum of sounds varying in VOT (0 to 80 ms in 10 ms steps)
- Subjects classify plosive as b or p
- Plot pre-adaptation results
- Sharp changeover at 23 ms VOT

Selective Adaptation Phase

- Endpoint stimulus repeated several times (e.g. repeat lots of b stimuli) before doing classification task
- Plot results as before
- Finding
 - Curve moves leftwards (towards b)
 - Fewer b responses, more d responses
 - As if b feature detector tired out

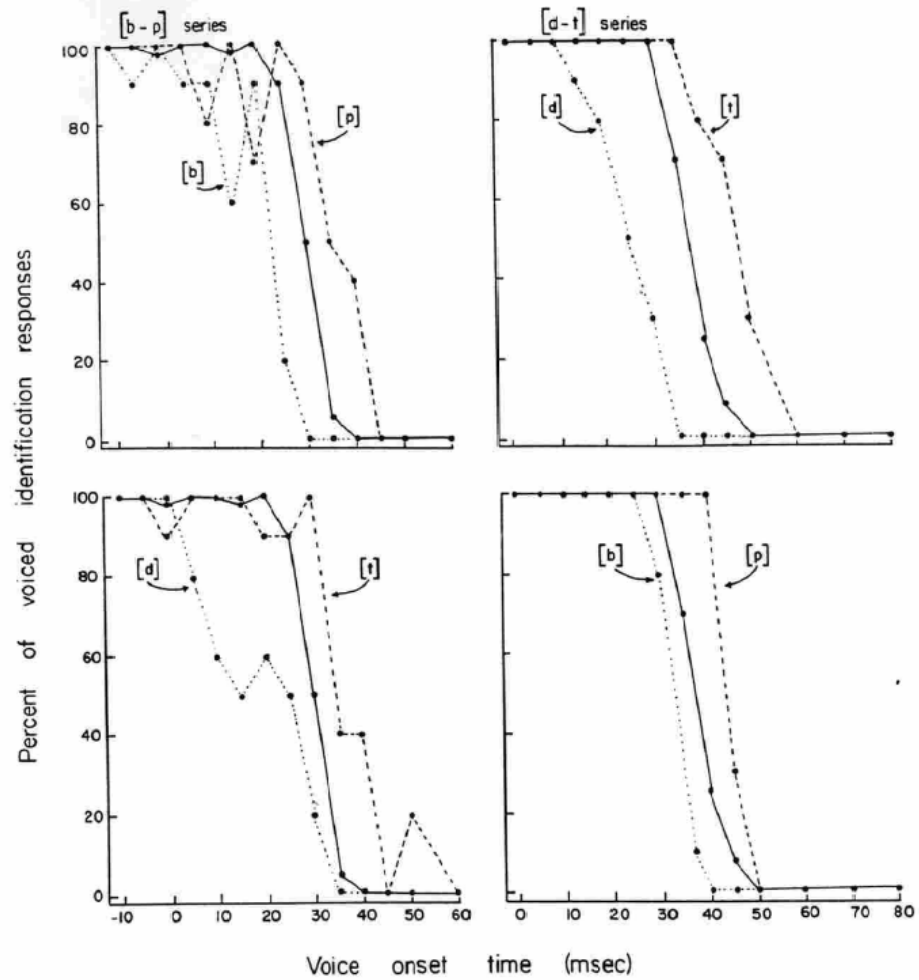


FIG. 2. Percentages of voiced identification responses ([b or d]) obtained with and without adaptation for a single subject. The functions for the [b, p] series are on the left and those for the [d, t] series are on the right. The solid lines indicate the unadapted identification functions and the dotted and dashed lines, the identification functions after adaptation. The phonetic symbols indicate the adapting stimulus.

Samuel

- Can we use selective adaptation to show that word context influences the perception of phonemes within a word?
- Instead of b – d sound, use *words* as adaptor stimuli
 - S-context: bronchitis, embarrass, malpractice, tremendous
 - Sh-context: abolish, demolish, diminish, replenish
 - Adaptor words have been edited so that they have ambiguous ‘s’ ‘sh’ sound
- If s/sh continuum shifts (showing effects of adaptation) it suggests the adaptor stimuli were being registered by ‘s’ vs. ‘sh’ feature detectors
- Since same acoustic sound, this reflects top-down processing of word on perception of phonemes

Samuel

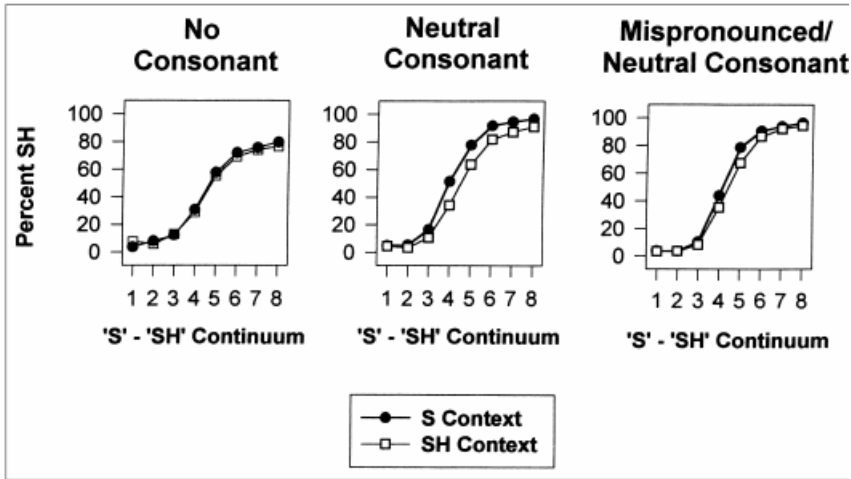


Fig. 1. Percentage of test syllables on the /s/-/ʃ/ continuum identified as /s/. Results are shown separately for test syllables presented after no consonant control items as adaptors (left panel), experimental items with neutral consonants as adaptors (middle panel), and mispronounced words with neutral consonants as adaptors (right panel). In "s contexts," the adaptors were derived from words that end in /s/; in "sh contexts" the adaptors were derived from words ending in /ʃ/.

Models of Spoken Word Identification

- The TRACE (Interactive Activation) Model
 - McClelland & Elman, 1986
- The Cohort Model
 - Marslen-Wilson & Welsh, 1978
 - Revised, Marslen-Wilson, 1989

Marslen-Wilson's Cohort Model

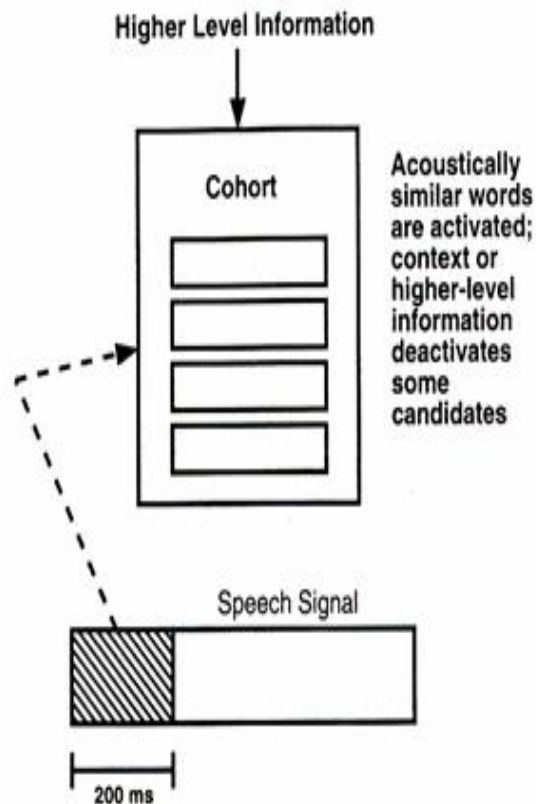


FIGURE 6-11 The Cohort Model of Word Recognition. (Reprinted with permission by Singular Publishing Group, Inc. Kent, R. [1997]. *The Speech Sciences*. San Diego: Singular 388.)

- Mental representations of words **activated** (in parallel) on the basis of bottom-up input (sounds)
- Can be **de-activated** by subsequent input
 - bottom-up (phonological)
 - top-down (contextual)

Uniqueness and Recognition

- When we hear the beginning of a word this activates ALL words beginning with the same sound: the “word initial cohort”. Subsequent sounds eliminate candidates from the cohort until only one remains (failure to fit with context can also eliminate candidates)
- t - tea, tree, trick, tread, tressle, trespass, top, tick, etc.
- tr - tree, trick, tread, tressle, trespass, etc.
- tre - tread, tressle, trespass, etc.
- tres - tressle, trespass, etc.
- tresp - trespass.

Uniqueness and Recognition

- The **recognition point** is the point at which, empirically, a word is actually identified
- Empirical studies show that recognition point correlates with (and is closely tied to) the uniqueness point.
 - phoneme monitoring latencies correlate with *a priori* cohort analysis (and one way to recognise word initial phonemes is to recognise the word and to know it begins with e.g. /p/)

Effects of Material beyond the UP / DP

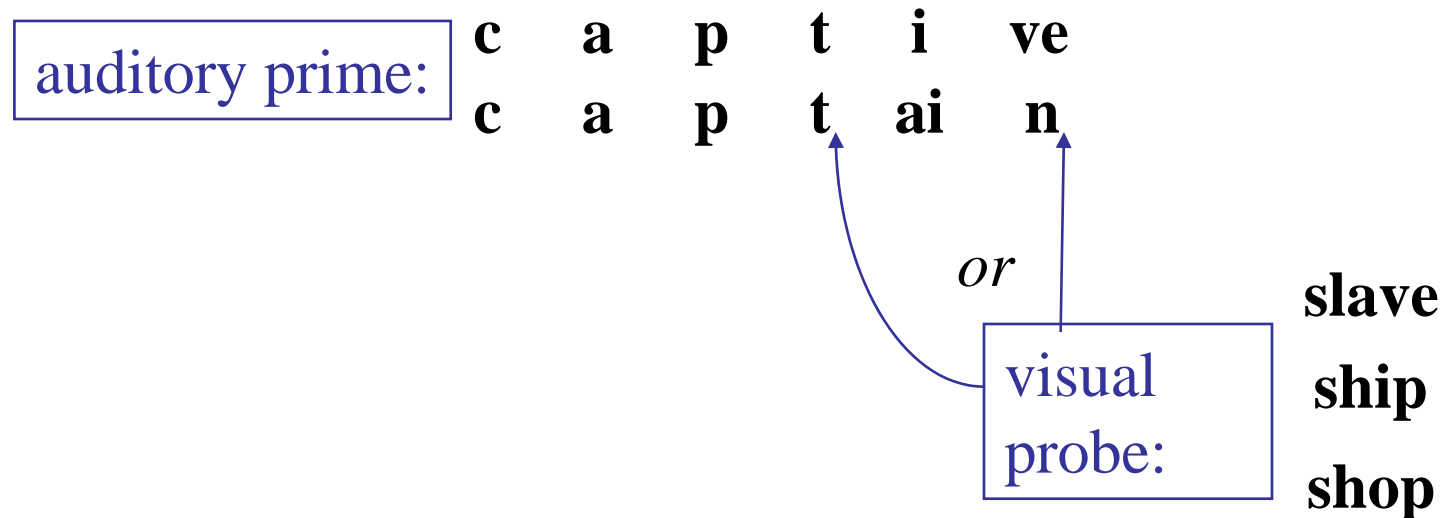
- Auditory lexical decision task, pairs of non-words compared with the same Deviation Point, but one resembled a real word beyond (and before) the DP.
- e.g. rith | l | ik rith | l | an
- UP|DP UP|DP
- The cohort model predicts same RT for both; but first word (472ms) was slower than the second (372ms), and error rate was 3.5% for the first and 0.6% for the second.
- Conclude that the cohort model fails to account for this phenomenon.

Frequency Effects in Spoken Word Identification

- Marslen-Wilson: auditory lexical decision task with pairs of words with the same length, UP, and different frequencies.
- e.g. DIFFIC | ULT high frequency (250ms)
- DIFFID | ENT low frequency (379ms)
- Not immediately clear how the original version of the Cohort Model accounts for this effect

The Zwitserlood experiment

- cross-modal priming



- priming found to both alternatives in “early” condition only
- *more* priming found to “ship” — a *frequency* effect

Zwitserslood - Conclusion

- Zwitserslood's experiment showed that frequency of a word affects the activation level of candidates in the early stages of lexical access, hence "there are relative frequency effects within the initial cohort, so that entry in the cohort cannot be all-or-none, but varies along a continuum...some candidates are more activated than others." pp.60 Harley.

Need to Revise the Cohort Model

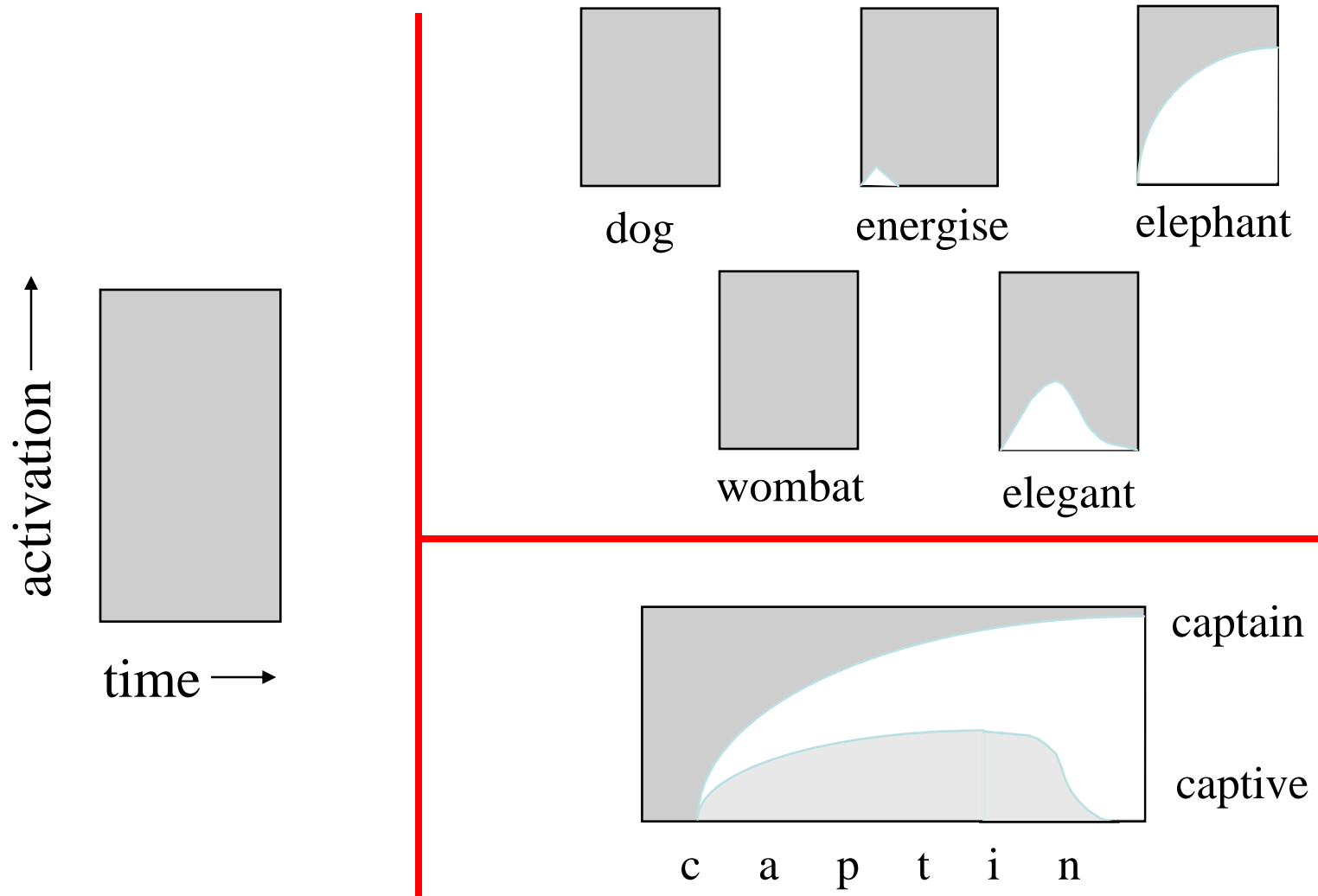
- Further Evidence

- We are capable of identifying a word when mispronounced (even at the beginning e.g. “shigarette”, and (sometimes) when we only hear a word from the middle on.
- The original cohort model cannot account for these effects

The Revised Cohort Model

- Initial activation is (still) bottom-up
- Competition between active elements leave one element standing out above the rest. Incompatible bottom-up evidence does not eliminate a candidate (as it does in original), but partially deactivates it.
 - Thus, revised version of model is much more similar to TRACE
- The highest ranking elements are assessed in parallel with respect to the interpretation — the best fit is integrated and (hence) recognized.

Activation in the Revised Cohort Model



Spoken Word Recognition: Conclusions

- The two leading models, TRACE and the Revised Cohort Model, have much in common
- Both depend on competition between partially activated candidates for the word's identity

Word ID & Semantic Integration

- Cohort model suggests context impacts word recognition via the deactivation of some words in the cohort, but
- Doesn't say much about the relative timing of word recognition and understanding meaning of sentence
- Van Petten & colleagues raise 3 possibilities
 - Semantic processing of words begins after uniqueness point has been reached
 - Meaning of all words in cohort active early, but contextual integration does not begin until after uniqueness point has been reached
 - Semantic processing at both word and sentence levels begins early

Van Petten et al.

- Determine isolation point for a bunch of words
- Embed words in sentences where they are congruous vs. incongruous
- N400 as index of contextual integration
 - When is onset effect of N400 relative to isolation (uniqueness) point for words?
 - Are words in the same cohort ruled out by context before the uniqueness point or after it?

Gating Study

- Isolation point of words in study averaged about 300 ms
 - Range of variability
- Duration of words in study averaged around 600 ms
 - Range of variability
- Most words identified before acoustic offset

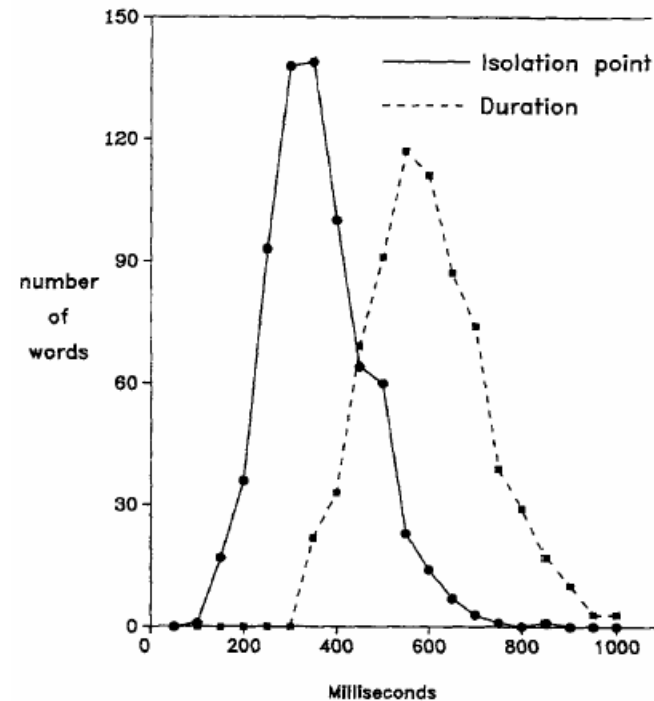


Figure 1. Distributions of full-word duration and isolation points across the set of words, in 50-ms increments (duration was rounded to the closest multiple of 50).

Gating Results

- Is isolation point (defined as when 70% of people correctly identify word) a valid index of time it takes people to ID a word?
- Accuracy rates before isolation point quite low
- Accuracy rates after isolation point remain fairly constant
- IP seems to truly reflect amount of acoustic info needed to identify the word

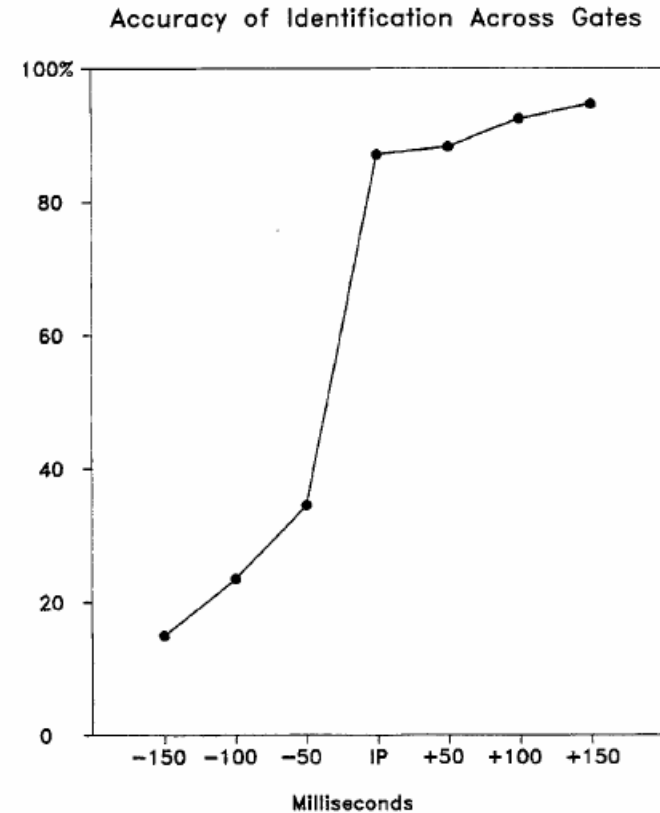


Figure 2. Identification accuracy before, at, and after the isolation point (IP). Accuracies are for 630 words of the total set, with IPs of 200 ms or greater and durations at least 150 ms longer than the isolation point.

Gating Study

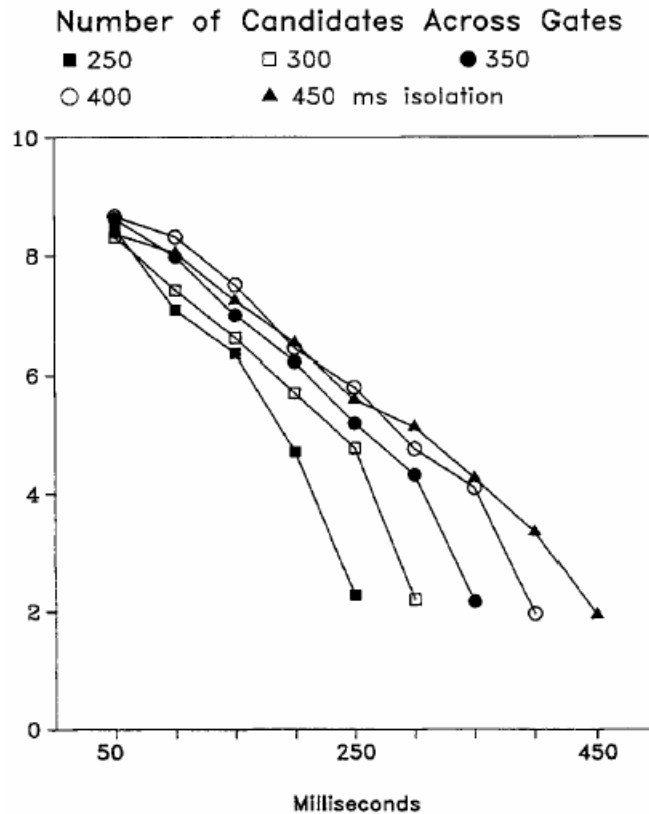


Figure 3. Number of candidate words generated by the participants at gates of increasing length, for subsets of stimuli with different final isolation points. The maximum number of candidates is 10, the number of participants hearing each gated stimulus.

- Steady pruning of cohort w/increasing amount of acoustic information
- Dramatic drop to one candidate at isolation point
- Isolation point valid indicator of when word recognition possible

Materials

Table 2

Sample Stimuli in Experiment 2

Cohort congruous/cohort incongruous/rhyme

It was a pleasant surprise to find that the car repair bill was only seventeen *dollars/dolphins/scholars*.

Most marine mammals have some sort of legal protection, but fishermen continue to kill *dolphins/dollars/muffins*.

The referee got tired of the coach's behavior and gave his team a *penalty/pendulum/loyalty*.

The visitor stared at the grandfather clock and seemed almost hypnotized by the swinging of the *pendulum/penalty/asylum*.

The movie was meant to be a horror flick, but the acting was so bad it was *funny/funnel/penny*.

He spilled some of the oil onto the engine because he didn't have a *funnel/funny/tunnel*.

Instead of sending flowers, they asked everyone to make a donation to their favorite *charity/chariot/cavity*.

The Roman general made his appearance in battle gear, with a white horse pulling his golden *chariot/charity/idiot*.

Sir Lancelot spared the man's life when he begged for *mercy/mermaid/fancy*.

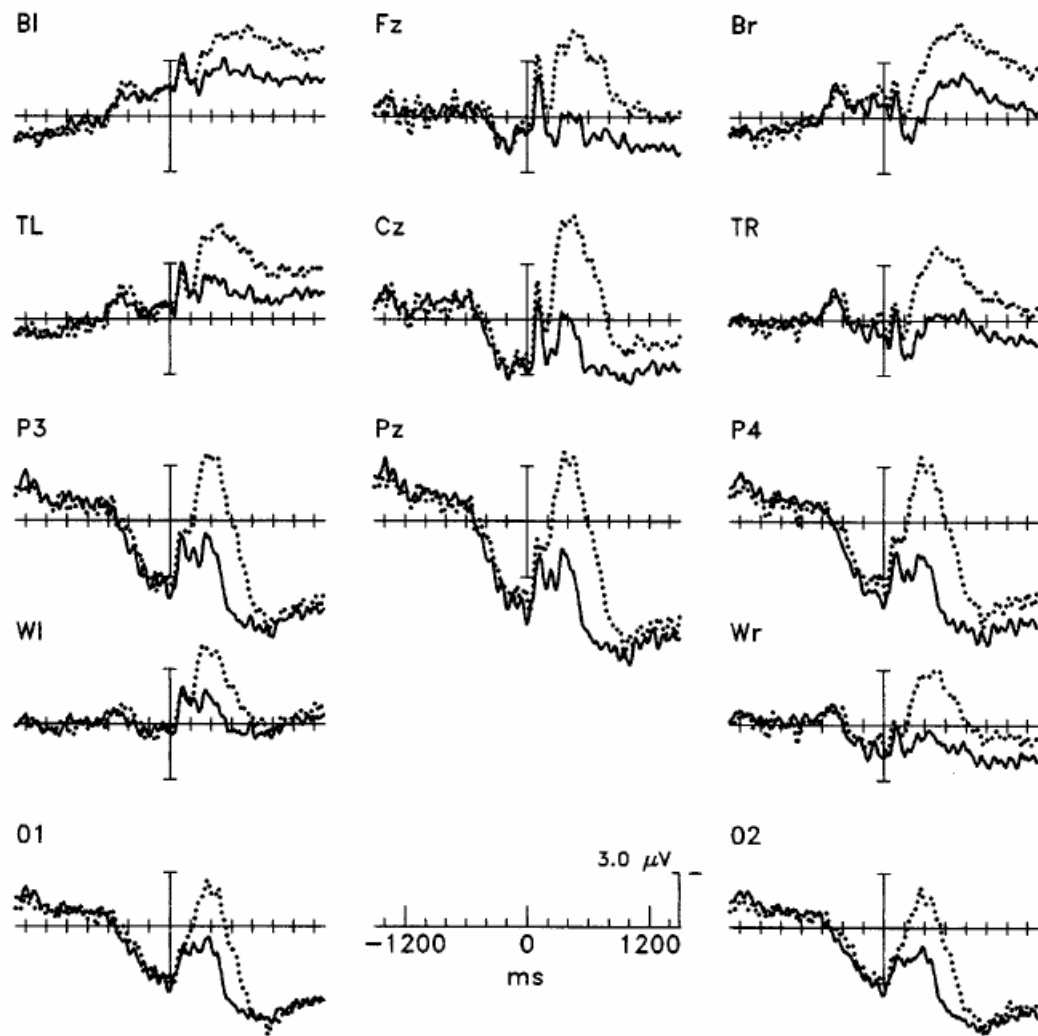
The old sailor kept a straight face as he told of his love affair with a beautiful *mermaid/mercy/grenade*.

Plain congruous

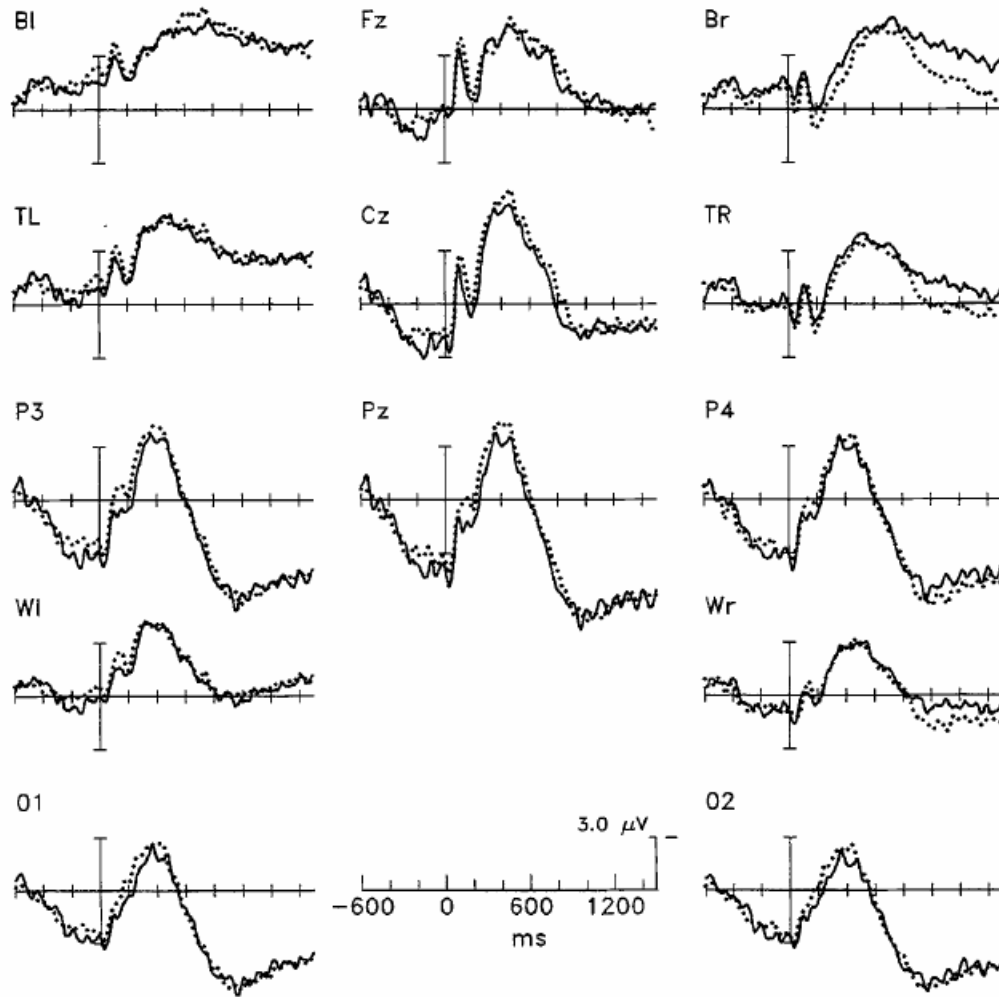
The mill worker caught his hand in a piece of machinery and was rushed to the *hospital*.

Plain incongruous

The gold medal winner from Brazil started out slow but took the lead in the second *bureau*.

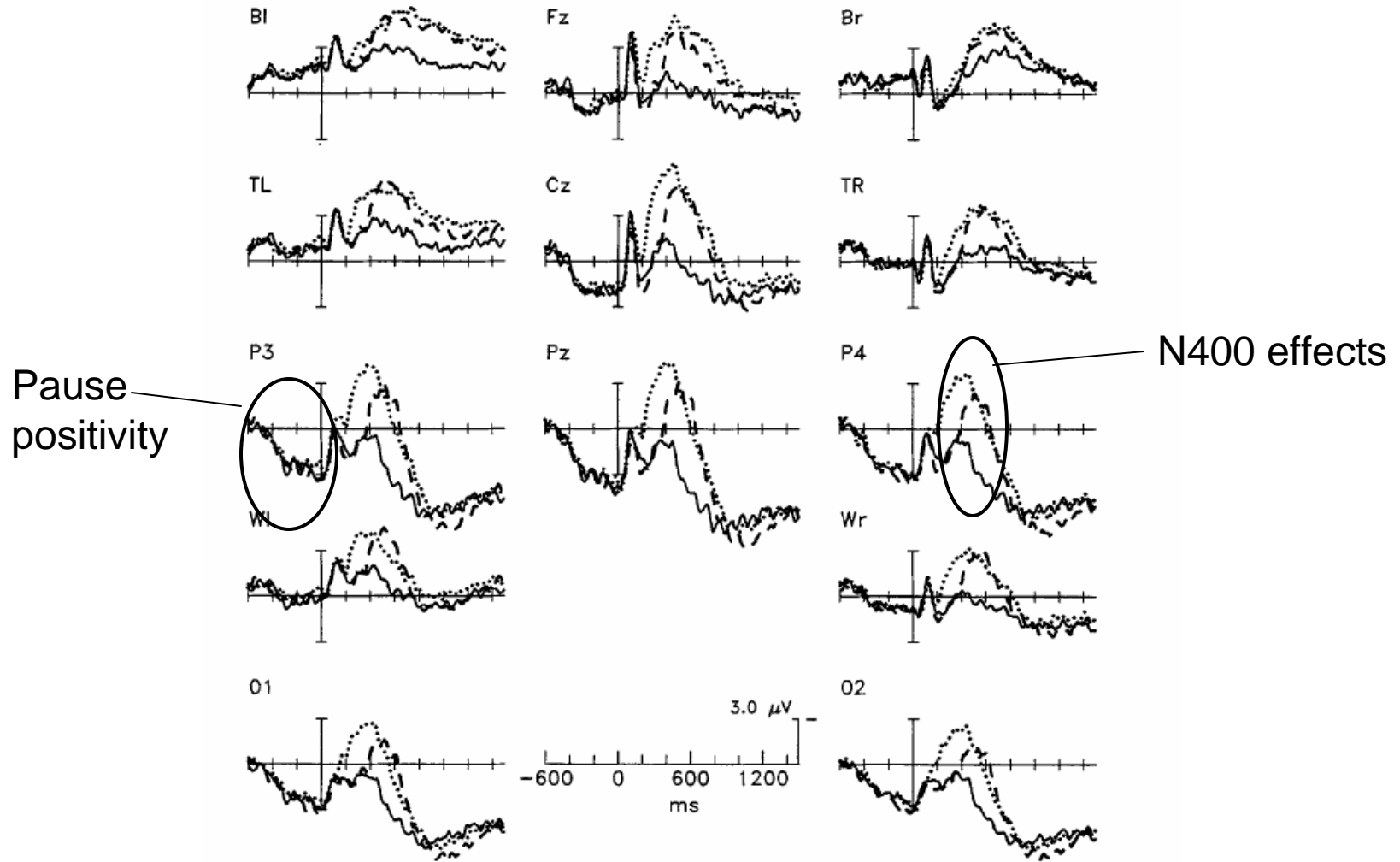


— Plain congruous
 Plain incongruous



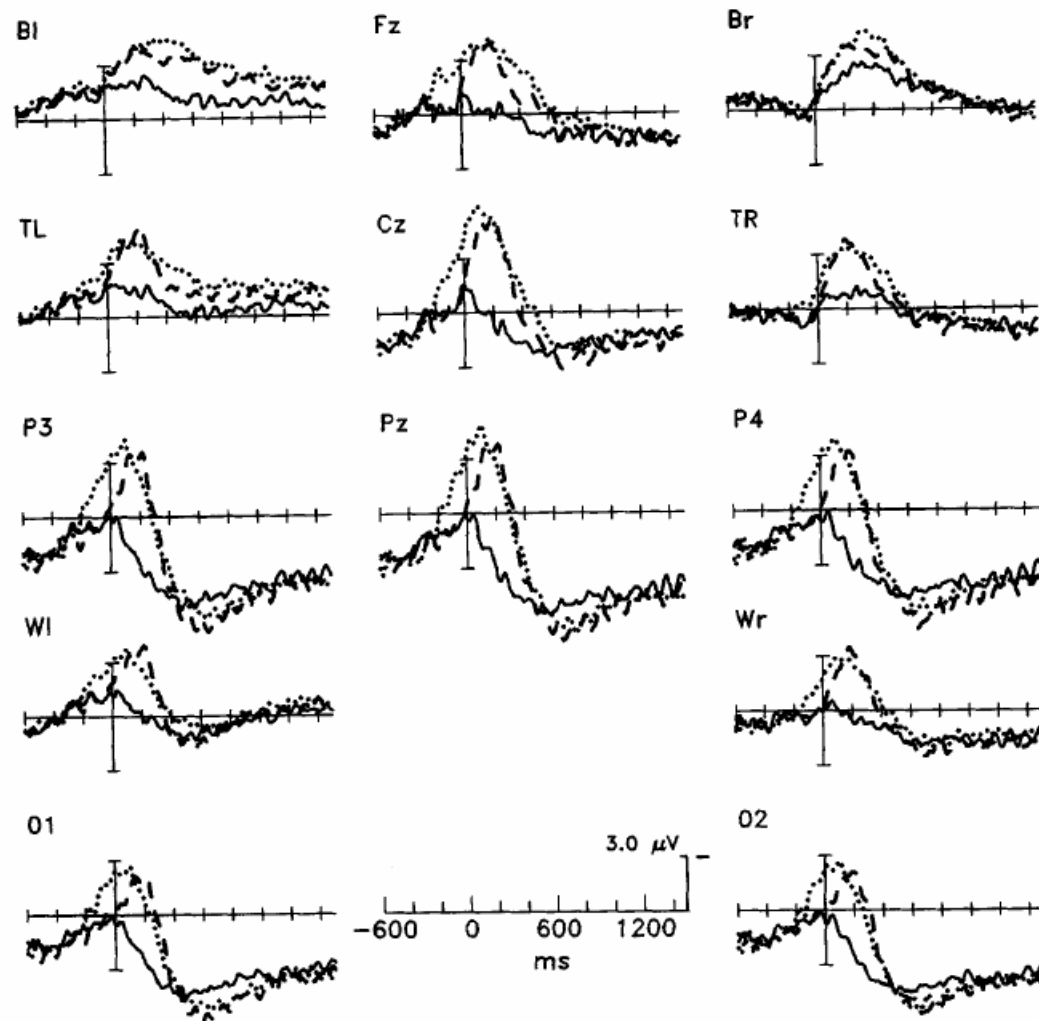
— Plain incongruous
 Rhyme incongruous

TIMELOCKED TO WORD ONSET



- Cohort congruous
- - - Cohort incongruous
- Rhyme

TIMELOCKED TO ISOLATION POINT



— Cohort congruous
- - - Cohort incongruous
..... Rhyme

Word ID & Semantic Integration

- Cohort model suggests context impacts word recognition via the deactivation of some words in the cohort, but
- Doesn't say much about the relative timing of word recognition and understanding meaning of sentence
- Van Petten & colleagues raise 3 possibilities
 - Semantic processing of words begins after uniqueness point has been reached
 - Meaning of all words in cohort active early, but contextual integration does not begin until after uniqueness point has been reached
 - Semantic processing at both word and sentence levels begins early

Which proposal do these data support?

Expectations

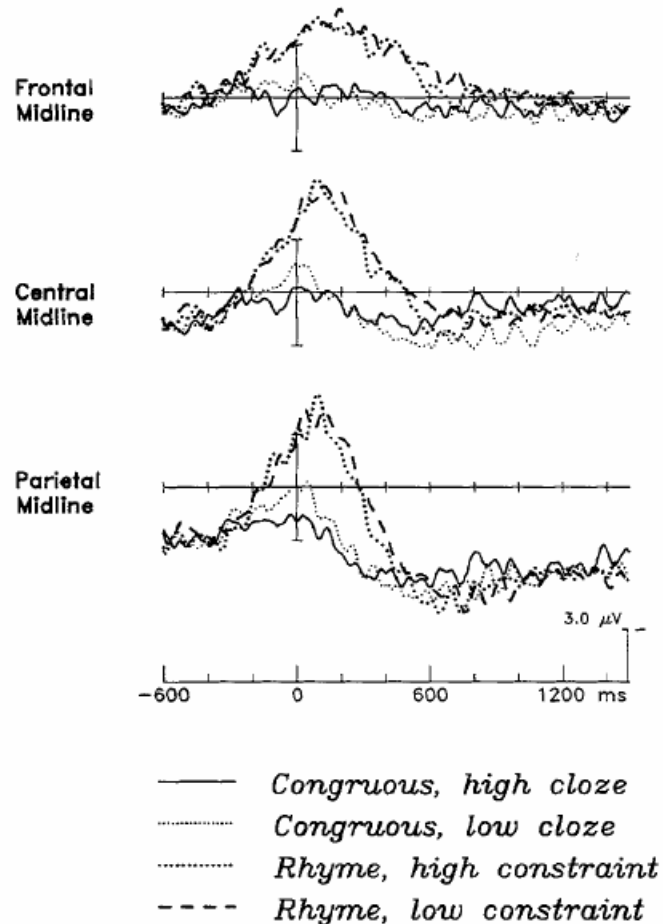


Figure 9. Grand average event-related potentials from the three midline scalp sites, timelocked to the isolation point (Time 0).

- Cloze probability
 - Was ending expected?
- Sentence Constraint
 - Were expectations specific?
- Cloze effect in congruous sentences
 - Begins before IP
- No constraint effect in incongruous sentences
- N400 to incongruous sentences begins before IP in both high & low constraint sentence contexts
- *What might this mean?*

