Summaries

# steinhauer1999brain

Written garden path sentences are interpreted syntax-first, but auditory info (i.e., prosody) gives a reliable cue to differentiate ambiguous syntactic structures. Prosodic info influences decisions about syntactic structure at very early stages.

Initial syntactic misanalysis in both written & spoken = P600 (~500-1200 ms, “syntactic positive shift”)

Fig 2: Closure positive shift associated with the right side of intonational phrase boundaries (but not the final boundary?)

# steinhauer2003electrophysiological

Connolly & Phillips (1994): Phonological mismatch negativity for sentence terminal words that differed phonologically from the expected target word.

CPS found for commas, although smaller than auditory stimuli. Those that used commas more paid attention to commas more & performed better on sentence comprehension. Those who didn’t use commas displayed no CPS component in ERPs! People that pay more attention to commas activate “implicit prosody” when reading.

# pannekamp2005prosody

The CPS is directly linked to prosody. It occurs in conditions with decrease semantic, syntactic, and phonemic information.

# mourao2006intonation

Theme and rheme components are proposed to be marked by distinctive tunes, L+H\* LH% and H\* LL%, respectively. H\*L can also mark rheme. L+H\* marks “contrastive focus”.

However, perception experiments show theme/rheme accents were characterized by differences in relative pitch height and timing of pitch rise onset.

H\* signals new info and L+H\* signals contrast? Eye tracking: L+H\* biased listener to contrastive, but H\* didn’t produce bias.

H\* and L+H\* are linked to info structure, but not in a clear way.

CPS = 100-200 ms after IP. Occurs during semantic and syntactic processing, not integrated at later stage.

Magne et al [44] for French: question-answer. “Did he give his fiancée a ring or bracelet? Did he give a ring to his fiancée or his sister?” same answer w/ different pitch accents. Elicits P3a and P3b in response to sentence-medial words, for inappropriate accents (both), and missing accents (P3b). P3a indicates attention switch; P3b induced by inappropriate/missing accents that are task-relevant. **Sentence-final words with inappropriate/missing accents evoke N400.** Heim & Alter [45] show same for German.

This study:

11 participants. Materials: Statement & question, follow by response. Manipulations: First occurring accent (H\* or L+H\*), intonation (correct or anomalous), info structure (early or late phrase boundary).

# kharaman2019processing

Information-seeking (ISQ) vs rhetorical (RQ) questions. 1) Identification exp 2) EEG experiment. German wh-questions. Prosodic expectancy positivity (PEP) [8, 9, 10, 11, 12].

Identification exp: 32 questions, 4 conditions, cross pitch accent & voice quality. pitch accent had strongest effect.

EEG exp: same materials. Participants task = listen to question, determine if it matches a visual cue “Who looks paying taxes?” vs “What time is it?” Picture + example sentence of ISQ or RQ 🡪 fixation 🡪 question mark on screen + audio 🡪 Audio coherent with visual cue?

83%-87% correct responses.

Difference between expectancy violations between prosodic realizations. Occurred relatively early ~50 ms after onset of object noun (indicates that the prosodic cue is earlier than that?). Timing/efficiency of prosodic cues different for ISQ and RQ. Needs full-sentence data analysis for that interpretation. Maybe error-detection component N2b? Prosodic expectancy positivity of P3 group?

# lu2015intonation

Congenital amusia affects processing of speech prosody? Mandarin Chinese. EEG. Presented pairs of emotional words spoken with statement or question intonation. Amusic = reduced N2 (200 to 350 ms peak) response to incongruent intonation pairs. Disconnect between low- and high-level processing, can’t access info extracted at early processing stages.

N1 (50 to 150 ms peak) reflects relatively early auditory processing.

N2 (200 to 350 ms peak), typically larger in “conflict” processing e.g. told it’s a question, but hear a statement. Perez et al (2005) used oddball paradigm, amusics “overreacted” to unexpected pitch changes, larger N2 than controls. Related to expectancy?

230 positive & negative words, spoken as a statement or question. Given a probe word, then asked if it was the same or different intonation from stimuli.

D-prime scores calculated. Amusia made more errors than control.

N1: No overall difference b/w control/amusic. Reduced N1 at posterior electrodes in response to incongruent intonation. Control group larger N1 to negative words at anterior, but amusic group more broadly distributed.

N2: Amusic elicited smaller N2 amplitude in incongruent than control, but not congruent.

No effects of emotional valence, didn’t facilitate pitch processing.

“Following the detection of a conflict, perceivers presumably increase their attention and make “strategic adjustments in cognitive control” ([Botvinick et al., 2001](https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2015.00385/full#B7), [2004](https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2015.00385/full#B8)), resulting in reduced interference in subsequent trials ([Kerns et al., 2004](https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2015.00385/full#B25)).”

“If a conflict in pitch cannot even be detected, amusic perceivers would not have an opportunity to become aware of the conflict, even though at a lower processing level, pitch discrimination is intact, as suggested by our N1 findings.”

# li2018temporal

Access order of intonation and lexical tone in Mandarin Chinese.

Listen to Mandarin sentences. Intonation and lexical tone in same syllable, just intonation (task 1) or tone (task 2). Intonation task = participants responded to intonation first, then lexical tone. Tone task = participants sensitive to both intonation and tone, early interaction beginning from 100ms. Participants processed intonation no matter what in each task.

“The falling slope of tone4—which would be flattened by the question intonation—not only makes question more obvious perceptually and easier to be recognized, but also strengthen the question-statement contrast, supported by findings in previous ERP studies (see Ren et al., 2009; Ren et al., 2013 for MMN effects of statements and questions in tone4 rather than tone2; Liu et al., 2016 for P300; Kung et al., 2014 for P600)”

Tasks: 1) previous sentence a question or statement? 2) final tone was tone2 or tone4?

Results:

Question has larger negative component in parietal areas for 150-250ms and 250-400ms. Stimuli ending in tone4 statements = smaller positive component than questions (450-550ms). 550-750ms = tone2 smaller positive component compared to tone4, statements have smaller positive component than questions.

3way interaction in 100-250ms: Questions in parietal area = tone4 has larger negative than tone2.

A screenshot of a computer

Description automatically generated

Intonation has higher temporal hierarchy than tone, early effects on auditory processing as early as 100ms.

“These ERP results could be caused by the conflict between a rising intonation and a falling tone, supported by plenty of previous research findings (e.g., Kung et al., 2014; Yuan, 2006; Yuan, 2011; Ren et al., 2009; Ren et al., 2013; Liu et al., 2016)”

“Besides the interaction effect, significant main effects were also found in intonation task. In time window 150ms-250ms and 250ms-400ms, question has a larger negative component than statement in parietal area, which could be explained by the behavioral result that questions are harder to identify than statements. As Yuan suggested (Yuan, 2006), identification of statements is easier than questions perhaps because statement might be a default intonation while question intonation is a marked intonation type which requires some specific features to identify.”

“most of our ERP results are found in the parietal area, which is consistent with the previous findings of intonation and tone effects in centro-parietal area (Kung et al., 2014; Liu et al., 2016).”

# lanwermeyer2016dialect

South German dialects. /oa/-/oƱ/ phonemic contrast. Central Bavarian (CB) = stable contrast. Bavarian-Alemannic transition zone (BA) only /oa/ occurs before obstruents.

Does using dialect phonemes attributed to different lexemes in these contiguous dialects, leading to minimal pairs, evoke increased neural costs during sentence processing?

Three conditions:

1. Misunderstanding: roasn = roses (BA), roasn = journeys (CB)
2. Incomprehension: stroa = straw (BA), not part of CB competence
3. Similar: nasalized lou (BA) vs nasalized lo (CB) “wage”

Oddball design, EEG.

Predictions: In the current study, a member of the N200 family (MMN, N2b) might be evoked as in the comparable study of [Bendixen et al. (2014)](https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2016.00739/full#B1) for the conditions misunderstanding and incomprehension.

Participants = CB. Task given in CB. “Deviant” items in oddball exp = BA.

1. Misunderstanding roasn = roses (BA), roasn = journeys (CB)
   1. Deviant elicited neg effect b/w 300-500ms, centro-parietal. N400.
   2. “Reversed” condition = Earlier negativity b/w 100-200ms i.e., N200 family “reflects an active discrimination and classification process”. N2a (MMN), N2b, N2c. Interpreted as detections of sudden changes in acoustic features of speech sounds embedded in sentences. N2a/MMN = pre-attentive passive change detections; N2b = task relevant physical mismatches & requires attention to stimuli.
   3. Late Positive Components (LPC) elicited for 550-1000ms and 400-900ms. P300 family, evaluation process related to given task requirements. Categorization processes, decision making, context updating. Reanalysis of semantic correctness, modulated by degree of required reanalysis.
   4. Biphasic N200/LPC complex
2. Incomprehension stroa = straw (BA), not part of CB competence
   1. 100-200ms negative peak, early error detection.
   2. Lack of N200 effects, context does not provide hints about continuous of sentence.
   3. LPC (350-600) elicited in priming and neutral conditions. Enhanced positivity for primed sentences in contrast to neutral. Categorization of stimulus easier when participants build up expectation via priming.
3. Similar: nasalized lou (BA) vs nasalized lo (CB) “wage”
   1. Deviant condition elicited negativity at 250-350ms and 400-500ms.

“although the respective vowel contrast is still preserved in CB, the less clear rejection of r⌢oaoa⌢sn*ˈ*nˈ/roƱoƱ⌢sn*ˈ*nˈ indicates a level of uncertainty during lexical and evaluation processing caused by the exposure to regional variability.”

“These results are in line with [Brunellière et al. (2009)](https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2016.00739/full#B7) who show that listeners who preserve a particular phonological contrast, but are often exposed to merged variants, discriminate this contrast less easily than regional stable contrasts. [Conrey et al. (2005)](https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2016.00739/full#B10) could further show that unmerged dialect speakers are still worse at distinguishing between merged vowels than other vowels unaffected by a merger.”

# scharinger2011you

Dialect extraction occurs speaker-independently, pre-attentively, and categorically. EEG. MMN/oddball experiment. M100 = auditory evoked response to vowels when dialect change detected.

Bottom-up acoustic info integrated with top-down knowledge of speaker/dialect categories in long-term memory.

# borras2012role

Chapter 3: Specific neural traces for intonation-based discourse categories (e.g., statement vs question)

MMN. 100-250ms after onset of stimulus violating established acoustic regularity. Pre-attentative detection of auditory changes & higher-level cognitive processes in auditory system. Reflects early access to stored linguistic representations & match/mismatch between stimulus and memory trace. Two parts: automatic detection & activation of cortical cell assemblies forming long-term memory traces.

Catalan: Info-seeking Q and counter-expectational Q both are rise-fall, dependent on size of pitch range interval of rising movement.

Exp: 15 Catalan. IFS and CEQ can elicit specific MMN response.

MMN = 80ms time window centered on mean peak latency (265-345ms). Found to be larger for across-category contrast compared to within-category.

First study to demonstrate MMN elicited by difference in intonation-based discourse category.

# doherty2004question

fMRI BOLD signal associated w/ question/statement judgemnets. Rherotical Q, statement, and question with falling intonation & word order change “was she talking to her father?” EPI scans. Increased BOLD activity in bilateral inferior frontal and temporal regions for RQs. Different regions responsive to intonationally marked illocutionary differences b/w questions & statements.

# steele2019relationship

Impact of high music aptitude (associated w/ ability to more easily and quickly process auditory cues related to emotion) and high empathy (facilitates ability to recognize emotions) on individual differences in neural responses to emotional cues in language (and music).

Hear musical prime stimuli, then presented w/ spoken target nonsense word that either matched or mismatched in emotional valence (told to ignore prime). Judge speaker’s voice. Results showed decreased P50 and larger N400 effect when words spoken with happy intonation followed sad music compared to happy music. Positive relationship b/w size of P50 & musical amplitude. Empathy didn’t modulate processing emotional music or prosody.

# casillas2023using

Non-Caribbean natives were significantly slower and less accurate when judging Caribbean vs non-Caribbean speakers’ statements vs questions.

# orrico2020individual

Empathy/Exposure interaction – people w/ higher empathy and exposure to other dialects had more “steps” for intonation boundaries when perceiving biased questions.

# esteve2020empathy

Eye-tracking study. French natives with high empathy use contrastive vs non-contrastive intonation cues to disambiguate homophones.