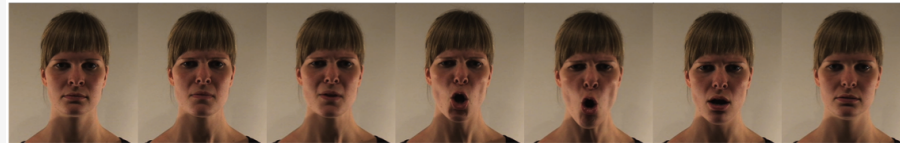


Attention and emotional face-voice perception

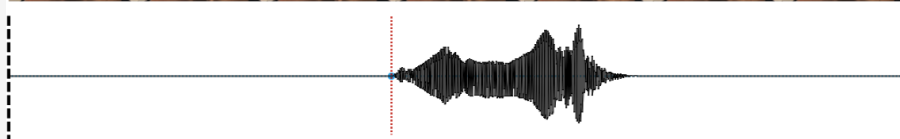
(top-down & bottom-up)
ATTENTION?



Emotional face



Emotional voice



→ Coherent & unified
percept

HOW early do audiovisual emotional signals interact? →

EEG

To what degree do these interactions require attention?

Early audiovisual emotional interactions

Facial and vocal emotional information interacts *early*, i.e., within 100-200 ms after voice onset

N1 (~100 ms)

smaller amplitude to incongruent than congruent emotional face-voice combinations Pourtois et al. (2000) NeuroReport

MMN (100-200 ms)

congruent and incongruent emotional face-voice combinations elicit a **Mismatch Negativity (MMN)** de Gelder et al. (1999) Neurosci Lett

GBA (100-200 ms)

greater Gamma band activity (GBA) ~40-50 Hz to congruent than incongruent non-emotional stimuli Scheider et al. (2008) Neuroimage, Senkowski et al. (2009) Exp Brain Res

All ERP studies employed a passive viewing or listening task

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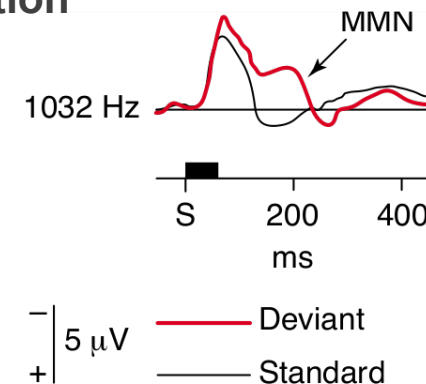
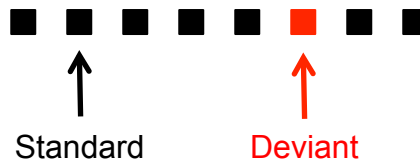
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Pre-attentive change detection

Oddball paradigm



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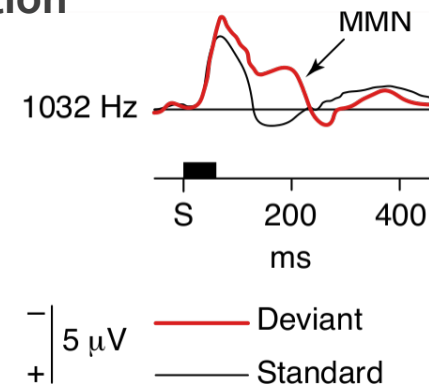
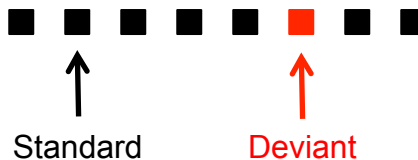
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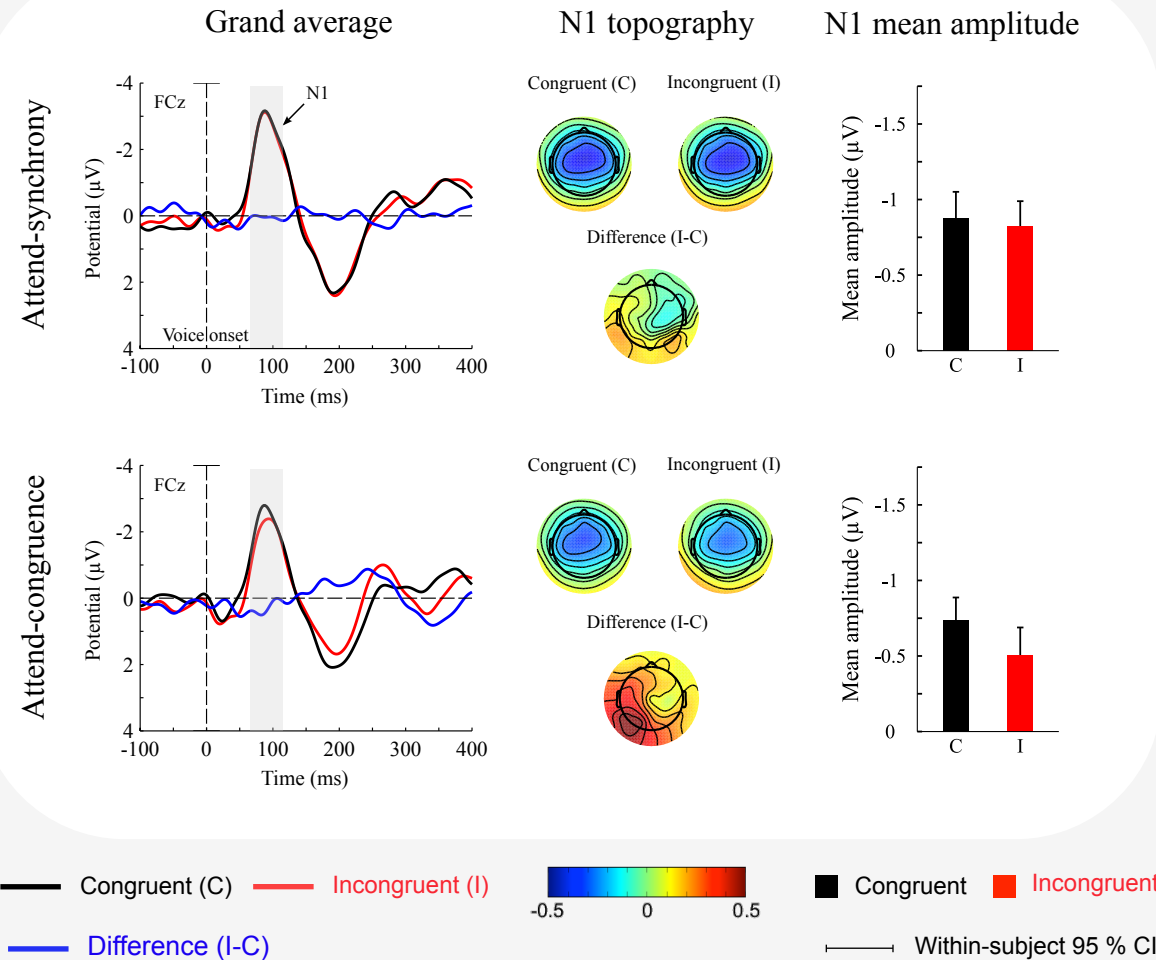
Pre-attentive change detection

Oddball paradigm



Effect of task on emotional face-voice perception

Effect of task on emotional face-voice perception



N1 (70-140 ms)

- Smaller amplitude to incongruent stimuli
- BUT: only when attention was directed to facial and/or vocal expression
- No N1 modulation when attention was directed to the a/synchrony of audiovisual speech

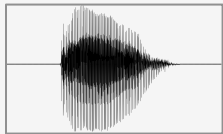
Top-down attention modulates early audiovisual emotional interactions

=

Three-stimulus oddball paradigm

Videos: 1-2 seconds

Face

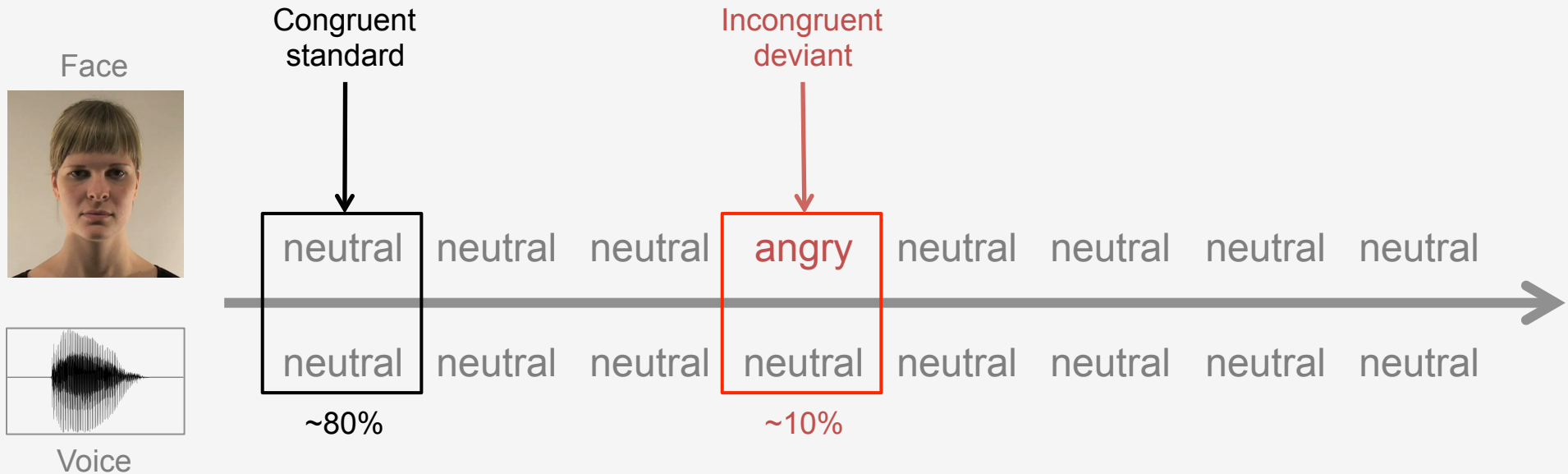


Voice

neutral neutral neutral **angry** neutral neutral neutral neutral

neutral neutral neutral neutral neutral neutral neutral neutral

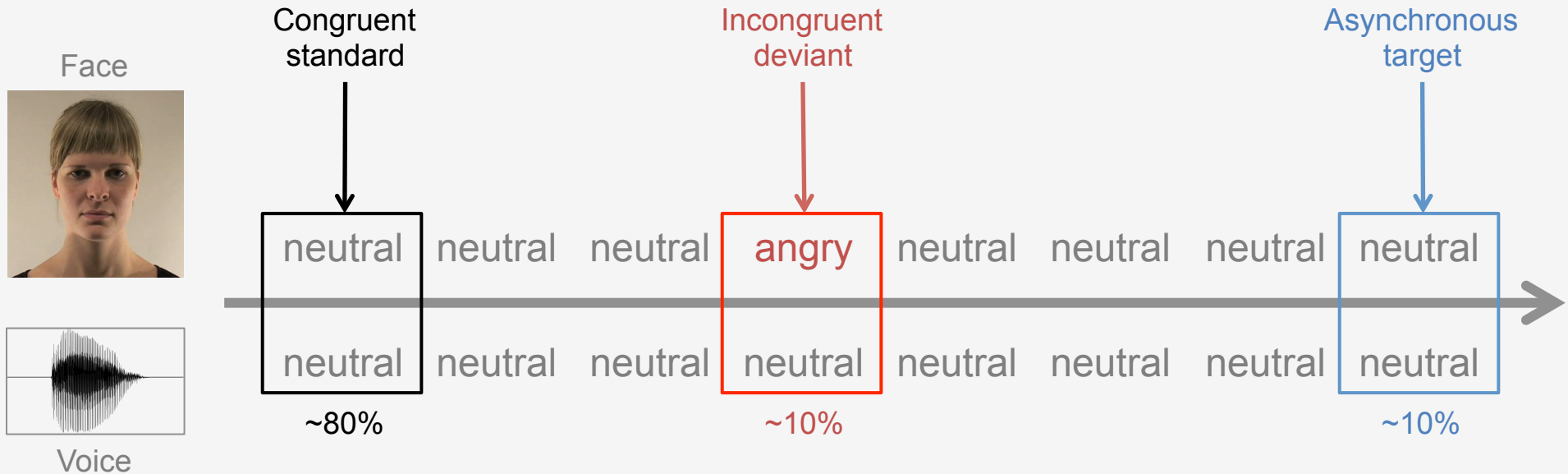
Three-stimulus oddball paradigm



2 Blocks: neutral voice

2 Blocks: angry voice

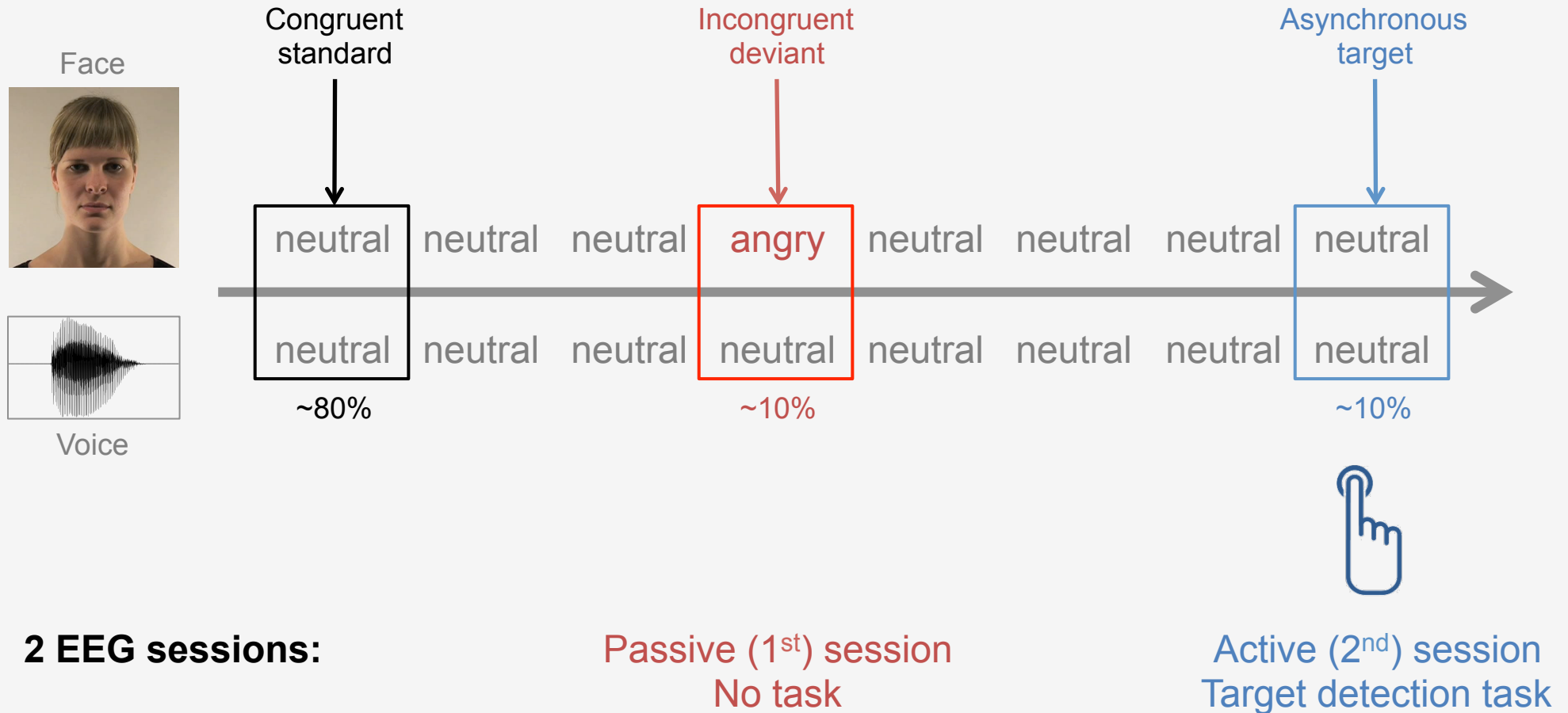
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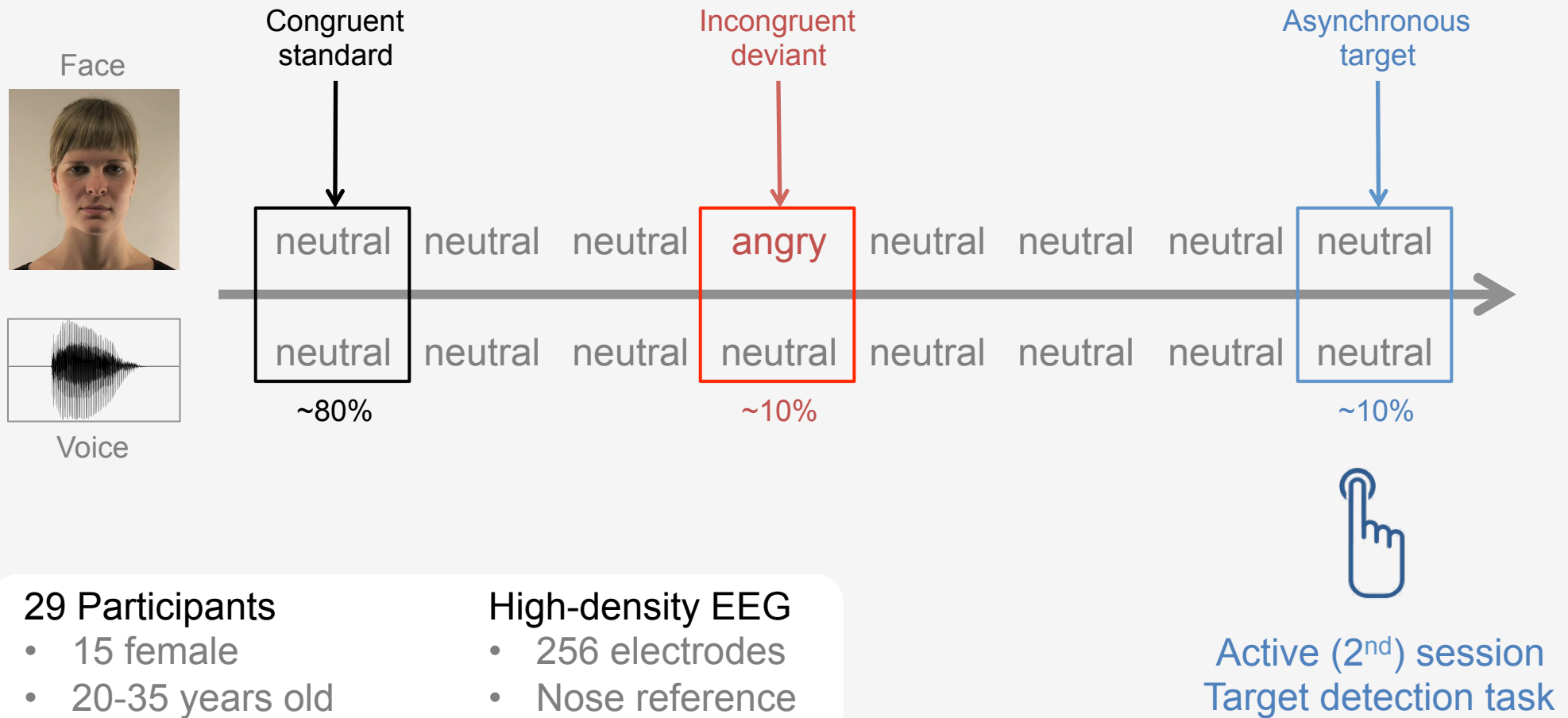
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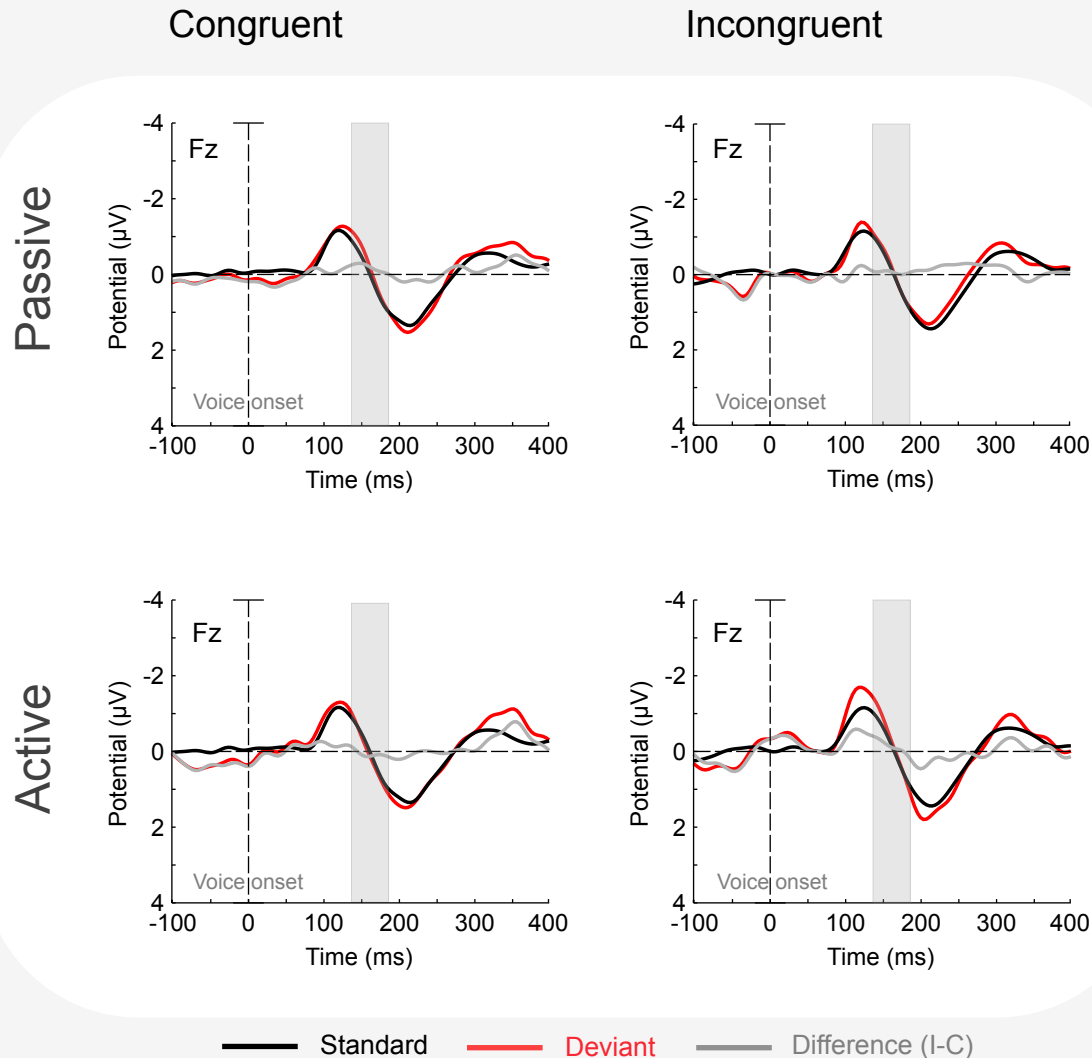
Three-stimulus oddball paradigm



Three-stimulus oddball paradigm



MMN: 140-180 ms

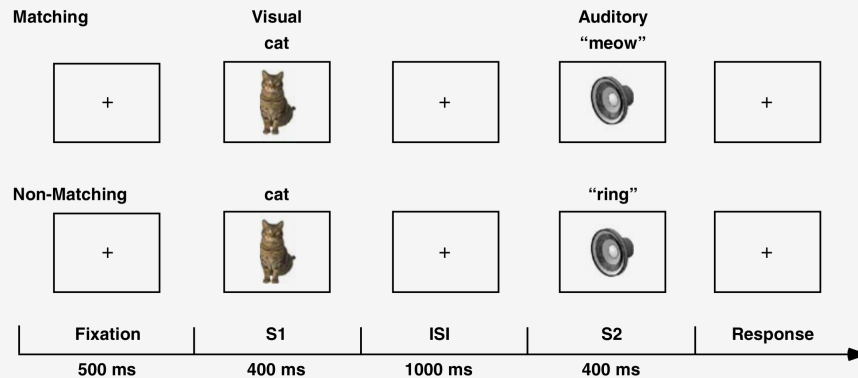


- No MMN to congruent or incongruent deviants
- Absence of MMN due to stimulus material?
- Interference of asynchronous videos with deviance detection mechanism?

Why can the MMN response to audiovisual emotional stimuli be elicited only in certain context?

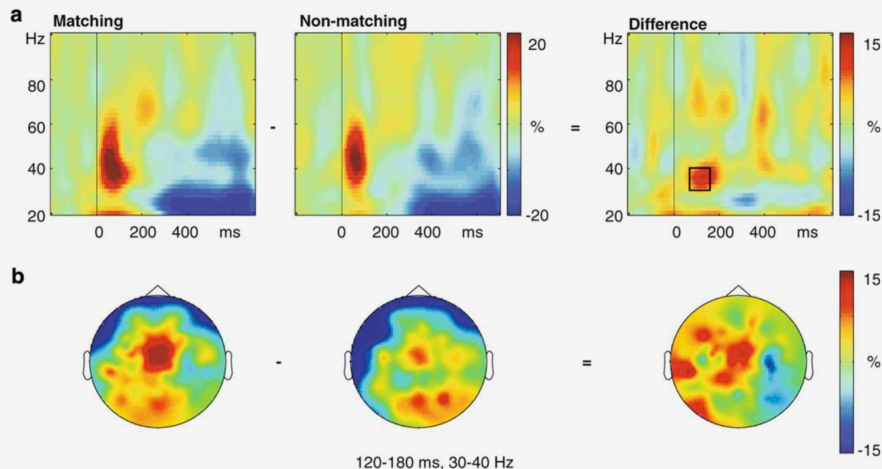
Early gamma band activity (GBA)

Early gamma band activity (GBA)



Explicit cross-modal matching paradigm

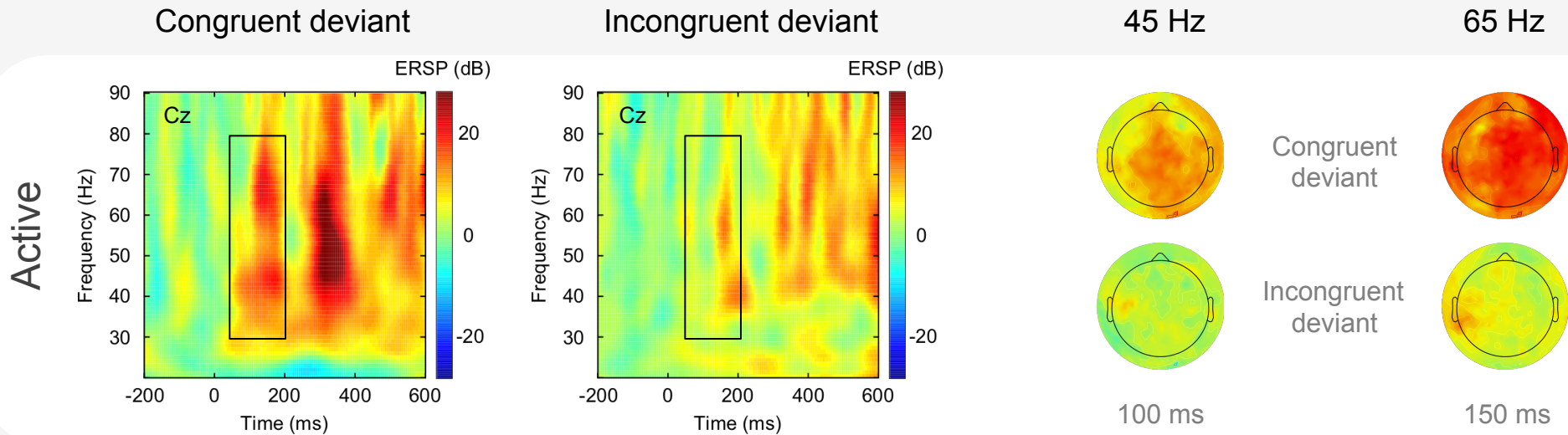
- Enhanced lower GBA (30-40 Hz) within 120-180 ms after auditory onset
- Reduced ERP amplitude within 120-170 ms after auditory onset



Implicit cross-modal matching paradigm Schneider et al. (2008) Neuroimage

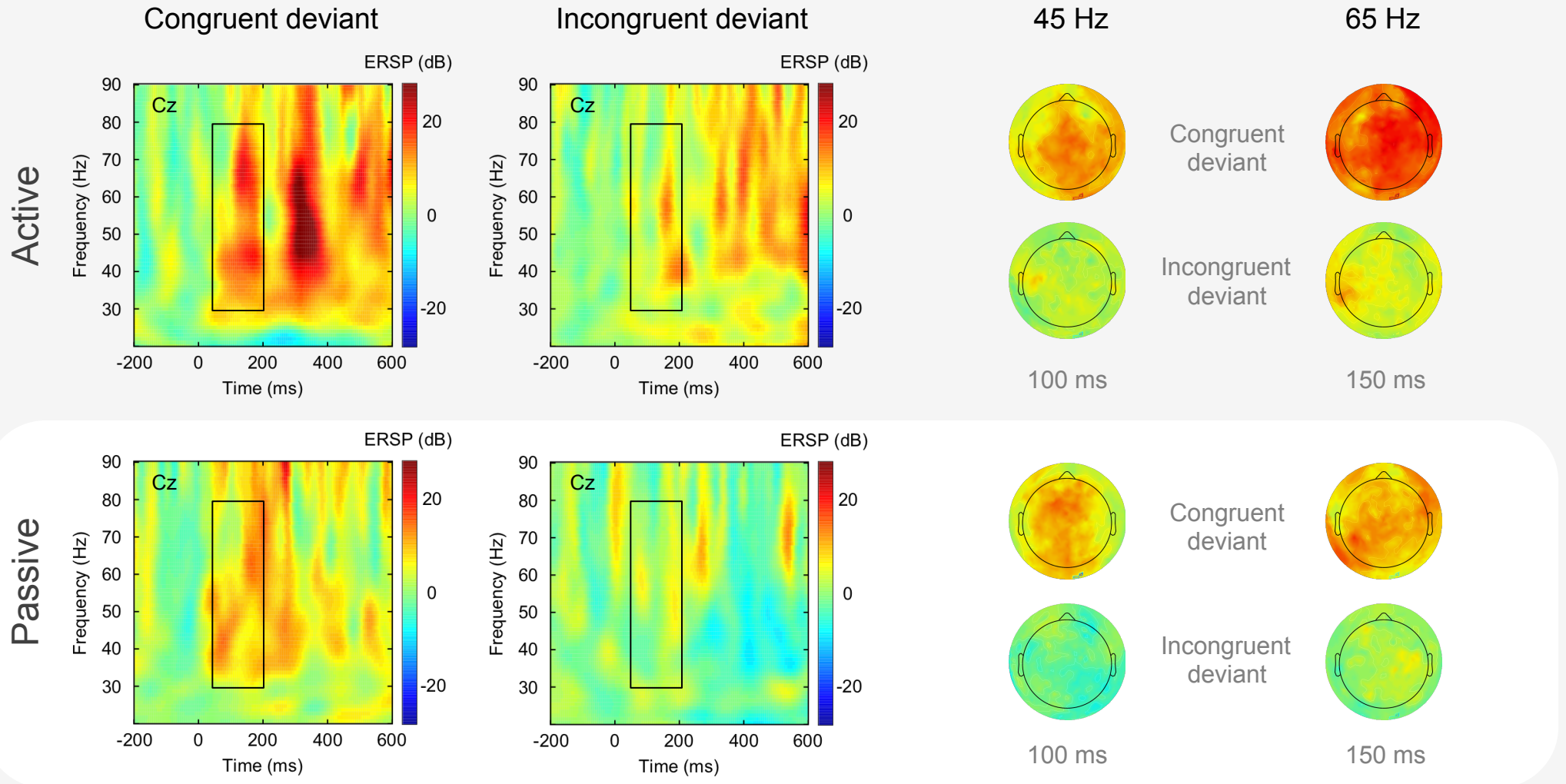
- Enhanced lower GBA (40-50 Hz) within 120-180 ms after auditory onset
- But no early ERP effects

Early gamma band activity (GBA)

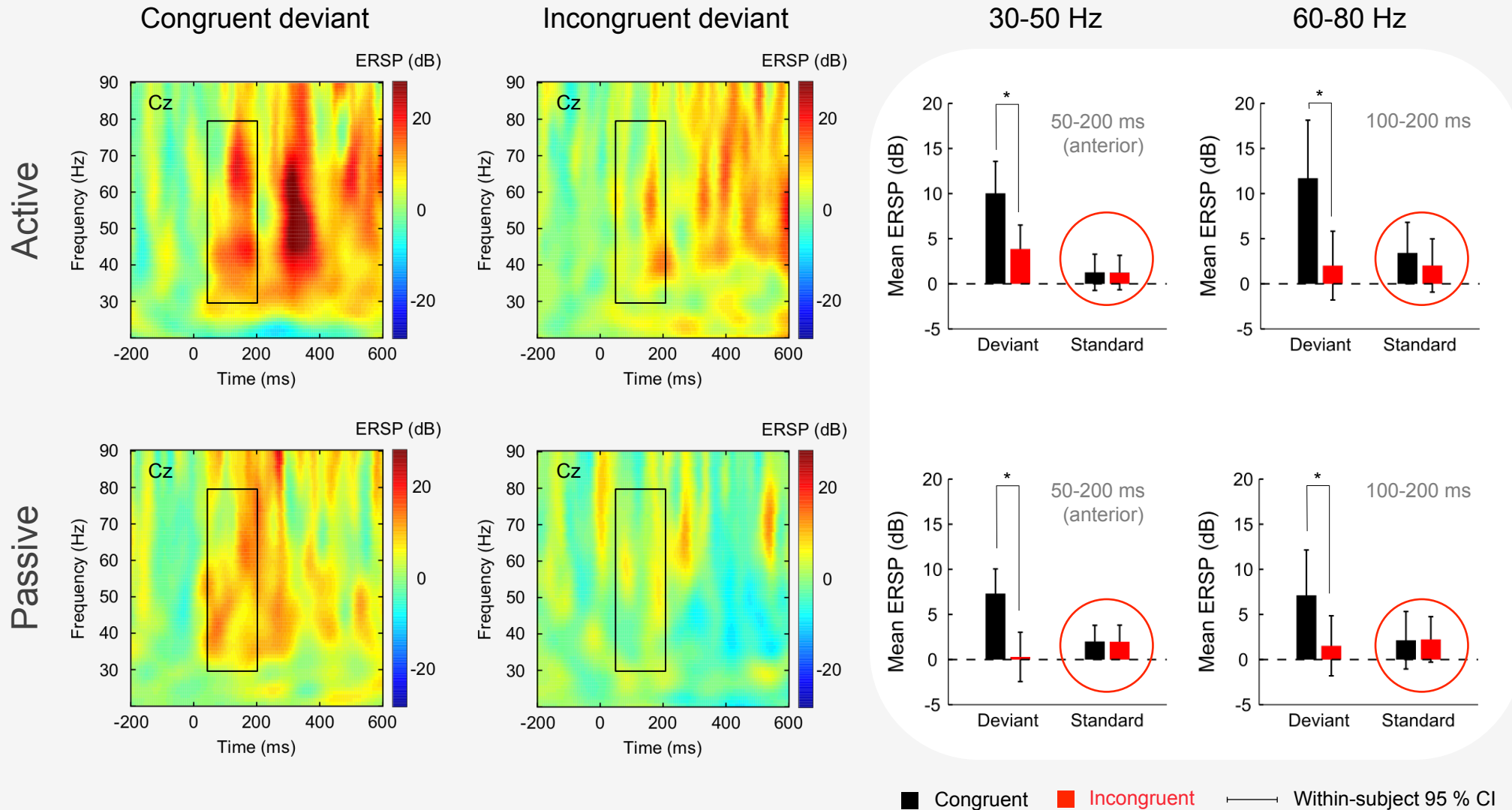


- Congruent deviants show enhanced GBA starting from ~50 ms post voice onset
- Incongruent deviants show less activity in the same frequency band and time window

Early gamma band activity (GBA)



Early gamma band activity (GBA)



Summary and conclusion

MMN

- Neither congruent nor incongruent deviants elicited a MMN

GBA

- Enhanced activity to congruent deviants within 100-140 ms
- Greater increase in active than passive condition
- Congruent and incongruent standards show no such difference

Is early audiovisual emotional interaction pre-attentive?

- ERP provided no evidence that early audiovisual emotional interaction is pre-attentive
- Time-frequency results suggest that early audiovisual emotional interactions require some degree of attention

Acknowledgements

Methods

Maren Grigutsch
Francois Tadel

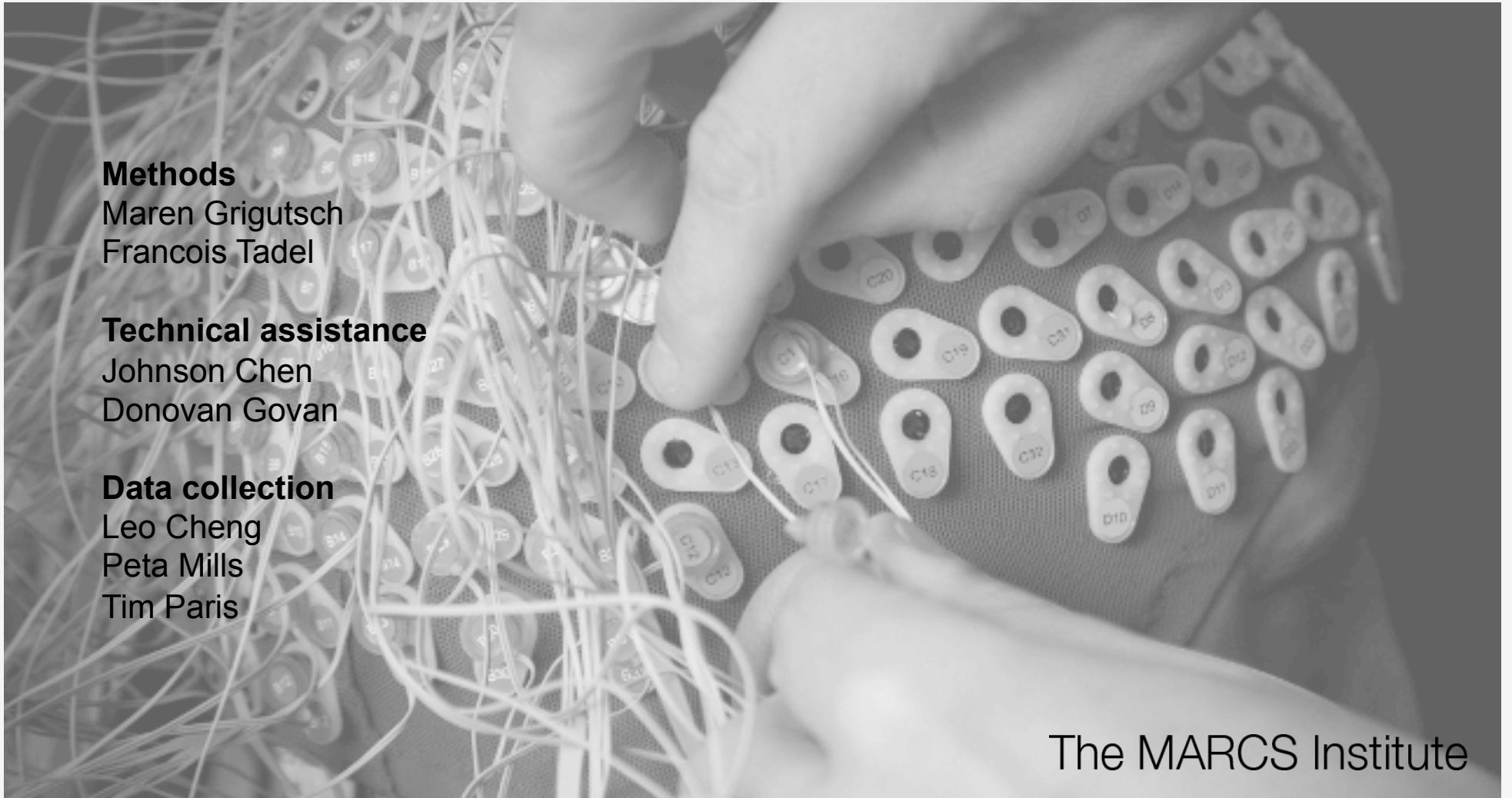
Technical assistance

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Leo Cheng
Peta Mills
Tim Paris

The MARCS Institute



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=> irrespective of whether early ERP effects are present

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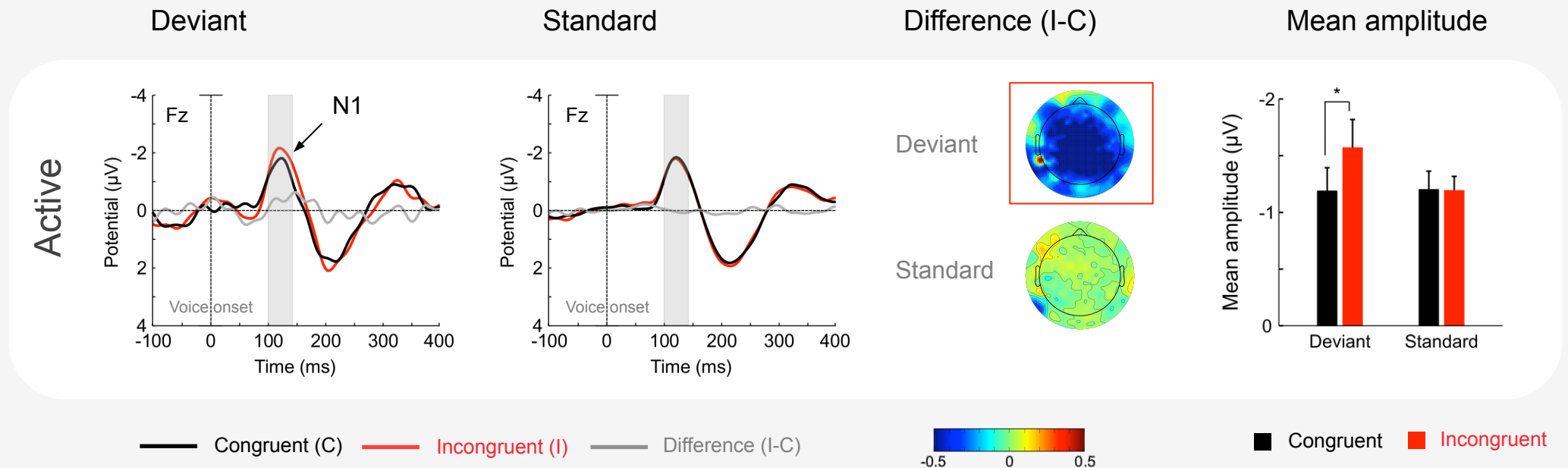
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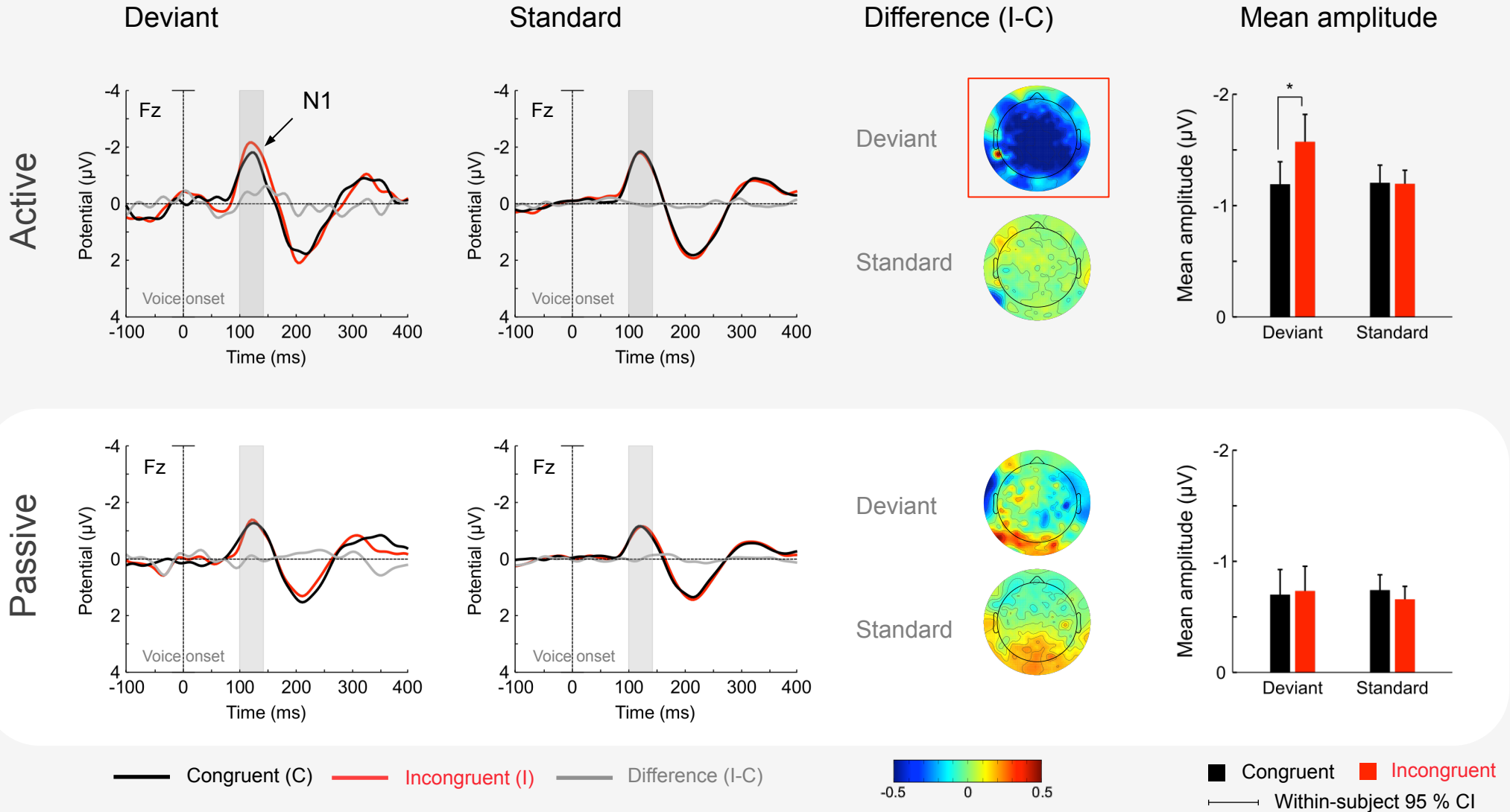
All ERP studies employed a passive viewing or listening task

N1: 100-140 ms



- Significant increase in N1 amplitude to incongruent deviant stimuli
- Congruent and incongruent standards showed no difference
- Enhanced N1 likely reflects increased attention to incongruent deviants

N1: 100-140 ms



Concluding remarks

Role of attention in emotional face-voice integration

- No evidence that early audiovisual emotional interaction is pre-attentive
- Early modulation by emotional face-voice congruence constrained to deviant stimuli
 - => Deviant stimuli typically capture involuntary attention
 - => Early audiovisual emotional interactions require some degree of attention
- Voluntary and involuntary attention influence multisensory perception differently

What is the function underlying early GBA at ~45 Hz?

- Matching bottom-up information with top-down information Hermann et al. (2004) TICS
- Could this GBA enhancement be related to N1 modulation?
 - => N1 suppression is only elicited by 'predictable' stimuli Vroomen & Stekelenburg (2010) JCN
 - => Both N1 modulation and early GBA enhancement require some degree of attention

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