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Does hallucination proneness alter sensory feedback in emotional self-voice perception?

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Background

- Self-generated speech → reduced auditory cortex activity & suppressed N100 and P200 amplitudes [1-4]
- Salience detection, attention allocation and detection of emotion in auditory stimuli affects sensory feedback → modulations in P200 [3, 5, 6]

Altered sensory feedback + source misattribution → hearing voices

Emotional (negative)quality of voices [7]: Non-clinical voice hearers; Clinical voice hearers

low HP ⟷ high HP

non-voice hearers → non-clinical voice-hearers → clinical voice-hearers

Hallucination proneness (HP) continuum [8]

Research Questions

Is the N100/P200 suppression effect sensitive to unexpected changes in self-voice quality as it changes from neutral to emotional?

How does HP affect the N100/P200 suppression effect to self-voice modulations as it changes from neutral to emotional?

Results

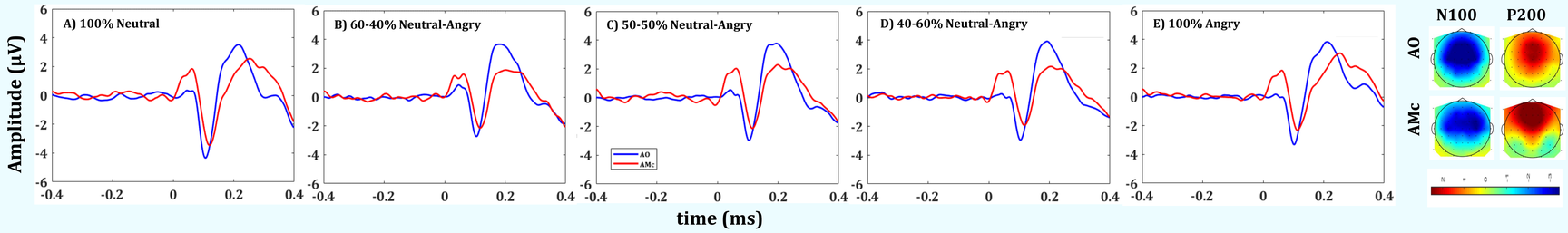


Figure 2: Grand average (GA) waveforms from the frontocentral ROI corresponding to each type of stimuli. **Blue line = AO & Red line = AMc.** Topographic maps show voltage distribution in the GA waveforms at N100 and P200 peaks across all conditions.

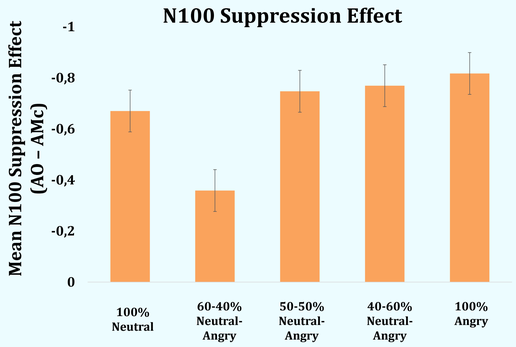


Figure 3: Mean N100 suppresion effect for each stimulus.

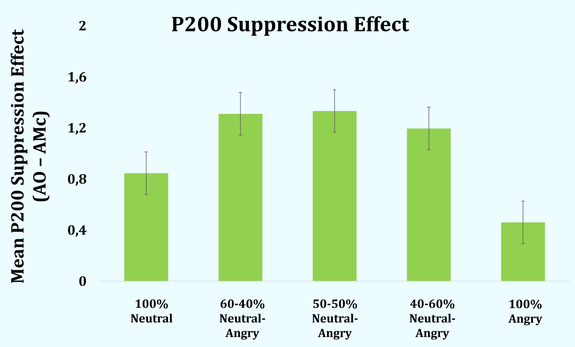


Figure 4: Mean P200 suppresion effect (AO-AM corrected).

Preliminary statistical analysis:

- Fronto-Central ROI (N100: χ^2 (1) = 2390.3***; P200: χ^2 (1) = 6979.7***)
  - N100: model with main effect of Condition + Stimulus (χ^2 (4) = 133.6***); ANOVA [Condition [F (1, 20715) = 55.20 ***]; Stimulus [F (4, 20715) = 33.39***]]
  - P200: model with main effect of Condition + Stimulus (χ^2 (4) = 9.96*)
  - No significant LSHS effects

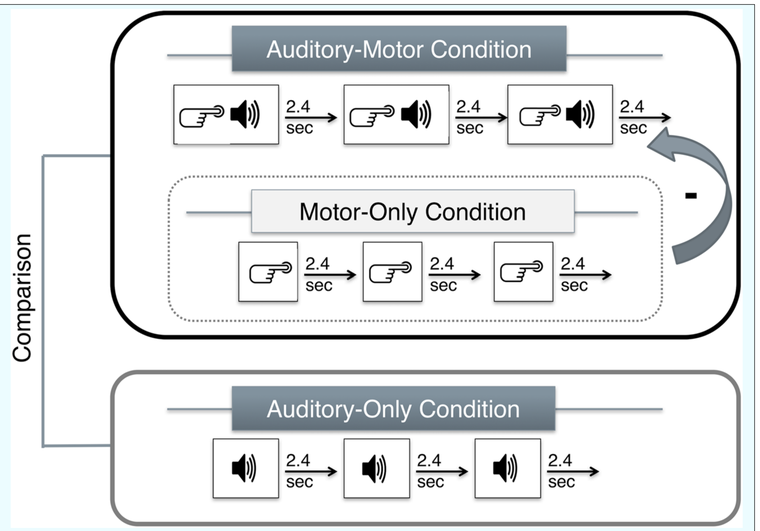
Note 1: AM corrected = AM minus MO; Suppression effect = peak amplitude values of AO minus AM corrected

Note 2: Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Methods

- 27 participants, non-voice hearers [19 females, mean age (23.22 years) ± s.d. (2.23 years)] varying in HP as measured by Launay Slade Hallucinations Scale [LSHS [2]; mean total score (15.81) ± s.d. (10.66); max = 42; min = 0]
- Five types of *stimuli*: "Ah" self-voice (500 ms) varying in **emotion and predictability;** 100% neutral, 60-40% neutral-angry, 50-50% neutral-angry and 40-60% neutral-angry and 100% angry
- Mixed task design; blocked AM, AO and MO, 5 stimuli randomly presented within AO and AM
- *EEG acquisition:* 128 channel active electrodes (actiChamp), sampling rate (1000 Hz), impedances (≤ 10 kOhms)
- *Preprocessing:* downsampling (500Hz), band-pass filtering (0.5-30 Hz), re-referencing (mastoids), ICA/PCA to reject artifacts (eye movements, muscle activity, line and channel noise), epoching (-0.4 – 0.4 ms), baseline correction (-200 – 0 ms), amplitude rejection (>65 mV)
- Peak amplitude time windows: N100→ 80-150 ms & P200 → 160-260 ms

Figure 1: Auditory-Motor task [2]. Three conditions: (i) **Auditory-Motor (AM)-**button pres elicits voice stimuli self-generation, (ii) **Motor only (MO)-**button press elicits no voice; control condition, (iii) **Auditory only (AO)-**no button press, passively listen to a voice, external generation.



Conclusions

- Replication of N100 sensory suppression effect regardless of HP or stimuli type
  - N100 peak amplitude: AO (externally generated) > AMc (self-generated) for all stimuli.
- Lack of the influence of emotional manipulation in the self-voice on N100/P200 can be ascribed to task design (mixed vs. blocked conditions)
- Lack of HP influence on the N100/P200 suppression effect → only non-voice hearers in the sample

non-voice hearers → non-clinical voice-hearers → clinical voice-hearers

Hallucination proneness (HP) continuum [8]

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