Dynamic Gaze Contact and Attention Deployment: An ERP study

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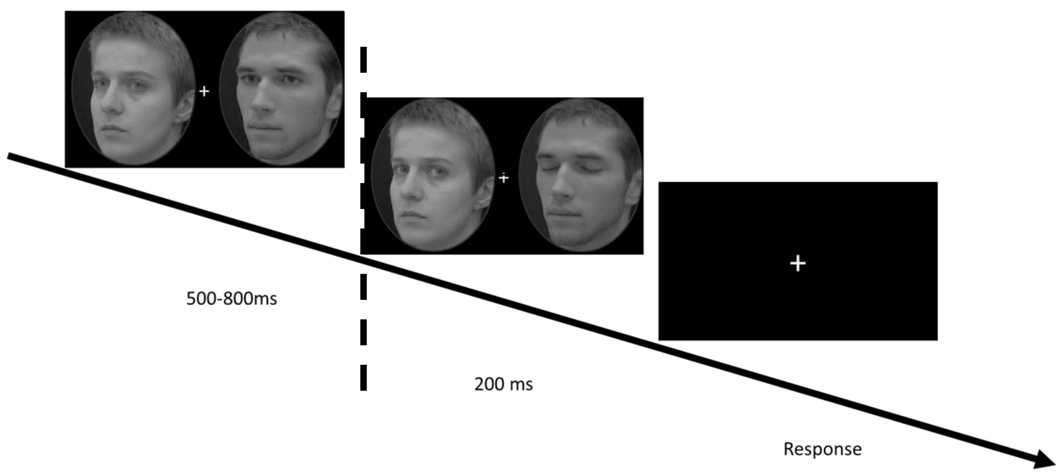
INTRODUCTION

- Understanding how dynamic eye contact captures attention is crucial for social interactions, communication, and establishing social bonds. Eye contact is recognized as a powerful social signal, yet it is uncommon to study its dynamic effects on cerebral processes.
- Early effect of direct gaze results are mixed (Tautvydaitė et al., 2022).Dynamic presentation might increase the capture of attention by gaze directed toward the observer compared to gaze directed away, while static pictures have shown mixed results (Conty et al., 2007), Task demand (social vs. non-social) enhances this capture. (Latinus et al., 2015).
- We systematically assessed how these factors impacted early sensitivity to direct gaze and how its impact attentional deployment. To do so, we used the N2pc component. This component is an ERP marker reflecting visual attention allocation. It is sensitive to spatial attention and provides an objective measure of how dynamic eye contact influences attentional processes.

METHOD



Stimuli: Stimuli consisted of three male and three female faces, taken from a database used in prior experiments of gaze perception (i.e., George et al., 2001). Their head orientation was ¾, and the gaze was straight, averted or closed. All stimuli were matched in luminance (using the SHINE Toolbox).

Experiment 1:

Participants: 21 participants were included in the final analysis after excluding 3 outliers. The sample size was based on an effect size calculation from Experiment 1 with an effect size (d) of 1.6.

Task: Participants looked at two faces positioned left and right of a fixation cross. Faces initially deviated at 15° and then shifted gaze toward or away from the observer, with one face closing its eyes. Participants reported if the open-eyed face was looking at them or away.

Experiment 2:

Participants: 10 participants. The sample size was determined based on the effect size calculation from Experiment 1.

Task: Participants detected a missing point in the fixation cross while observing the same visual presentation as in Experiment 1.

Experiment 3:

Participants: 12 participants. The sample size was determined based on the effect size calculation from Experiment 1.

Task: Participants reported if eyes moved left or right compared to the initial 15° deviation, similar to Experiments 1 and 2.

EEG Method and Lateralized ERPs results

EEG: Biosemi ActiveTwo system with 64 channels was recorded continuously during experimental task. Reference: Average. Filtering: 0.1-30 hz. Baseline: 200ms. Epochs containing saccades, blinks, abnormal signal or wrong response were discarded from the analysis.

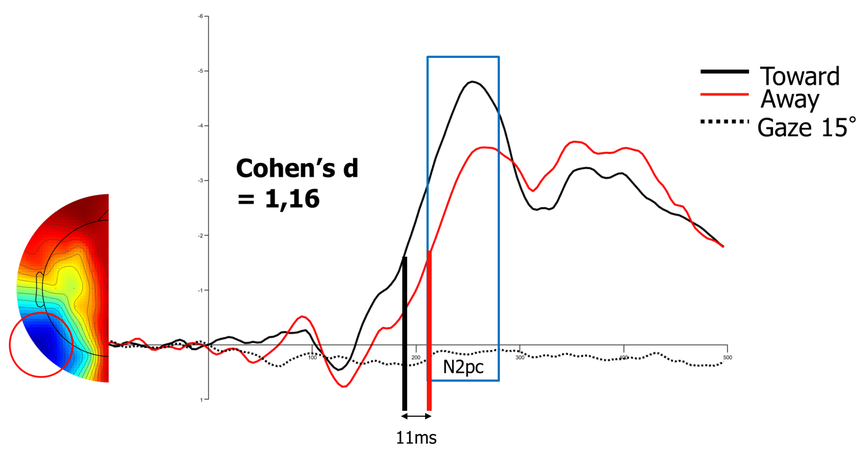
Lateralized ERPs: We computed the lateralized ERPs (contra-ipsilateral differences) and measured the difference in a cluster of parieto-occipital electrodes. Mean amplitude were extracted N2pc (190-290ms) time windows (see Towler, et al., 2016).

Onset latency: We used the jackknife procedure to answer measure the N2pc onsets.

Experiment 1:

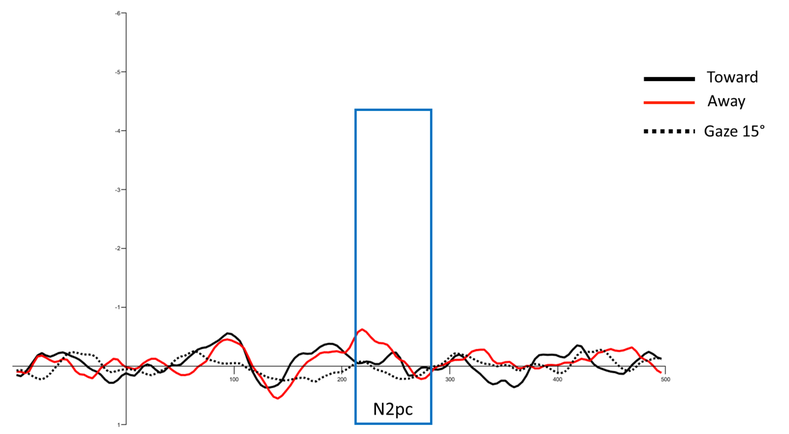
•N2pc Amplitude: Larger for gaze toward the observer compared to gaze away.

•Onset Difference: 11 ms earlier for gaze toward compared to gaze away.



Experiment 2:

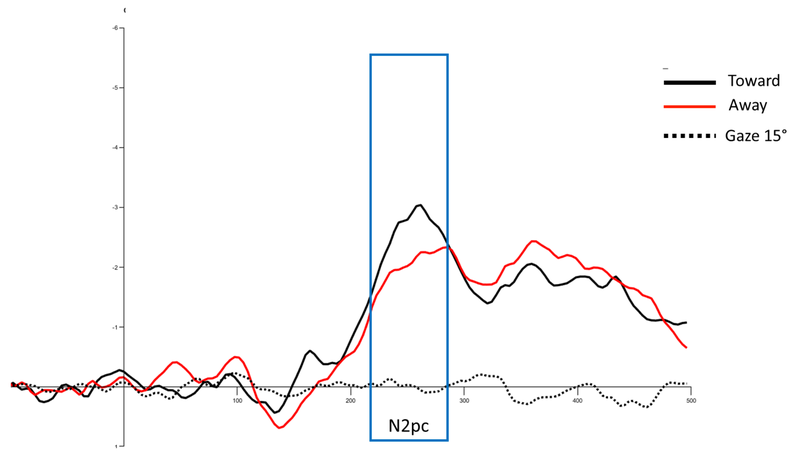
•N2pc Component: No significant N2pc component was observed, suggesting that dynamic presentation alone does not explain the results of Experiment 1.



Experiment 3:

•N2pc Amplitude: Still larger for gaze toward the observer.

•Onset Difference: Disappeared, indicating social mode enhances sensitivity to direct gaze.



Discussion

Summary

- Experiment 1 showed enhanced attention capture for gaze toward the observer, with a larger and earlier N2pc.
- Experiment 2 showed no N2pc when focusing on the fixation cross.
- Experiment 3 showed larger N2pc for gaze toward without onset difference, highlighting the role of social context.

Conclusion

•Dynamic eye contact captures attention more effectively in social contexts. The social mode enhances sensitivity to direct gaze, as evidenced by the N2pc component.

Future Directions

•Future research should explore different social cues and their impact on attention, investigate real-world applications, and develop interventions for individuals with social attention deficits.

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