



HAL
open science

Hearing/Seeing it approaching: Neural correlates of multisensory looming cues integration in the autistic personality

Rachel Poulain, Magali Batty, Céline Cappe

► To cite this version:

Rachel Poulain, Magali Batty, Céline Cappe. Hearing/Seeing it approaching: Neural correlates of multisensory looming cues integration in the autistic personality. Cognitive Neuroscience Society, Mar 2023, San Francisco, Californ, United States. <hal-04352282>

HAL Id: hal-04352282

<https://univ-tlse2.hal.science/hal-04352282v1>

Submitted on 19 Dec 2023

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



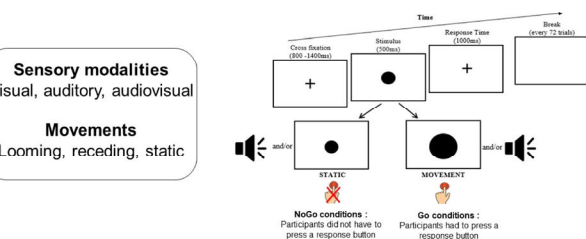
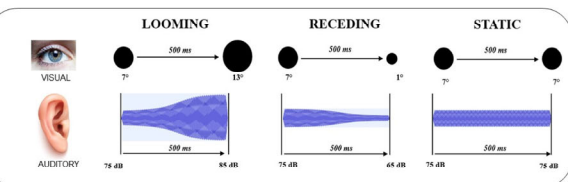
HAL Authorization

INTRODUCTION

As a spectrum disorder, autistic traits associated with ASD extend in the general population [1].
Sensory specificities are a key component of ASD diagnosis [2].
Depth movement (looming/receding) informs us about essential non-social (e.g., avoid a danger) and social information (e.g., approaching to interact).
Multisensory (e.g., audiovisual) integration in ASD and in the autistic personality has only been studied with static stimuli [3].
Aim : Study the integration of audiovisual depth movement using behavioral and neurophysiological measures.

METHOD

Participants: 37 healthy young adults (M = 23,32 yo; SD = 2,9 yo).
Stimuli and paradigm came from the study of Cappe et al. (2009) [4]



Personality questionnaires :
AQ [1] (Autistic Quotient) and AASP [5] (sensory profile).

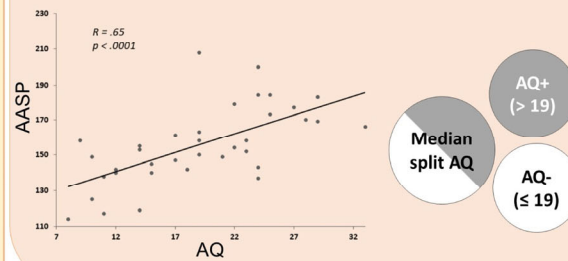
EEG material :



Biosemi system, 64 channels
Sampling rate : 512 Hz
Common average reference

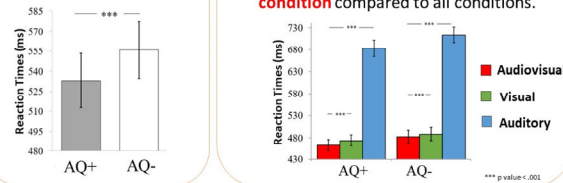
QUESTIONNAIRES - RESULTS

Positive correlation between the autistic quotient (AQ) and the sensory profile (AASP).

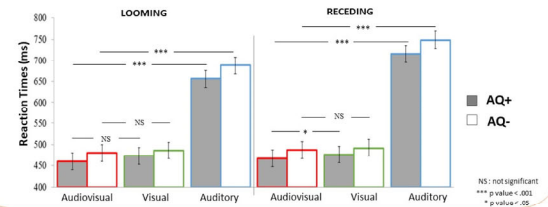


BEHAVIORAL - RESULTS

Shorter reaction times in AQ+

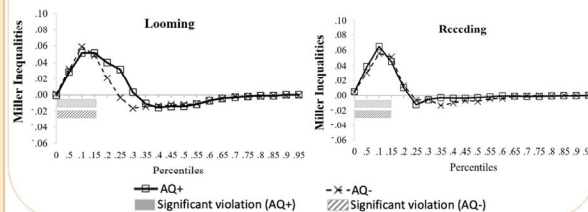


AQ+ : Multisensory benefit in receding condition



Race Model [6] application

Behavioral index of multisensory integration in both AQ groups



EEG - RESULTS

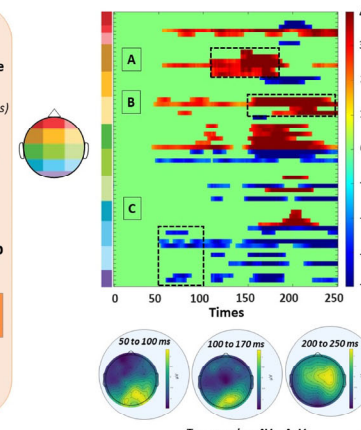
1- Additive Model [7] (AV vs. A + V) application to the overall sample
T-tests with FDR and temporal corrections (effects > 12 ms)

2 – Definition of temporal windows and regions

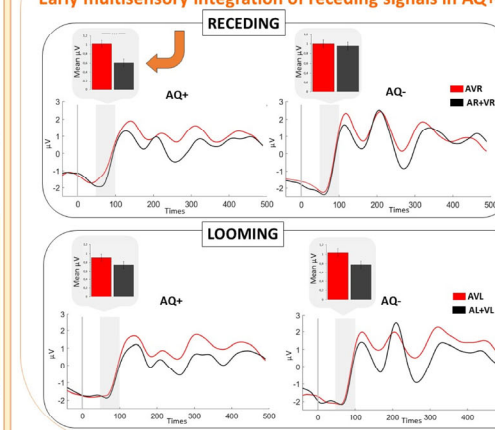
3 – ANOVA computation to test movement and group effects/interactions

Mean μV = Modality x Movement x Group

ANOVA showing significant intergroup differences



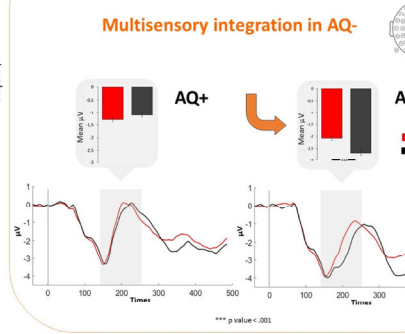
50 to 100 ms Parieto-occipital region
Early multisensory integration of receding signals in AQ+



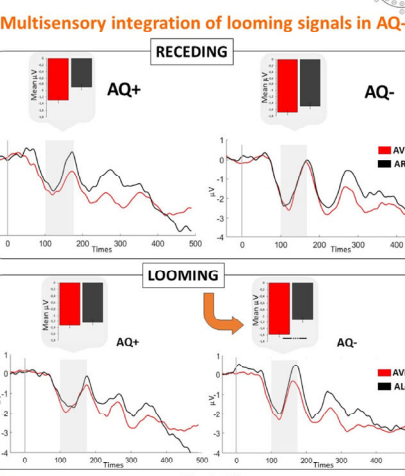
TAKE HOME MESSAGE

- There was a relationship between the sensory profile (AASP) and the autistic profile (AQ).
- AQ+ presented reduced detection times of depth movement.
- Integration of receding audiovisual signals in AQ+ underlied by early integrative interactions at parieto-occipital region.
- In line with the study of Cappe et al. (2012) [8] which explored EEG correlates of depth movement, AQ- presented a specific integration of audiovisual looming signals
- Only AQ- has integrated multisensory information and particularly looming signals at frontal regions
- Different temporal and spatial characteristics of multisensory integration of depth movement according to the level of autistic personality. These differences in the cortical network relate to different multisensory facilitation at the behavioral level.

150 to 250 ms Fronto-central region
Multisensory integration in AQ-



100 to 170 ms Frontal region
Multisensory integration of looming signals in AQ-



REFERENCES

[1] Baron-Cohen, S., Wheelwright, S., Skinner, R., Martin, J., & Clubley, E. (s. d.). (2001). Autism-Spectrum Quotient (AQ): Evidence From Asperger Syndrome/High-Functioning Meisnerd remotes, Scientists and Mathematicians. 15.

[2] American Psychiatric Association. (2013). Diagnostic and Statistical Manual of Disorders (Fifth Edition). American Psychiatric Association.

[3] Feldman, I. I., Dunham, K., Cassidy, M., Wallace, M. T., Lu, Y., & Wvvaranski, T. G. Audiovisual multisensory integration in individuals with autism spectrum disorder: systematic review and meta-analysis. *Neuroscience & Biobehavioral Reviews*, 95, 220-230.

[4] Cappe, C., Thut, G., Bornet, V., & Murray, M. M. (2009). Selective integration of audiovisual looming cues by humans. *Neuropsychologia*, 47(4), 1045-1055.

[5] Brown, C., & Dunn, M. (2002). *Adolescent/Adult Sensory Profile manual*. San Antonio: Psychological Corporation.

[6] Miller, J. (1982). Divided attention : Evidence for coactivation with redundant Cognitive Psychology, 14(2), 247-270.

[7] Barth, D. S., Goldberg, N., Brett, B., & Di, S. (1995). The spatiotemporal organization of auditory, visual and auditory-visual evoked potentials in rat cortex. *Brain Research*.

[8] Cappe, C., Thut, G., Bornet, V., Thut, G., & Murray, M. M. (2012). Looming reveal synergistic principles of multisensory integration. *The Journal of neuroscience: official journal of the Society for Neuroscience*, 32(4), 1171-1182.