

An oculo-pupillometric and heart rate analysis of painting perception in adults with ASD, artists, and neurotypicals

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Context

Individuals with **Autism Spectrum Disorder (ASD)** often show singularities in perceptual and attentional patterns, such as **atypical visual exploration**, **reduced attention to faces and social elements**, and information processing focused on details over global scenes. These characteristics, while posing challenges in social contexts, may offer **advantages** in domains like **visual arts**, where detailed observation is crucial. Similar detail-oriented strategies are also found in trained artists, suggesting a potential convergence between artistic expertise and ASD perceptual profiles. Moreover, **physiological reactivity** provides insight into how the **body emotionally and automatically responds to visual stimuli**.



Aim of the study :

Analyze visual exploration strategies (fixation time), **emotional reactivity**, and **autonomic regulation** (pupil dilation and heart rate) in response to **paintings** with **social and non-social content** in adults with ASD, artists, and neurotypical individuals.

Method

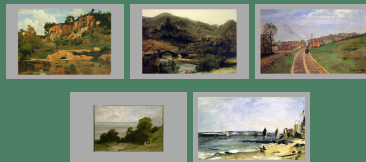
Participants :

12 Neurotypicals (9F, 23.83 ± 4.6)
12 Artists (8F, 38.06 ± 12.04)
12 ASD (4F, 31.73 ± 12.3)

Stimuli :

10 paintings were randomly presented on a grey screen for 15 seconds each, with an interstimuli of 2 seconds and a constant luminosity of 60 lux. Among these paintings, **5 inert content paintings (non-social stimuli)** and **5 human content paintings (social stimuli)** belonging to the artistic movements of impressionism and realism were selected for this study.

Inert content paintings



Human content paintings



Material :

Eye-tracker system SMI RED500® (500 Hz)
Biopac MP36® with electrodes

Measurements :

The proportion of **fixation time on the artwork** in percentage, excluding fixations on the gray area surrounding it, was analyzed.

Pupil size variation in millimeters was calculated by subtracting the baseline (which is the median pupil diameter during the 200 ms before the stimulus) from pupil size during stimulus viewing.

RR intervals of cardiac recording in seconds during stimulus presentation were compared with those recorded 200 ms before stimulation (during interstimuli).

Analysis :

Kruskal-Wallis test +
Dunn post hoc test /
Wilcoxon test

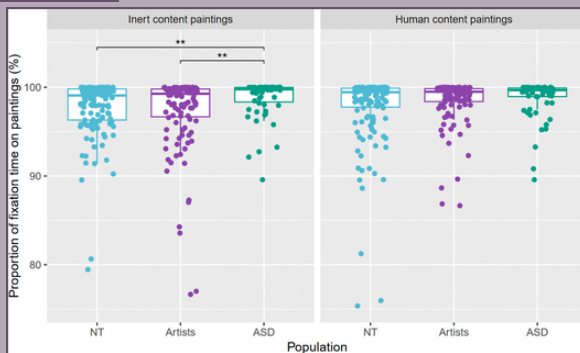
Linear mixed model

Test the effect of paintings content between our 3 groups / within a group

Kruskal-Wallis test +
Dunn post hoc test

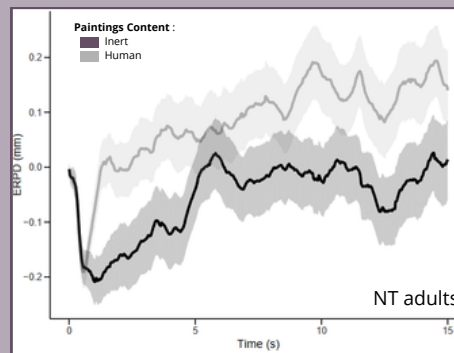
Results

Oculometry

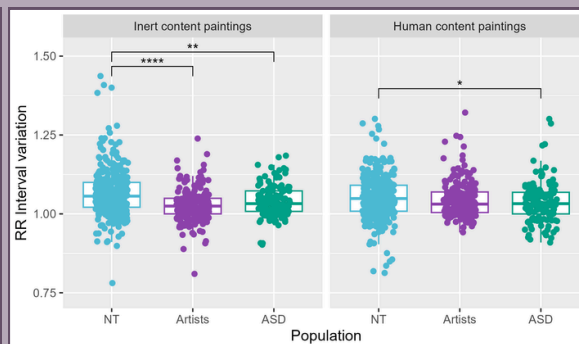
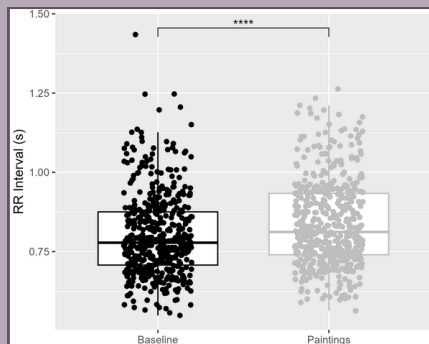
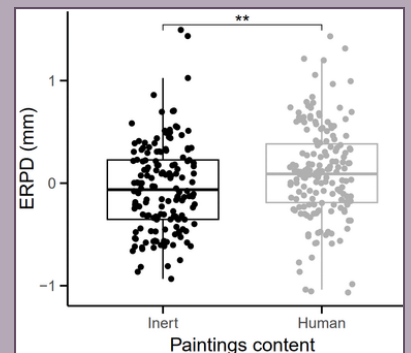


→ Higher fixation time on inert content paintings for ASD group

Pupillometry



→ Human content paintings induce a higher pupil dilation than inert content ones (same results for artists and ASD groups)



Heart rate

→ Increased duration of RR intervals during paintings visualisation compared to baseline = Decrease of heart rate while watching the paintings

→ Higher increase of RR intervals duration for NT than for artists and ASD when presenting paintings with inert content
Higher increase of RR intervals duration for NT than for ASD when presenting paintings with human content

Conclusion

Our results highlight **distinct visual perception strategies among adults with ASD, artists, and neurotypicals when observing paintings**. Individuals with ASD showed a stronger focus on non-social content, supporting the idea of reduced attention to social elements. **Human content paintings** elicited greater pupil dilation across all groups, reflecting **higher emotional or cognitive engagement**. Additionally, **heart rate** analyses suggest that neurotypicals exhibit greater physiological reactivity to social content than both ASD participants and artists, possibly reflecting the **body's mobilization for social engagement**, as described in Porges' polyvagal theory.

These findings suggest a **convergence between artistic training and ASD perceptual profiles**, particularly in the way attention is allocated and autonomic responses are regulated. However, the small sample size, especially in the ASD group, makes it difficult to draw robust conclusions and limits our ability to fully capture the **variability within the spectrum**. Exploring different art styles or social cues could further deepen our understanding of how visual and emotional processing interacts with neurodiversity.

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