

Heart Rate Orientation Responses to Faces in Toddlers with Prodromal ASD

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Background

Early detection of ASD is essential for initiating support and enabling the most optimal development. Psychophysiological responses to direct gaze might serve as one potentially useful predictive marker of ASD in young children. Previous study by Helminen et al. (2017) showed that while young, 2 to 5-year-old children without ASD show stronger heart rate deceleration response to gaze shifts to direct vs. averted direction, a similar physiological orientation response is not seen in young children with ASD.

Aims

- To investigate heart rate orientation responses in toddlers with prodromal ASD to faces versus objects, and to gaze shift to direct vs. averted direction.
- To investigate whether toddlers showing different levels of ASD-related symptoms differ in their orientation responses.

Methods

Participants of this on-going study were 38 toddlers, who were recruited in Gaze@Toddler (Tampere University, Finland) study from child welfare clinics by using M-CHAT-R/F screening questionnaire (11 screen-negatives and 28 screen-positives). Toddlers were divided into three groups according to their ADOS-2 toddler module score; Little-to-no concern, Mild-to-moderate concern, and Moderate-to-severe concern group (see Table 1). Toddlers were presented with dynamic pictures of faces (direct and averted gaze directions) and clocks on a computer screen (Fig 1). Heart rate (bpm) change between prestimulus baseline (-500 to 0 ms) and stimulus presentation (0 to 2000 ms) was analyzed in 500-ms intervals.

Table 1. Participant characteristics.

Group based on ADOS-2 total score	N	Mean age (Range)	ADOS-2 total score
Little-to-no concern	18	17.91 months (16.17-22.0)	≤ 9, M= 5.33 Range= 1-9
Mild-to-moderate concern	9	18.31 months (16.67-24.47)	10-13, M= 12.11 Range= 11-13
Moderate-to-severe concern	11	21.18 months (16.57-33.0)	≥14, M= 19.76 Range= 14-26

Results

Preliminary analysis (Stimulus X Time X Group ANOVA) revealed a significant three-way interaction, $F(4.5,78.0) = 2.47$, $p = .045$, $\eta^2 = .124$. This interaction was explained by the Little-to-no concern group and Mild-to-moderate concern group showing stronger heart rate deceleration to faces vs. clocks while similar orientation response to faces is not seen in Moderate-to-severe concern group (Fig 2). No other significant effects were found.

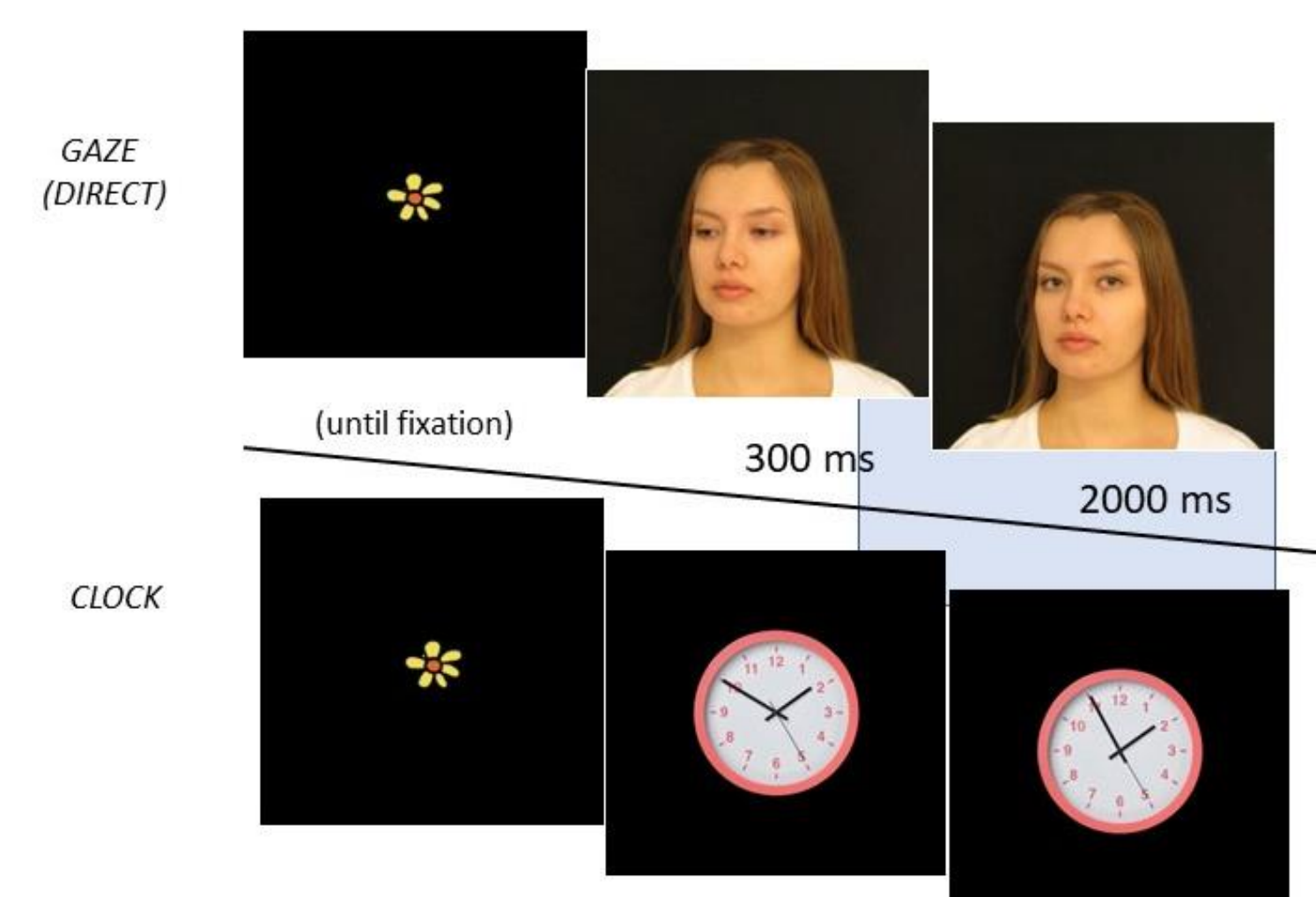


Fig 1. Example trials with a face (direct gaze direction) and a clock as a stimulus.

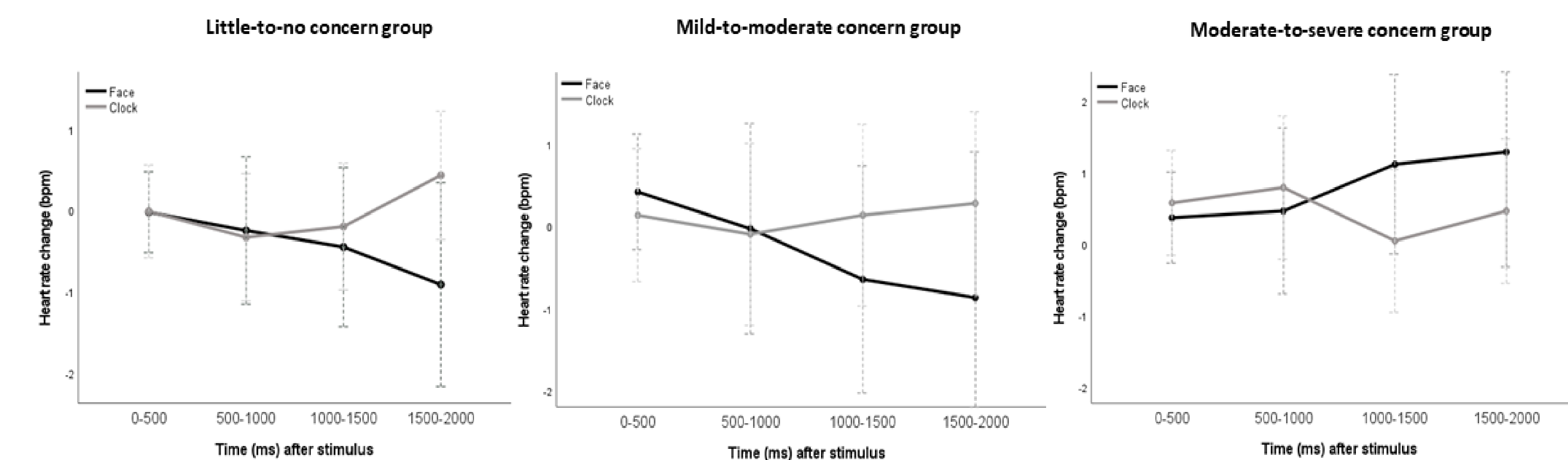


Fig 2. Heart rate deceleration response to faces vs. clocks. Error bars: 95% CI.

Conclusions

- The results indicated that toddlers who have no to moderate ASD-related symptoms showed enhanced orienting response to faces whereas toddlers with clear ASD-related symptoms evidenced no heart rate deceleration to faces.
- Orienting response was not affected by gaze direction.
- Preliminary findings suggest that orienting responses to faces vs. objects, regardless of gaze direction, might aid in early detection of ASD together with other sources of information such as parental concern.

