

# Reduced Social Responsiveness in Infancy as Early Behavioural Marker of Later Developmental Outcomes in Typically Developing Infants and Infant Siblings

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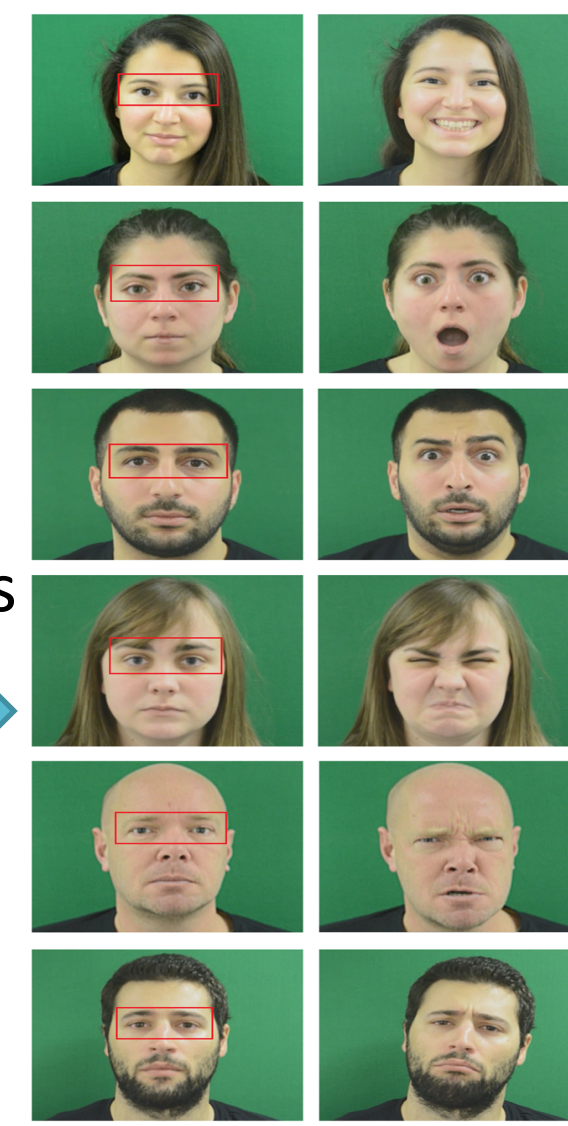


## Background

- Even though various studies of early brain and behaviour development<sup>1,2,3,4,5</sup> and perinatal term<sup>6</sup> have demonstrated that early markers associated with autism spectrum disorder (ASD) begin to emerge **before age three**, the reliable first-year behavioural markers specific to ASD are not clear yet.

- **One promising first-year behavioural marker, reduced social responsiveness** has been suggested in recently conducted infant study by Keemink et al. (2021).

- Keemink et al. (2021) used **interactive gaze-contingent (GC) eye-tracking paradigm** with typically developing and infant sibling (infants who have a sibling with the diagnosis of ASD) groups in which engaging in eye contact with on-screen actors would trigger the stimulus to produce a facial expression of six basic emotions (happiness, surprise, sadness, disgust, anger, and fear). Both **eye movements** and **behavioural responses** of infants to the stimulus were recorded.



Results showed that despite eye movements were comparable between groups, infant sibling group showed **reduced behavioural responsiveness** to the stimulus on the screen.

## Introduction

- Existing previous research (Keemink et al., 2021) has suggested that **reduced social responsiveness** could differentiate infant siblings from their typically developing peers **in the first year of life**.

- However, this study only reported differences in behavioural responses of infant siblings and typically developing infants. It is unknown yet that whether these behavioural differences have any predictive of later developmental outcomes, which is essential to generalize the utility of identified markers to clinical setting<sup>1</sup>. Therefore,

the aim of the current research

to investigate whether reduced social responsiveness in GC eye-tracking paradigm in infancy is associated with later developmental outcomes and still reliably differentiates infant siblings from their peers in early childhood

## Method

### Participants

- 45 typically developing infants (25 male, 20 female) aged 21 - 56-months and 6 infant siblings (4 male, 2 female) aged 42-60 months.

### Procedure

- We conducted a **follow-up** work with infants previously tested in interactive GC eye-tracking paradigm study. We applied online interaction task and also conducted a battery of developmental assessments that provide detailed information about infants' current development in early childhood.

### Stimuli

- **Interaction Task:** A task modelled on the Parent-Child Free Play<sup>8,9</sup> was used. Parents and children were recorded while engaging in free play. A total of five behavioural measures were coded for parents and children.

### Behavioural Measures in Free Play Task

For children

For parents

Smiling, face look, social vocalisations, contingent responsiveness, child engagement

Smiling, praise, social vocalisations, directiveness, contingent responsiveness

- **Developmental Assessments:** Parent-report Repetitive Behaviour Questionnaire-2, Ages & Stages Questionnaire-3 and Language Use Inventory were completed online over Qualtrics Software.

## Results

### Behavioural Measures

- Free-play results indicate that infants from the infant sibling group on average scored lower on all child behaviour measures and parent measures.
- Following the approach taken by Keemink et al. (2019; 2021), behavioural data were Z-converted separately for each individual measure and individual infants with a Z-scored value -1.5 SDs from the group mean or lower were identified. Fisher's Exact tests found a significantly higher frequency of low scores in the infant sibling group for Low Engagement in Play ( $\chi^2(1,51) = 11.243, p = 0.006$ ).

### Questionnaire Data

- Collection and analyses of the questionnaire data are still ongoing, but provisionally the infant sibling group show significantly lower values on several measures of the Ages and Stages Questionnaire.

- Specifically, a higher frequency of low values (as identified using the ASQ scoring method) was found for Problem Solving ( $\chi^2(1,45) = 3.441, p = 0.069$ ) and marginal effects were found for Communication ( $\chi^2(1,45) = 16.744, p = 0.010$ ) and Personal-Social ( $\chi^2(1,45) = 3.462, p = 0.066$ ).

### Eye-Tracking Data & Later Outcomes

- A logistic regression will be conducted to explore the relationship between eye-tracking data and behavioural responses recorded during infancy and outcomes from the questionnaires and behavioural; interaction data.

## Conclusions

- Preliminary findings indicate that infant siblings on average scored lower on all child behaviour measures with significant differences in frequency of low engagement in play.
- The infant sibling group shows significantly lower values on Problem Solving, Communication and Personal-Social development in the general developmental assessment.
- Data collection and analysis for infant sibling group are still ongoing, so the relationship between reduced social responsiveness in infancy and later outcomes will be analyzed when data collection is completed.
- However, these preliminary findings have highlighted differences in social engagement in play and in general developmental assessments between typically developing infants and infant siblings in early childhood.

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