Eye-tracking methodology for the assessment of social function in infancy

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There is a need for better understanding of cognitive development in the first year as a prerequisite for early identification of deviance from typical developmental trajectories, particularly in children with known vulnerabilities. Existing studies of early social cognition have not taken into account factors known to affect adult social attention such as stimulus complexity (1).

We used eye-tracking methodology to assess social functioning in infants who are typically developing. The hypotheses were; i) Attention to social information in infancy differs across stimuli of increasing social complexity; ii) Attention to social information across tasks can be quantified by social preference scores; iii) Social preference score is related to infant age at time of assessment.

Method

30 typically developing infants (15 female; 15 male) ; age range = 6.2 – 12.9 months (mean = 8.3 months) were tested following ethical approval by University of Edinburgh.

A battery of visual tasks were presented on a Tobii x60 eye-tracker. The tasks were shown in three trial blocks which lasted 6 minutes, combining both novel visual tasks with previously tested tasks provided by British Autism Study of Infant Siblings (BASIS). Analysis: Social preference scores = the percentage of mean time looking at the social area of a scene versus mean total looking time for that scene.

Results

Face-scanning: Infants fixated on the eyes longer than the mouth (means = 1.82s versus 0.29s; p<.001) and looked at eyes quicker than the mouth (means = 2.32s versus 3.90s; p=.02; Figure 2A-C).

Face Pop-out: Each area of interest, bird, car, face noise, phone was fixated less than the face (means = 0.36s, 0.45s, 0.43s, 0.22s versus 1.78s; all ps<.001; see Figure 2D-F). Time to first fixation was slower to the other areas bird, car, phone compared to the face (means = 4.20s, 3.66s, 4.27s versus 2.44s; all ps<.001), except time taken to fixate the face compared to face-noise (means = 2.44s versus 3.10s; p=.061).

Social Preferential Looking: There was no difference in fixation duration to social scenes compared to non-social scenes (means = 1.68s versus 1.40s; p=.09; see Figure 2G-I). Time to first fixate was quicker for social scenes compared to non-social scenes (means = 1.19s versus 1.54s; p=.009).

Social Preference variables: Social preference scores were all significantly correlated with each other for all three tasks (face-scanning with pop-out: r = .638, p<.001; face scanning with social PL: r = .546, p=.002; pop-out with social PL: r = .497, p=.005).

Relationship between social cognition, and infant age: A single social composite score was created by averaging social preference scores across the three eye-tracking tasks. Social preference score did not correlate with infant age at testing.

Discussion

The preference that infants show for social content in eye-tracking tasks is moderated by complexity of the display. Social cognition in infancy can be summarised by a composite score, derived from gaze behaviour which varies across tasks.

The composite score may have greater utility than single tasks when developing early markers of later social cognitive impairment.


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