

Do 3.5-year-old Children Anticipate Others' Actions Based on Biological Motion Information?

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- This eye tracking study investigated adults' and children's ability to anticipate the goal of a biological or non-biological point-light (PL) reaching action.
- Adults were able to use biological motion to anticipate the goal of others' actions, while they did not anticipate a non-biological control condition. Explicit detection of the PL display as a reaching hand was unrelated to the latency of goal directed gaze shifts.
- Children and infants were not able to anticipate the goal of the PL reach. Results show that the latency of goal directed gaze shifts did not differ significantly between conditions in 3.5-year-old children.
- Preliminary pilots let assume a significant difference in 16-month-olds regarding the degree to which infants shift their gaze to the goal during observation of a biological or non-biological PL action.

Study 1

Adults (N=38) were presented with ten stimulus presentations (movies) of a biological or non-biological PL animation recorded using motion capture.

Stimuli

The *biological motion condition* contained a point-light hand performing a reaching action towards a partly occluded goal. A *control condition* showed a scrambled version of the point-light hand in which both the motion profile and the visual configuration of the point-light hand were modified. All participants were asked to fill out a questionnaire inquiring whether they detected the PL display as a familiar object/event.

Results

Adults anticipated the goal of the PL action in the biological motion condition ($M = 124$ ms, $SE = 28.5$), $t(18) = 4.36$, $p < .001$, but not the control condition ($M = -21.5$ ms, $SE = 29.4$), $t(18) = .73$, $p = .474$. Latency of goal directed gaze shifts differed significantly between conditions, $t(36) = 3.56$, $p = .001$, $d = 1.16$. Within the biological motion condition no latency differences were observed between those that detected the hand and those that did not, $t(17) = 1.40$, $p = .179$.

These results suggest that seeing low-level kinematic information from other people's movements is sufficient for adults to anticipate the goal of others' actions and that a conscious detection, a higher level of action understanding, is not required for anticipations to occur.

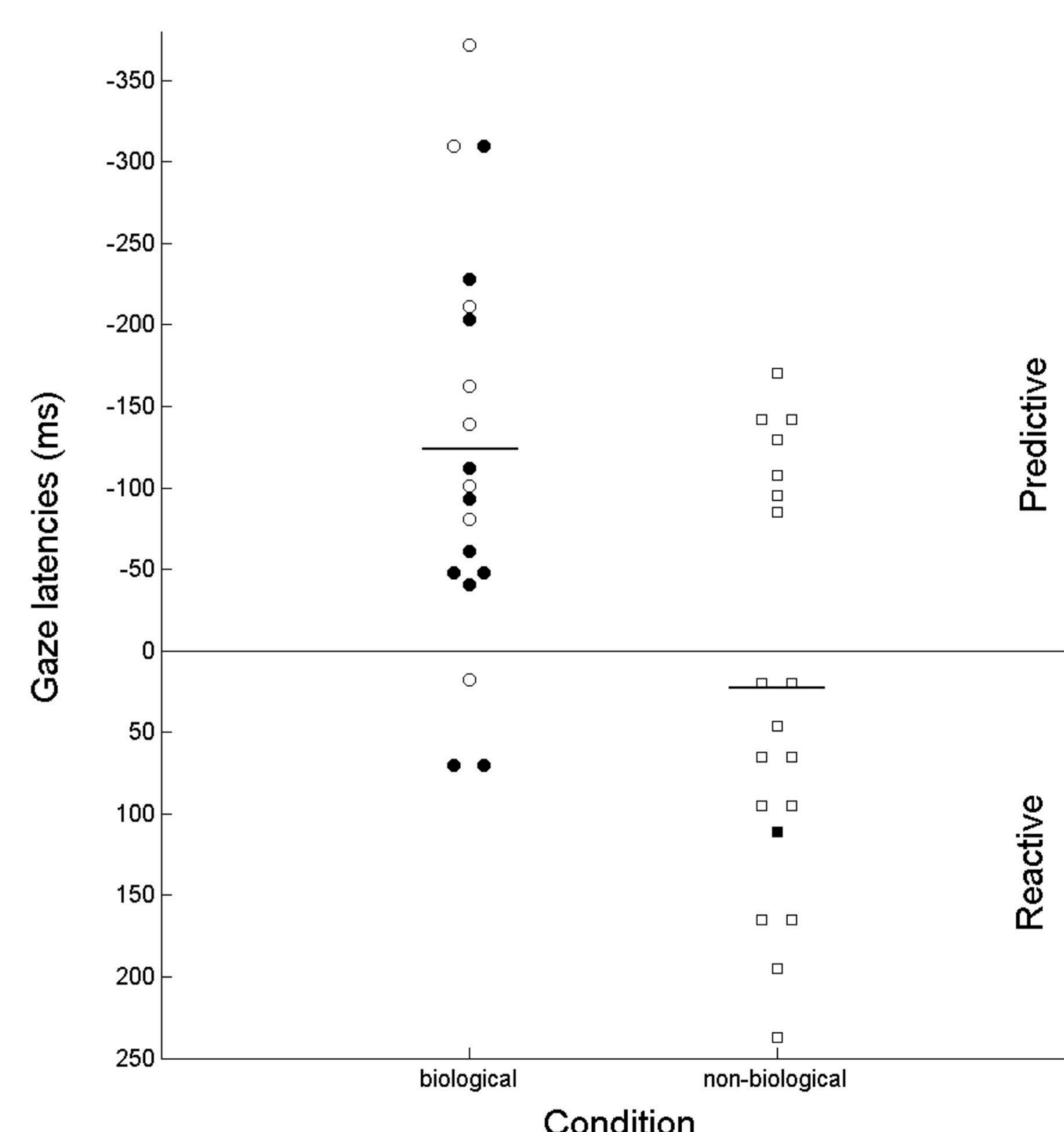


Figure 1: Average gaze latency in the goal AOI over all ten trials for each subject, separate for the biological and non-biological condition. The horizontal line differentiates predictive from reactive gaze shifts. Short horizontal lines mark the group average for each condition. Filled markers represent subjects reporting that the point-light display represents a hand; empty markers represent subjects who did not.

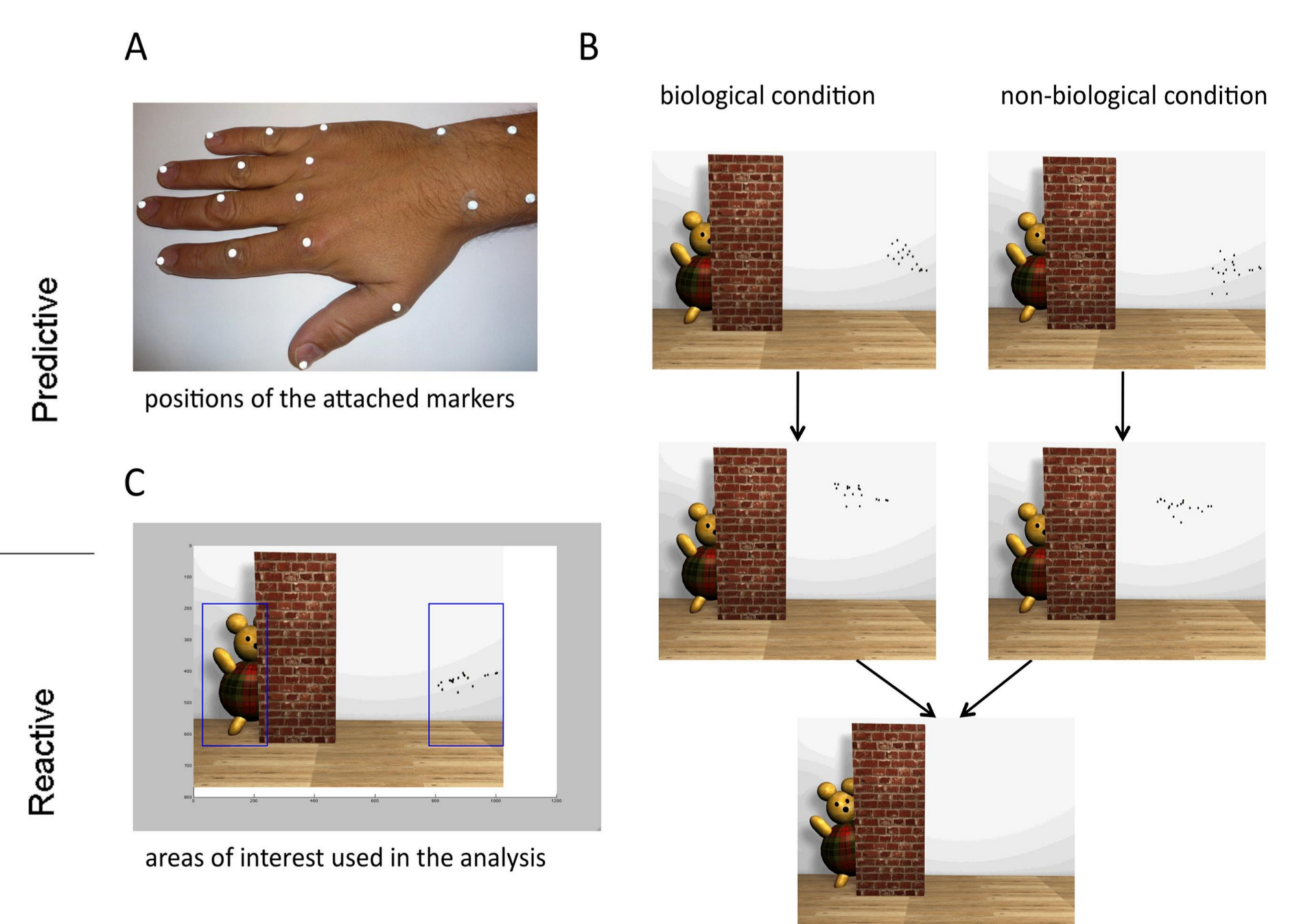


Figure 2: **A:** Photo showing the hand with 18 attached PL markers **B:** Snapshots of the stimuli movie during movement phase one, during the reaching phase (both separate for each conditions) and after the onset of the end effects (movement of goal object and sound, equal in both conditions). **C:** Area of interests (AOI) used in the analysis.

Study 2

3.5-year-old children (N=24) were presented with the same PL stimuli and observed ten trials of either a biological (n=14) or a non-biological (n=10) PL reaching action.

Results

Children were not able to anticipate the goal of the biological point-light reach, shifting their gaze on average -5 ms ($SE = 46.3$) after the completion of the action. Latency of goal directed gaze shifts did not differ significantly between conditions, $t(22) = 2.14$, $p = .678$.

Study 3

Recent pilot data suggests a significant difference regarding the extent to which 16-month-olds (N=20) shift their gaze towards the goal during observation of a biological point-light reaching action or a non-biological version of the same event.

The total number of gaze shifts towards the goal is significantly higher in infants observing the biological motion PL stimuli in comparison to the non-biological control condition, $t(18) = 3.112$, $p = .006$, $\eta^2 = .350$.

These first results indicate that 16-month-olds seem to differently scan the biological motion stimuli compared to the non-biological, scrambled control.