The effects of observing other people's gaze: Faster intuitive judgments of semantic coherence

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Introduction

Our actions are modulated by an observation of others' behaviour, especially when we represent others as intentional agents. However, inferring intentions can even be accomplished on the basis of seeing someone's gaze. Do eye movements also exert a stronger influence on an observer when he is ascribing them to a human instead of a machine? Indeed, reflexive shifts of attention in response to gaze shifts are modulated by subjects' beliefs (Wiese et al. 2012): A human face elicited stronger gaze cueing effects than a robot face, but this difference disappeared when the instruction stated that both stimuli were of the same origin (i.e. either produced by a human or a machine). This suggests that beliefs about someone else's visual attention can exert a direct influence on our own processing of the same stimuli.

A possible way in which the interpretation of gaze as human can affect our processing is that we try to *infer the meaning* of the things another person is attending to. In this case, observers of object-directed gaze should be more likely to perceive a coherent relation in the objects that they see being looked at. To test this, the present study used the *Remote Associates Test* (Mednick, 1962) in which subjects decide whether word triads are coherent by means of allowing meaningful combinations with a fourth word. Before each decision, a dot moved across the words and subjects were either told that it represented the eye movements of a human trying to find word associations, or a computer-generated control. It was hypothesized that interpreting the dot as someone's gaze would increase the frequency and reduce the time for "intuitive judgements", namely those for which subjects assume a coherent relation but cannot name a solution.

Methods

Sixteen subjects participated in the experiment and their eye movements were tracked with an SR EyeLink 1000. Within each trial there was a preview video with cursor overlay and a word triad. Videos showed a 5 x 4 grid of rectangles containing 20 words, three of which had to be rated for coherence later. A purple dot cursor (15 px) moved across the grid, either resting on the three words that were chosen later, or on three other words. Contrary to what subjects were told, the cursor always was a real eye movement recording. Each subject saw 100 triads, one after each video. All triads were composed of words from the respective video, but only in half of the trials these words had been cued by the cursor.

Subjects were instructed that the cursor either depicted eye movements (*gaze*) or a computer-generated control (*dot*). No strategy of using the cursor was instructed. Each trial started with a video which was followed by a triad that remained on the screen until subjects pressed a key to indicate whether it was coherent or not. If they negated, the response was counted as *incoherent*. After a positive response, they were asked to submit the solution word. If they gave no solution or a wrong solution, this was counted as a *yes+unsolved* response, whereas trials with correct solution words were classified as *yes+solved*. Subjects worked through two blocks of 50 trials, with each block corresponding to one of the cursor conditions.

Results

The frequency distributions of the three response types (yes+solved, yes+unsolved, incoherent) were compared between both cursors and there was no difference, χ^2 (2) = 1.546, *p* = .462. Specifically, the amount of yes+unsolved (intuitive) responses was similar for gaze and dot (24.6 and 22.5 %), and this also did not depend on whether the triad had been cued by the cursor during the video or not, both *F*s < 1, both *p*s > .3. Mean response times did not differ between gaze and dot overall (9.5 vs. 9.4 s), $F < 1$, $p > .8$, but cursor interacted with response type, $F(2,28) = 6.052$, $p = .007$, indicating that only the yes+unsolved responses were faster for gaze than for dot (8.9 vs. 11.3 s), $p = .02$. In contrast, there was no difference for yes+solved and incoherent responses, both *p*s > .6. There was no main effect or interaction with cueing, both *F*s < 1, both *p*s > .6, suggesting that the speed advantage for yes+unsolved responses in gaze was unspecific, i.e. it also occurred for triads that had not been cued by the gaze cursor.

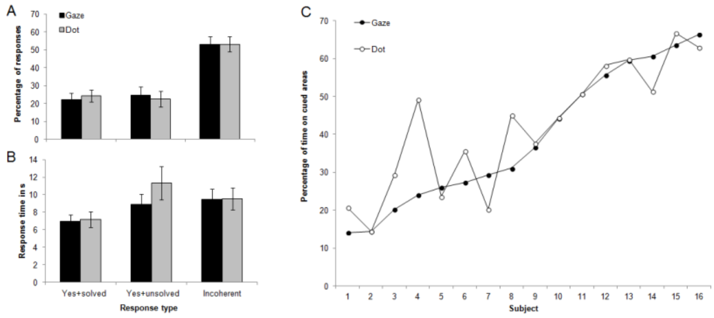

Figure 1. Percentage of responses (A) and response times (B) depending on cursor and response type. The percentage of time spent on the cued areas for every single subject (C) was similar for both cursors.

To investigate the impact of the two cursors on subjects' visual attention, subjects' eye movements were analyzed in terms of the time spent on the three cued areas within a grid. This time did not differ between gaze and dot (39.0 vs. 41.9 %), $t(15) = 1.36$, $p = .193$. Thus, although there was quite some interindividual variation in subjects' strategies of using the cursor, most subjects looked at the gaze and dot cursor in a similar manner.

Discussion

The present results indicate that observing another person's eye movements can affect the coherence we assume in the contents that are being looked at. When subjects believed that they saw a depiction of gaze on word triads, their intuitive classifications as coherent were no more frequent (perhaps due to a lack of sensitivity) but faster than when they interpreted the exact same cursor as non-human. Thus, it appears that seeing someone else looking at objects makes people assume that there must be "something in it", especially when they cannot name it. Interestingly, the effect was not specific to cued triads, suggesting that with gaze transfer the overall readiness for assuming coherence was higher. In the light of this result, it is possible that gaze increased subjects' openness for uncertain judgments more than it affected their actual processing of the objects. This question will have to remain for future research.

In contrast to what could be predicted on the basis of previous work (Wiese et al. 2012), subjects' visual attention allocation did not differ between gaze and dot. First, this rules out the possibility that differences between both cursors only occurred because subjects had ignored the presumably irrelevant dot. Moreover, it raises the question to what degree and on what level of processing more abstract depictions of intentional behaviour (such as cursors as opposed to real eyes) can exert their influence. This has implications for basic research on social attention and joint action as well as for applied topics such as the visualization of eye movements or computer-mediated cooperation with real and virtual agents.

References

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