Is orienting of attention influenced by EQ and SQ types?

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Introduction

- The direction of eye gaze is a reliable signal for comprehending social signals. Furthermore, the ability to determine objects and events that others are attending to, is key to understanding the social world.
- Studies that have used a modified Posner (1980) cueing paradigm have found that directional eye gaze cues can orient visual attention. This effect has been exhibited by using static directional eye gaze cues (Driver et al., 1999), and dynamic directional eye gaze cues (Culpeck et al., 2008).
- Culpeck et al. (2009) compared both static and dynamic eye gaze and arrow cues in order to determine whether movement onset alone sufficiently accounts for the greater orienting effect by dynamic eye gaze cues. Results showed that the magnitude of orienting (incongruent - reaction time) was stronger for dynamic cues compared to the static eye gaze cues, and that there was no significant difference between the magnitudes of orienting for the static and dynamic arrow cues. These results suggest that there is something ‘special’ about the eyes and that they are processed differently to arrows. Ergo the engagement of visual attention, by dynamic eye gaze, is not due to movement onset alone.
- Baron-Cohen (2003)’s E-S theory suggests that the mind is conceived of as having two major dimensions: empathizing and systemizing. Empathizing is the drive to comprehend and respond to another’s mental state and is a feature of the hypothalamic male brain. Systemizing indicates a drive to construct and understand the underlying rules governing systems and is a feature of the hypothalamic male brain.
- Baron-Cohen et al. (2003) have found that individuals who score highly on Autism Spectrum Quotient (ASQ) tend to also be classified as high Systematizers and low Empathizers. The present research seeks to conflate these findings of Baron-Cohen (2003) empathizing-systemizing (E-S) theory, to address the social deficits on the Autism Spectrum.
- Using saccade latency data, it is expected that there will be a significant interaction between magnitude cueing by eyes and arrows and scores on the empathizing quotient (EQ) and systemizing quotient (SQ).
- In other words, it is predicted that there will be differences between high empathisers and high systemizers, in how they treat eye gaze cues and arrow cues.

Method

Participants:
- Participants who scored highly on either the EQ (≥ 55) or SQ (≥ 41) questionnaires were recruited to take part in the eye tracking experiment and were paid £5. Participants consisted of 16 Empathizers (15 female) and 16 Systemizers (6 female). Their mean age was 30.52 (SD = 10.33).

Materials:
- Prior to the eye-tracking experiment, all participants were assessed using the Baron-Cohen et al. (2003) EQ and SQ Questionnaires.
- Eye movements were recorded using Eyelink II (SR Research, Ontario). Analysis was performed using Dataviewer software and custom Excel spreadsheets.

Design:
- A 2 (congruency: congruent vs. incongruent) x 2 (movement: static vs. dynamic) x 2 (cue: face vs. arrow) x 3 (SOA: 100, 200, or 300ms) repeated measures design, with participant type (high EQ vs. high SQ) as the between subject factor, was conducted. The dependent variable was the mean saccade latency to locate the target.
- There were 204 trials that were split into 4 blocks of 48 trials, plus a 12 trial practice block. The eye gaze and arrow cues were presented in separate blocks, and the static and dynamic trials were randomised and mixed within their respective blocks. The presentation order of the gaze and arrow blocks was randomised across participants. The direction of the cue was not predictive of the upcoming location of the target.

Procedure:
- The sequence of events for each trial was as follows: a central fixation cross appeared and after a brief interval, the fixation cross was replaced by either one of four different faces (2 female), or two arrows. The eye gaze and arrows were either statically pointing to the left or right hand side, or they would appear to move to the left or right. After the SOA interval, a target dot appeared on either the left or right side of the face or arrows and participants were instructed to look at the target upon onset. Participants were informed that the cues were non-predictive of the targets location.

Results

- There was a significant effect of participant type on saccade reaction times (RTs) (F(1, 30) = 4.19, p < .05, η² = .12), high scoring EQ participants elicited significantly faster saccades over trials overall (M = 217.36, SEM = 6.29), compared to the high scoring SQ participants (M = 235.59, SEM = 6.29).
- There was a significant effect of movement on RTs (F(1, 30) = 49.26, p < .001, η² = .62); participants were faster to locate the target in the dynamic condition (M = 214.1, SEM = 4.76), compared to the static condition (M = 238.66, SEM = 4.82). However, there was a non-significant interaction between movement and participant type (F(1, 30) = .43, p = .62, η² = .008). In other words, EQ and SQ participants did not exhibit any RT differences as a result if the cue was either static or dynamic.
- There was a significant effect of congruency on saccade RTs (F(1, 30) = 24.87, p < .001, η² = .45); participants elicited faster saccade RTs when the cue was congruent to the target (M = 230.09, SEM = 5.03) relative to incongruent trials (M = 234.01, SEM = 4.36). However, there was a non-significant interaction between congruency and participant type (F(1, 30) = .86, p = .36, η² = .04), which suggests that although the EQ participants were faster than the SQ participants overall, the SQ participants were equally as likely to be slower than the EQ participants.
- Overall, there was a non-significant effect of congruency on saccade RTs, (F(1, 30) = 2.31, p < .14, η² = .07). In other words, there was no significant difference in saccade RTs when an eye gaze cue was presented (M = 213.27, SEM = 5.7) compared to an arrow cue (M = 221.69, SEM = 5.2). In addition, the interaction of cue and participant type was non-significant (F(1, 30) = .53, p = .46, η² = .001). Therefore EQ and SQ participants again did not exhibit any differences in ocular motor orientation to the eye gaze or arrow cues.
- There was a significant interaction between movement and cue (F(1, 30) = 6.36, p < .05, η² = .18), which arises because the mean difference is greater in the static cue condition for the eye gaze and arrow cues (M = 247.62, SEM = 6.88; M = 230.09, SEM = 5.85, respectively) than the eye gaze and arrow cues in the dynamic condition (M = 214.93, SEM = 5.77, M = 213.28, SEM = 5.16, respectively). See Figure 2.
- A 2 (movement: static vs. dynamic) x 2 (cue: face vs. arrow) repeated measures ANOVA with the between subjects factors of EQ and SQ participants was conducted on the magnitude saccade latency data (incongruent - congruent) RTs.
- There magnitude effect of the EQ and SQ participant overall magnitudes was non-significant (F(1, 30) = .193, p = .644, η² = .006). Therefore there was no significant difference of the magnitude of orienting as a function of high EQ and SQ participants.

Discussion

- The current findings show that no significant interactions occurred in the ocular motor orienting to eyes and arrows as a function of high scoring EQ and SQ participants, for both the saccade RT and magnitude data.
- Although the high SQ participants exhibited slower saccade RTs compared to the EQs, the SQ participants did not display any deficits in covert orienting to both the eye gaze and arrow cues.
- Despite the null results as a function of EQ and SQ participants, overall, all of the participants showed the congruency effect and greater orienting was exhibited for the congruent trials for both arrow and eye gaze cues, supporting the previous findings of Posner (1980) and Driver et al. (1999), Ricciardelli et al. (2002) and Culpeck et al. (2000), respectively.
- Limitations of the study are an insufficient sample size of EQ & SQ groups. A larger sample size is needed in order for the results to be more reliable. The previous findings of Culpeck et al. (2005) used a mixed cue and movement condition block design. Therefore eyes and arrows were appearing in the same block.
- The current study used a blocked cue condition block design. Therefore it should be noted that any disparity in the current results that of Culpeck et al. (2009) could be due to the difference of the experimental design.
- Future research should review the selection process for SQ participants, whereby only the higher scorers on the SQ scale should be selected for analysis.

References