Eye-gaze to memory

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Ethical review	Approved WMO
Status	Recruitment stopped
Health condition type	Psychiatric disorders NEC
Study type	Observational non invasive

Summary

ID

NL-OMON33193

Source
ToetsingOnline

Brief title
Eye-gaze to Memory

Condition

- Psychiatric disorders NEC

Synonym
Autism

Research involving
Human

Sponsors and support

Primary sponsor: Universitair Medisch Centrum Groningen
Source(s) of monetary or material Support: European Marie Curie Excellence Grant

Intervention

Keyword: autism, memory, social cognition

Outcome measures

Primary outcome

The dependent variables are the number of correct answers, the number of correct answers for which a specific episodic memory could be retrieved, the amount of time the participant gazed at each object, the onset time and direction of the first gaze.

Secondary outcome

n.v.t.

Study description

Background summary

Autistic disorder has three core symptom domains: deficits in communication, abnormal social interactions, and restrictive and/or repetitive interests and behaviours. The last 20 years have seen a drastic increase in our understanding of the behavioural and neural basis of the social impairment in autism. Autistic individuals differ in the way they process faces. One main feature seems to be an avoidance of the eye region.
A delay in the development of visual joint attention is also reported, this delay could follow from a lack of interest in the information conveyed by the eye. There seems to be a lack in this fundamental ability to gaze at what another person is looking at, and this deficit appears to be correlated with their level of social impairment.
Psychological studies on gaze following have demonstrated that another*s individual gaze triggers a shift of attention automatically, and is even reported when the gaze cannot be perceived consciously.
Gaze is special in triggering this shift of visual-spatial attention.
The effect of eye-gaze is not limited to a shift in visual-spatial attention. Firstly, objects that are gazed at by someone else later seem more familiar, and are given a positive value. Secondly, direct gaze also influences access to categorical knowledge related to the person and the later recognition of the face. Actually, eye-gaze perception is probably a very important factor to developing social cognition.
The hypothesis was advanced that, in autism, an early impairment at processing eye-gaze could lead to more drastic social impairments later on. However, evidence for a deficit of eye-gaze processing in autism has been quite

inconclusive so far. Only 2 out of some 10 studies showed abnormal orienting to eye-gaze in autism and one study demonstrated that autistic fail to show the same advantage as control for detecting direct- over averted-gaze in an odd-ball paradigm. The paucity of positive findings is surprising as, in naturalistic situations, impairments of mutual gaze is documented in the majority of children.
Previous experiments on eye-gaze in adults with autism typically involve testing the presence of a shift of spatial attention in a situation where a schematic face or a photograph of a face looks left or right before the apparition of a target on the congruent or the incongruent side of the screen. Sometimes, one condition also includes arrow cues instead of faces as control. The gaze is always consciously perceived.
The lack of positive findings in previous studies could have two main reasons: (1) the gaze was available to consciousness, opening the door to compensation strategies in the autistic group, and (2) the use of schematic faces and arrow cues hamper the ecological validity of the experiment.
One key finding demonstrating that autistic are actually impaired at automatic processing of eye-gaze information is that they fail to show the same difference between gaze and arrow cue as control subjects when the cue is counter-predictive. This suggests that eye-gaze is processed as a non-social stimulus by autistic individuals in these experiments.

Study objective

In the present study we want to show that automatic processing of eye-gaze is impaired in autism, and that this deficit influences the way autistic individuals perceive the world. We will test this hypothesis using a masked priming procedure to avoid any compensatory strategy in the autistic group. The eye-gaze of the participants will be recorded in order to obtain a measure of the shift of attention. In order to assess the influence of eye-gaze on memory, we will test the participant*s recognition of objects that were or were not gazed at during the encoding phase of the experiment. The recognition memory test will use a remember/know procedure in which the participants have to indicate whether they can remember something about when they saw the item the first time (e.g., what they thought, how they were feeling). This will provide an information about the type of memory process that is influenced by social contact (i.e. eye-gaze).
In one condition, we will test the effect of a straight gaze on eye movements and memory performance. Straight gaze is not processed normally in autism. In typically developing (TD) individuals, straight gaze facilitates semantic categorization, and face recognition. We hypothesize that autistic will not show any effect of straight gaze, while in controls, we expect straight gaze to delay the shift of attention towards the cups, and therefore impede memory performance.
In order to test the hypothesis that autistic individuals use compensatory strategies when processing eye-gaze in an explicit visual-spatial orientation task, we will also test our participants on such task.

Finally, females have better social skills than males, and autistic are sometimes considered as having an extreme male brain. In order to test the hypothesis that females are more sensitive to eye-gaze than males, and males than autistic, we include a group of healthy female participants next to the autistic and the male controls.

Study design

Given that an IQ in the normal range is an inclusion criterion, the IQ test will be administered before the main experiment.

For the present study, we designed a set of stimuli consisting of 80 photographs of a pair of cups (160 cups), with one cup on each side of a table, and another 320 photographs of a single cup (160 old and 160 new cups) for recognition.
There will also be a picture of a face with eyes gazing straight, down, to the left, or to the right (at the location were the cups supposed to be). The pictures of the face were cropped around the face to remove the context.
In addition one picture was used to create a mask of the same luminance and color as the face by scrambling the picture.
Although it is known that a face presented for 25 ms and masked cannot be perceived consciously, we designed a pre-test to ensure that this is the case with our stimuli. In this test, 15 typically-developing volunteers were presented the faces between the 2 masks, which were displayed for 80 ms, and the face for 26.7 ms. In one task, the participant had to decide whether there was a face between the 2 masks or nothing. Ten out of 15 participants answered below chance level. In a second task, the participants had to decide whether the face was looking left, right, or straight at them. None of the participants scored above chance level. On this basis, we can be sure that eye-gaze cannot be consciously detected with our procedure.

1 Memory experiment
In the main experiment, participants will not be told that a face is flashed before the stimulus. The stimuli of the memory task consist of 320 different cups. 160 cups are presented during the encoding part of the memory task. The cups are presented by pairs in one of 4 priming conditions: face (1) gazing down, (2) gazing at the camera, (3) gazing at the left object, (4) gazing at the right object. The number of items is constant across conditions (n = 20). The items are randomly assigned to the 4 conditions for each participant in order to prevent any object-specific effect. The prime is flashed for 26.7 ms between the 2 masks which are displayed for 80 ms. Each pair of cups is presented for two seconds immediately after the second mask. The participants eye-gaze is monitored during encoding using a camera controlled by a second computer synchronized with the stimulus presentation computer. Participants* head remains stable thanks to a head-holder attached to the table. In the second phase of the experiment, 320 cups (160 old, and 160 new cups) are presented at a central location on the screen, and the participant has to

decide if s/he confidently saw the cups before. The response is given by pressing one of two keys (*yes I am sure* vs. *no I am not sure*). When the participant is sure a specific cup was seen at encoding, s/he will be asked whether s/he just know s/he saw it, or s/he can remember something about when s/he saw the cup. Specific episodic memories will be manually recorded by the experimenter. The total duration of the experiment is about 30 minutes

2 Detection post-tests
Although the timing parameters of the priming experiment were determined according to a pilot experiment, we will also test the ability of every participant to consciously detect the face, and the direction of eye-gaze (left, right, straight).
The detection post-tests shall take place after the main experiment, and before the explicit orienting task. Every participant will perform two tests. In the first test, a face or a scrambled picture of the face is presented between 2 masks. The participant must decide if there was a face between the two masks (yes / no). There are 120 items, half with a face, and one fourth at each exposure duration. In the second test, the participant must decide if the face between the 2 masks is looking straight, to the right, or to the left. There are 180 items in total; 60 items in every condition (straight, left, or right). The total duration of the detection post-tests is 15 minutes.

3 Explicit orienting task
In this test we use the same faces. This time, the face will be displayed for 250 ms, and followed by a square appearing on the left or on the right of the screen at the same place as the cup used to be. The asynchrony between the face and the apparition of the square is either 100 or 300 ms. The task is to press the left or right key according to the position of the target square. Half of the squares appear on the left and half on the right. The eye-gaze does not predict the position of the square (50% congruent trials). The participant will be told at the beginning that the gaze is non-predictive. There are 160 items, 80 at each onset asynchrony. The explicit orienting test will be completed in about 10 minutes. With this post-test, we hope to show that our group of autistic participants orient towards the direction of gaze in the context of an explicit task.

Study burden and risks

The experiment will not entail more than minimal risk to the participants. The study is not intended to benefit the subjects directly. However, the data collected during this study could improve our understanding of autism and human cognition at large.

Contacts

Public
Universitair Medisch Centrum Groningen

Postbox 196
9700 AD Groningen
NL
Scientific
Universitair Medisch Centrum Groningen

Postbox 196
9700 AD Groningen
NL

Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age
Adults (18-64 years)
Elderly (65 years and older)

Inclusion criteria

*Physically healthy individuals with IQ in normal range and normal or corrected to normal vision.
*Between 18 and 55 y.-o.
*DSM-IV diagnosis of Autism Spectrum Disorder established by an experienced clinician, and above cut-off scores on the ADOS for participants in the ASD groups.

Exclusion criteria

* Neurological problems (including epilepsy),
* Use of drugs that may influence the task performance,
* Psychiatric condition other than autism.

Study design

Design

Study type:	Observational non invasive
Intervention model:	Other
Allocation:	Non-randomized controlled trial
Masking:	Open (masking not used)
Control:	Active
Primary purpose:	Other

Recruitment

NL

Recruitment status:	Recruitment stopped
Start date (anticipated):	23-07-2019
Enrollment:	60
Type:	Actual

Ethics review

Approved WMO

Application type:	First submission
Review commission:	METC Universitair Medisch Centrum Groningen (Groningen)

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

Other (possibly less up-to-date) registrations in this register

No registrations found.

In other registers

Register	ID
CCMO	NL26794.042.09