LOOKING AT THE EYE LOOKING AT PICTURES

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INTRODUCTION

In this study eye movements and pupillary changes were measured while 32 participants viewed affective and neutral pictures. One aim of the study was to assess whether pupil diameter responses and eye movements differ as a function of the hedonic valence of the picture. A second aim was to determine whether eye movement behavior differs for pictures with simple figure /ground configuration and for pictures that depict more complex scenes.

METHOD

- Subjects: 32 (17 females)
- 192 IAPS pictures, varying:
  - HEDONIC VALENCE: pleasant, neutral, and unpleasant;
  - PERCEPTUAL TYPE: figure/ground or scene
  - CONTENT: people or objects.

  Each of the 12 cells formed by covarying these 3 factors contained 16 pictures.
- Pictures presentation: 6 seconds, 2.5 second ITI
- 2 picture presentation orders counterbalanced across subjects

- Eye-tracker recordings:
  ASL, model 504 eye-tracker
  60 Hz sampling rate

Figure/Ground **Scenes**

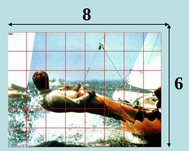
people objects people objects

pleasant

neutral

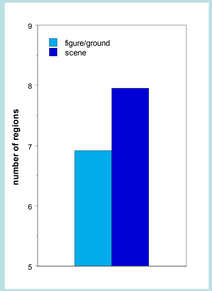
unpleasant

Number of regions

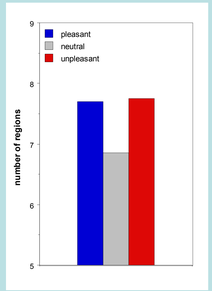


•For data analysis, a 8x6 matrix (48 cells) was imposed over each picture in order to identify 48 regions. Subsequently, the number of different regions looked at during each picture presentation was determined.

main effect Perceptual Type

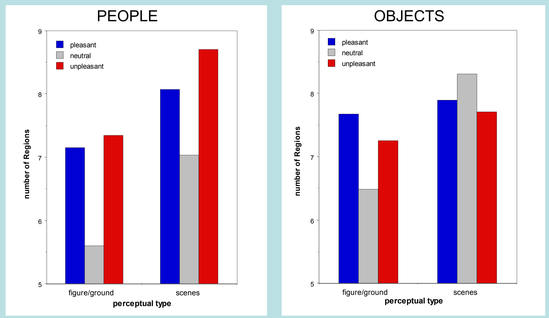


main effect Valence



A significantly larger number of different regions were explored when viewing more complicated scenes compared to when viewing simpler figure/ground pictures. Moreover, a significant main effect of hedonic valence, showed a greater number of different regions explored when subjects were looking at emotional (either pleasant or unpleasant), compared to neutral pictures. A significant interaction indicated that emotion had a larger impact on the number of regions explored when subjects viewed simpler images.

Interaction Perceptual Type * Valence



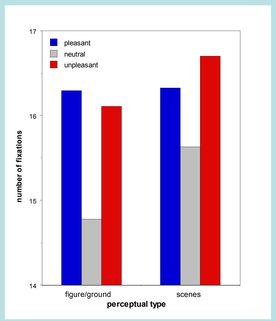
A 3-way interaction between valence, content and perceptual type indicated, however, that emotion had strong effects on the number of regions explored for both simple and complex pictures when people were depicted. For objects, hedonic valence only affected simpler figure-ground pictures.

Number of fixations

•A fixation was computed as the mean eye position coordinates (x and y) over a minimum period of time (100 ms) during which the gaze continuously remained within 1 degree of visual angle.

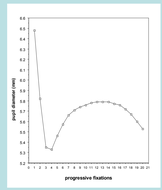
Significantly more fixations (regardless of region) were made when looking at emotional pictures. A significant interaction of valence and type indicated that more complicated scenes generally prompted more fixations, but not for pleasant pictures.

Interaction
Perceptual type * Valence



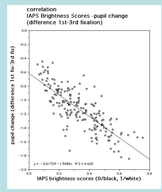
Pupil diameter change

Pupil diameter change
during 1st 20 fixations



•Following picture onset, the pupil diameter dramatically decreased, due to the reflexive light response to increased illumination.

Correlation
IAPS brightness scores - pupil diameter change
(difference 1st, 3rd fixation)

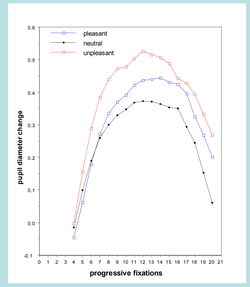


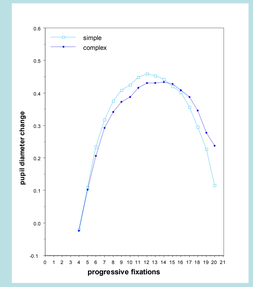
•Confirming this, the amount of change in the pupil from the first to third fixations correlated highly with the brightness of the picture.

A 3-way interaction between valence, content (people or objects) and fixation (time) indicated strong effects of emotion on pupil diameter viewing pictures containing people: both pleasant and unpleasant pictures prompted more dilation than neutral. For objects, however, only unpleasant pictures led to increased pupil diameter.

•To adjust for the light reflex, pupil diameter change was computed using the maximum light reflex (i.e., 3rd fixation) as the baseline.

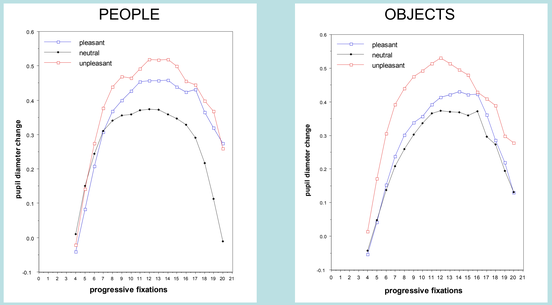
Interaction Time * Valence Interaction Time * Percept. Type, n.s.





Pupil diameter significantly increased (dilated) with picture emotionality. On the other hand, pupil diameter did not change as a function of whether pictures were scenes or simple figure/ground. A 2-way interaction between fixation (time) and valence indicated that pupil dilation occurred earlier for unpleasant pictures, with pleasant pictures showing an effect later in the interval. The same effects were obtained when picture brightness was used in an ANCOVA.

Interaction Valence * Content



CONCLUSIONS :

Both perceptual complexity and hedonic valence affected the way people looked at affective pictures: The number of different regions explored and the number of eye fixations increased for pictures that were more perceptually complex or more emotional.

Pupil diameter, on the other hand, only reflected picture emotionality. For pictures of people, pupil dilation was greater for pleasant and unpleasant, compared to neutral, pictures. For objects, on the other hand, only unpleasant pictures led to greater dilation. In general, affective pictures involving people prompt greater physiological response than those involving objects.

Taken as a whole, these results suggest that that both emotion and perceptual qualities of pictures affect eye behavior, while hedonic valence specifically affects the pupillary response.

	mean	median	std.dev.	max
Num. Regions	7.31	7	2.83	18
Num. Fixations	15.85	17	4.81	29
Pupil diameter	5.70 mm	5.74 mm	0.38 mm	6.74