

PERCEPTION

VOLUME 41 SUPPLEMENT

E	C	V	P	2	0	1	2
C	□	□	□	□	□	□	□
V	□	□	□	□	□	□	□
P	□	□	□	□	□	□	□
2	□	□	□	□	□	□	□
0	□	□	□	□	□	□	□
1	□	□	□	□	□	□	□
2	□	□	□	□	□	□	□

ECVP 2012

35th European Conference on Visual Perception

2 – 6 September 2012, Alghero – Italy

Abstracts

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However as attention to emotional faces increases, less socially anxious individuals may be better able to discriminate a genuine emotional threat than those with high social anxiety.

◆ **Just passing through: lack of IOR in planned saccade sequences**

³¹ W J MacInnes, H Krueger, A Hunt (University of Aberdeen, UK; e-mail: j.macinnes@abdn.ac.uk)
Responses tend to be slower to previously attended spatial locations. This is known as Inhibition of Return (IOR). We compared IOR for intermediate locations along planned and unplanned saccade sequences. Sequences of two saccades were instructed using a colour-based verbal cue. In the planned condition all the saccade target colours were visible before the saccade sequence began. In the unplanned condition, the second colour did not reveal itself until after the first saccade was initiated. Following the sequence a probe was presented at the first saccade target location or a control location. With saccadic responses to probes, IOR was observed only when saccade sequences were unplanned. IOR was absent for planned saccade sequences. IOR was also predominantly observed when probes appeared soon after the saccade sequence, and was absent later. When we repeated the experiment with manual responses to probes, IOR was absent in both planned and unplanned sequences. The results show that intermediate locations along a pre-planned sequence are not inhibited. When the sequence cannot be planned in advance, intermediate locations are inhibited, but this inhibition appears to be transient and stronger for saccadic responses, suggesting a motor rather than attentional locus.

◆ **Qualitative differences between attention capture by conscious and unconscious cues**

³² I Fuchs¹, J Theeuwes², U Ansorge¹ (¹University of Vienna, Austria; ²Vrije Universiteit Amsterdam, Netherlands; e-mail: isabella.fuchs@univie.ac.at)
Classical attention theory assumes exogenous capture of attention by unconscious cues and endogenous capture by conscious cues. Here we tested the classical view by varying cue visibility. In experiment 1, we demonstrate that unpredictable cues (equally likely at target position and away from the target) lead to capture. With conscious cues, attention capture was restricted to endogenously fitting cues: If the participants searched for black targets, black but not white cues captured attention, and this pattern reversed if white targets were searched for. By contrast, with unconscious cues, capture was equal for searched and unsearched contrast-cues. In experiment 2, we used antipredictive cues: After 75% of the right cues, the target was on the left and after 75% of the left cues the target was on the right. Here, participants endogenously directed attention towards the opposite side of the conscious but not of the unconscious cue. Together, the findings support the classical view.

◆ **Visual word recognition in latvian children with and without reading difficulties**

³³ E Kassaliete¹, E Megne¹, I Lacis¹, S Fomins² (¹University of Latvia, Latvia; ²Institute of Solid State Physics, Latvia; e-mail: sergejs.fomins@gmail.com)
In Latvia approx. 15–20% of school-aged children are with reading difficulties. Latvian is complicate language and cause of poor reading has not been studied. There are many neural processes which participate in text decoding during reading. The aim of the study was to determine differences in visual word recognition for children with and without reading difficulties. Fifty-two children from Grade 3 ($n=22$) and Grade 4 ($n=30$) took part in the study. Using a modified One minute reading test, children were divided in two groups—with and without reading difficulties. The stimulus set for word recognition contained 150 words. The length of the words varied from four to ten letters. Each word was shown on a computer screen for 500 ms. The answers were expected verbally. Correct and incorrect answers were recorded. Each word length was shown 15 times. Letter size corresponded to 6 cycles/ degree. Data of correctly named words for children with and without reading difficulties were significantly different ($p<0.05$) in both groups for all word lengths. The study confirms that children with reduced reading speed use letter-by letter reading pattern, when normal reading children use parallel letters activation. Word recognition and processing speed improves with age and lexical experience.

◆ **Averaging of simultaneous instances of familiar and unfamiliar faces**

³⁴ A Marchant¹, X Van Montfort², J De Fockert³, R Jenkins² (¹London South Bank University, UK; ²University of Glasgow, UK; ³Goldsmiths, University of London, UK; e-mail: alex.marchant@gmail.com)

There is growing evidence that faces are represented in terms of a summary description based on shared features of multiple, previously seen faces. This phenomenon has been reported for multiple faces that have been processed either sequentially (eg Burton, Jenkins, Hancock, and White, 2005 *Cognitive Psychology* **51** 256–284) or simultaneously (eg De Fockert, and Wolfenstein, 2009 *Quarterly Journal of*

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◆ **A study to evaluate peripheral visual perception**

38 I Timrote, G Krumina, T Pladere, M Skribe (Dept of Optometry and Vision Science, University of Latvia, Latvia; e-mail: Gunta.Krumina@lu.lv)

There are disorders linked to M, P visual pathways that can be improved until certain age (Parrish et al, 2005 *Vision Research* **45** 827–837). For this reason we are developing a method to evaluate peripheral visual perception. An individual has to count a specific letter from a set of letters on white background, in lines or in squares in central visual field and no noise, five times five or ten times ten black dots in peripheral visual field. Additional peripheral stimulus in different size appears during the task. Time needed to accomplish the counting is statistically significant for two of the individuals ($p < 0.05$)—it takes more time to count letters in white central background comparing with letters in squares or in lines. A black stimulus should be in size of 4 cm and green, red or blue stimulus in size of 2 cm for a figure to be distinguished in the peripheral visual field. Three individuals did not notice any of the peripheral stimuli. Therefore our method can be used to evaluate peripheral perception hence trying to look for a problem in visual pathways, although we have to make some improvements to adapt these tests for children.

◆ **The effects of temporal cueing on metacontrast masking**

39 S Mota, M Bruchmann (Institute for Biomagnetism and Biosignalanalysis, Germany; e-mail: Maximilian.Bruchmann@uni-muenster.de)

Temporal information can induce expectations about when a given event will occur; expectations that facilitate perception by selectively directing attentional resources to discrete moments in time (temporal orienting effect). A temporal analog to the standard spatial cueing paradigm was used to examine the effects of temporal attention on the perception of briefly presented visual stimuli in a metacontrast masking paradigm. Subjects rated the visibility of a target stimulus that was followed by a mask after various stimulus onset asynchronies. In two separate runs subjects were made to expect the target either after 100ms or 1s. In some instances, however, the subjects' expectations were violated by presenting the target earlier or later than assumed. We observed cueing effects in the form of higher visibility when the target appeared at the expected point in time compared to when it appeared too early. Unlike spatial cueing effects on metacontrast masking reported in the literature, these effects were not restricted to the late branch of the masking function, but enhanced visibility over its complete range. These results suggest that the neural subsystems involved in temporal attention differ from those involved in spatial attention.

◆ **Neural activity in category-selective regions is modulated by both subjective and physical disappearance**

40 A Loing, R van Lier, A Koning, F de Lange (Radboud University Nijmegen, Donders Institute for Brain, Cognition and Behavior, Netherlands; e-mail: floris.delange@donders.ru.nl)

Although it is well-known that early visual areas can contain stimulus representations in the absence of subjective awareness, it is more controversial whether high-level visual areas such as the fusiform face area (FFA) and parahippocampal place area (PPA) are driven by physical stimulus properties or subjective perception. We examined whether physical and/or subjective disappearance of face and house stimuli modulated the neural activity in FFA and PPA, using a contrast decrement technique. Nine participants participated in an fMRI experiment. On each trial, the participants were shown a face or house stimulus, after which the stimulus was either removed (physical disappearance) or its contrast was reduced, leading to subjective disappearance of the stimulus in a proportion of trials (on average, 53%). Category-selective neural activity in FFA and PPA was lower during physical disappearance, in the context of equal subjective experience. It was also lower during subjective disappearance, in the context of equal physical stimulation. Together, these results demonstrate that neural activity in category-selective higher-order visual regions is not solely determined by the subjective experience of perceiving the category, but rather represents sensory evidence for its category, on the basis of both physical stimulus characteristics and subjective experience.

◆ **Eye movement behaviour to natural scenes as a function of sex and personality**

41 F Mercer Moss, R Baddeley, N Canagarajah (University of Bristol, UK; e-mail: f.mercermoss@bristol.ac.uk)

Women and men are different. As humans are highly visual animals, these differences should be reflected in the pattern of eye movements they make when interacting with the world. We examined fixation distributions of 52 women and men while viewing 80 natural images and found systematic differences

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demonstrate a perceptual illusion in which the center of a spatially extended target is mislocalized as a function of its 2D orientation. Observers visually aligned a small dot with the center of an oriented target (an elongated elliptical shape). There was a large misalignment when the target axes were oriented away from the cardinal directions; the size of the misalignment was a function of object orientation and as large as 15% of the major object axis length. However, average landing positions for single saccades made to the object from the comparison dot showed no similar mislocalization bias. Furthermore, perceptual mislocalization varied as a function of the eye-movement/fixation task: fixating the comparison dot when doing the alignment yielded the largest bias, followed by free scanning. The lowest errors were obtained when the oriented target itself was fixated. Taken together, the results suggest that eye movement programming has access to the true center of an object even in situations where its perceptual location cannot be accurately determined. The results bear on the debate regarding differing representations for visual judgments and visually-guided motor actions.

◆ **Why you are more likely to see a snail move if it is surrounded by grasshoppers: Influence of the prior assumption of stationarity on saccadic suppression**

162 M Duyck, M Wexler, T Collins (Université Paris Descartes, France;
e-mail: therese.collins@parisdescartes.fr)

Object displacement often goes unnoticed when it happens around the beginning of a saccade. It has been suggested that this phenomenon, saccadic suppression, results from a combination of three sources of information: retinal, extra-retinal, and the assumption that the world is stable during eye movements. Here, we investigated this issue experimentally using a classic saccadic suppression paradigm. We manipulated the prior assumption stationarity by varying the probability of target displacement around the saccade in two conditions: in the unstable condition, the target jumped on every trial whereas in the stable condition, those jumps occurred on only 25% of the trials. The subjects' task was to maintain fixation on the target and to follow its first displacement, then to report the direction of the second displacement in a 2AFC procedure. Results indicate that saccadic suppression increases in the stable condition compared to the unstable one: subjects are worse at detecting target displacements around the beginning of the saccade when target displacement is rare, than when the target always shifts during saccades. Thus, visual stability mechanisms seem to take into account knowledge regarding the stability of the world, knowledge that can be updated during the course of a two-hour experiment.

◆ **Peripheral spatial frequency processing affects timing and metrics of saccades**

163 J Laubrock, A Cajar, R Engbert (University of Potsdam, Germany;
e-mail: laubrock@uni-potsdam.de)

The visual acuity gradient with eccentricity and cortical magnification suggests a specialization of foveal vision for high-acuity analysis and peripheral vision for orienting and target selection. How does this specialization affect eye movements? We used Gaussian-envelope gaze-contingent filtering of spatial frequencies in natural scenes and colored-noise images to investigate influences of level-of-detail on saccade amplitudes and fixation durations in free-viewing and search tasks. Filter characteristic (low-pass vs high-pass), filter location (foveal vs peripheral), and filter size were independently varied. Spatial results reveal a preference for targeting regions in the region that was unfiltered during the current fixation, and an additional influence of filter characteristic. Surprisingly, temporal results indicate that peripheral information does play a role in controlling fixation duration. Task influences are mainly visible in how the filter characteristic affects the evolution of durations and amplitudes over the course of the trial. We conclude that both foveal and peripheral vision contribute to how and when we move our eyes.

◆ **Effect of perceptual grouping by similarity on eye movements in processing simple visual stimuli**

164 I Lacis, I Laicane, J Skilters (University of Latvia, Latvia; e-mail: ivars.lacis@lu.lv)

In the present study we analyzed the impact of grouping by similarity on saccadic processing of simple sequential stimuli. We used four sets of stimuli: (1) points, (2) points, triangles, squares, and rhombs (two or more figures of the same shape were followed by two or more figures of a different shape), (3) the 2nd set of stimuli colored according to the shape, and (4) the 2nd set of stimuli with a colored background according to the shape. Stimuli were distributed in the same distance from each other and the size of stimuli was equant. In measuring saccadic amplitudes and stability of gaze during fixations we observed increasing processing load in grouping stimuli. This is reflected in (a) increase of standard deviations of amplitude dispersion in the tasks with grouping effects (additionally the distribution of saccadic

amplitudes is significantly higher in stimuli with grouping effects); (b) increase of small saccades in the grouping tasks, (c) a systematic increase of the amplitude of microsaccades within a fixation time. These observations enable us to confirm two general assumptions: a. the grouping significantly influences saccadic processing of simple visual stimuli, b. the complexity of grouping is reflected in complexity of saccadic processing.

◆ **Eye movement deficits in neglect dyslexia**

165 S Primativo¹, L S Arduino², M De Luca³, R Daini⁴, M Martelli¹ (¹Dept of Psychology, Sapienza University of Rome, Italy; Neuropsychology Unit, IRCCS Fondazione Santa Lucia, Rome, Italy; ²LUMSA University, Rome, Italy; ISTC-CNR, Rome, Italy; ³Neuropsychology Unit, IRCCS Fondazione Santa Lucia, Rome, Italy; ⁴Dept of Psychology, University of Milano-Bicocca, Milan, Italy; e-mail: silvia.primativo@uniroma1.it)

Neglect Dyslexia (ND) is an acquired reading disorder often associated with right-sided brain lesions and Unilateral Spatial Neglect (USN). In reading aloud single words patients with ND produce left-sided errors. The reported dissociations between USN and ND suggest that the latter can be interpreted as a selective reading deficit distinct from USN. We analyzed eye movements in USN patients with and without ND (respectively ND+ and ND-) and in a group of controls (right brain-damaged patients without USN) comparing a reading aloud task and a saccadic task (left-right saccade test). Only ND+ patients did left-sided errors and showed an impaired behavior in saccade execution both in reading and in the saccadic tasks. Finally, in a speeded reading-at-threshold experiment, that doesn't allow for eye movements, ND- patients, but not controls, did left-sided errors. Our results indicate that ND+ patients have an impaired eye movement pattern in addition to their spatial attention disorder that exposes the neglect gradient in reading, ND- patients show the same gradient in reading errors when eye movements are prevented. We conjecture that ND rather being a dissociated disorder is the result of the USN syndrome when the fine eye movements required in reading are compromised.

◆ **Reading parallel texts—augmentation and eye movements**

166 G Brelstaff¹, F Chessa², L Lorusso², E Grosso² (¹CRS4, Italy; ²University of Sassari, Italy; e-mail: gjb@crs4.it)

The experience of reading translated texts can be augmented by presenting parallel texts, of the source and translation, side-by-side on the page. On screen those texts can be made to dynamically reveal correspondences between their words and phrases (Chessa and Brelstaff, Proceedings of CHIItaly, ACM, 2012). We attempt to assess the utility of such methods by monitoring the reader's eye movements, with and without augmentation—using a Tobii TX300 tracker. The literature on eye movements and reading (eg Rayner *Psychological Bulletin*, 1998; Schultz et al 2001 *Journal of Vision*) has little to say on parallel text appreciation: Nevertheless, a greater number of fixation regressions is a likely consequence of switching gaze between columns of parallel texts. Our results indicate if regression rates improve with augmentation—via on-screen dynamic colour highlighting. We also report variations occurring for the task of reading-while-listening (Levy-Schoen 1981) to the text in either language.

◆ **Post-saccadic location judgments after presentation of multiple target-like objects**

167 S Ohl¹, S Brandt², R Kliegl³ (¹Berlin School of Mind and Brain, Germany; ²Charité Universitätsmedizin Berlin, Germany; ³University of Potsdam, Germany; e-mail: svenohl@uni-potsdam.de)

In the present study we examine how the interplay between oculomotor error, secondary (micro-)saccades and available visual information affect post-saccadic location judgments when multiple target-like objects are presented during post-saccadic fixation. During saccade flight the screen presenting the target was replaced by a screen with 63 target-like objects presented horizontally side by side. Subjects were asked to fixate the target and to indicate via mouse click the object they assume to be identical with the pre-saccadic target. Each subject participated in two sessions which differed with respect to whether or not a blank period of 200 ms was inserted between saccade initiation and presentation of the target array. Contrary to our expectation, preliminary analyses did not reveal significantly different location judgments between the blank and no-blank condition. Nevertheless, inserting a blank significantly influenced oculomotor behavior by decreasing the number of secondary (micro-)saccades during an early time window. When subjects generate a post-saccadic eye movement, they strongly tend to choose the object which is fixated after the post-saccadic eye movement. Results are discussed with respect to current mechanisms proposed to underlie the perception of a stable visual world.