
3rd Iberian Conference on Perception
8-10 July 2009 Guimarães, Portugal

Universidade do Minho

3rd Iberian Conference on Perception

Abstracts Book

8th-10th, July 2009
Guimarães (Portugal)

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Preface

Dear colleagues,

It was with great pleasure that we organized the 3th Iberian Conference on Perception in Azurém, Guimarães. This conference represents a joint effort to bring close together Spanish and Portuguese researchers in the different areas of human perception.

This edition takes place in the grounds of the Azurém campus of the University of Minho and has the special support of the Computer Graphics Centre which hosts the conference in its modern facilities.

The program of this edition is diverse and encompasses fundamental, applied, and clinical aspects of research in several aspects of human perception. We will also have the opportunity to visit the Laboratory of Visualization and Perception, a large facility for visualization and precise psychophysics recently implemented in the Centre of Computer Graphics.

We wish you all a great conference!

The Organizing Committee

Committees

Organizing Comittee

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- Jorge A. Santos, Ph.D.
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- Soledad Ballesteros, Ph.D.
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- Luis Enrique Lopez Bascuas, Ph.D.
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Caixa Geral
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Programme

Wednesday, 8th July

8:30-9:00 Wellcome Desk Open.

9:00-9:30 Opening of the Symposium.

Symposium 1

Biological Motion

Moderator: **Jorge A. Santos.**

9:30-10:30 ***Recognition of body motion: from visual sequence analysis to structured dynamic motor representations***. Martin Giese. (Invited speaker)..... [**BM1**]

10:30-11:00 **Coffe break.**

11:00-11:20 ***Multimodal perception and action in biological motion***. J.A. Santos, S. Mouta, C. Mendonça, J. Ferreira. ..... [**BM2**]

11:20-11:40 ***Translational biological motion stimuli for perceptual research***. B. Aragão, L. Fontes, R. Pereira, J.A. Santos, E. Soares, M.V. Correia. ..... [**BM3**]

11:40-12:00 ***Neural correlates of 2D and 3D biological vs non-biological object perception: psychophysics, and neurophysiology***. B. Graewe, R. Farivar, P. Weerd, M. Castelo Branco. graewe..... [**BM4**]

12:00-12:30 **Visit to the laboratory of visualization and perception.**

12:30-14:30 **Lunch.**

Symposium 2

Visual Illusions and Complexity

Moderator: **Enric Munar.**

14:30-14:45 ***Illusions and illusionists: how to fool the brain with magic and other tricks***. S. Martínez-Conde. ..... [**VIC1**]

14:45-15:00 ***Visual complexity and beauty***. M. Nadal, E. Munar. ..... [**VIC2**]

15:00-15:15 ***Adjustment strategies in the Vertical-Horizontal illusion***. J.E. García-Albea, D. Rivera, J.M. Gavilán, M. Guasch, J. Demest. ..... [**VIC3**]

15:15-15:30 ***What drives the first dominance phase in binocular rivalry?***. M. Blanco, F. Valle-Inclán, J. Corral, I. Serrano-Pedraza. . . . . [**VIC4**]

15:30-15:45 ***Illusory reverse-motion caused by converging moving objects***. A. Maiche, R. Budelli, L. Gómez-Sena. . . . . [**VIC5**]

15:45-16:00 ***Three factors in visual complexity***. E. Munãr, M. Nadal. . . . . [**VIC6**]

16:00-16:30 **Coffe break.**

Symposium 3

Visual Perception

Moderator: **Miguel Castelo-Branco.**

16:30-16:45 ***Ambivalence and ambiguity in facial expression of emotions***. M.F. Cahill, L.A. Aguilar. . . . . [**VP1**]

16:40-17:00 ***Modulation of perceptual processing by the affective meaning of faces: an ERP (event-related potentials) study***. B. Valdés-Conroy, L. Aguado, T.D. Risco, S. Rodríguez, F.J. Román. . . . . [**VP2**]

17:00-17:15 ***Neural correlates of ambiguous face detection***. J. Castelhano, J. Rebola, E. Rodríguez, B. Grawe,M. Castelo-Branco. . . . . [**VP3**]

17:15-17:30 ***Perception of radial motion relies on detecting spatial displacements***. C. de la Malla, J. López-Moliner. . . . . [**VP4**]

17:30-19:00 **Posters and reception.**

THURSDAY, 9TH JULY

9:00-9:30 Wellcome Desk Open.

Symposium 4

Colour Vision

Moderator: **Julio Lillo.**

9:30-10:30 ***Colour categories in infancy and early childhood***. Anna Franklin. (Invited speaker). [**CV1**]

10:30-11:00 **Coffe break.**

11:00-11:15 ***A categorical colour effect in the brown-orange boundary***. J. Lillo, A. Al-Rasheed, H. Moreira. . . . . [CV2]

11:15-11:30 ***The relationship between categorical colour perception and shift towards prototype***. I. Davies, E. Özgen. . . . . [CV3]

11:30-11:45 ***Colour categorical perception and colour metrics***. O. Wright. . . . . [CV4]

11:45-12:00 ***Category training affects colour discrimination***. G.V. Drivonikou, A. Clifford, A. Franklin, E. Özgen, I. Davies. . . . . [CV5]

12:00-12:20 ***Chromatic diversity of indoor scenes rendered with CIE illuminants and white LEDs***. J.M.M. Linhares, P.E.R Felgueiras, P.D. Pinto, S.M.C. Nascimento. . . . . [CV6]

12:30-14:30 **Lunch.**

Symposium 5

Temporal Aspects of Perception

Moderator: **Joan López-Moliner.**

14:30-14:45 ***The role of temporal processing and feedback in visual attention and awareness***. S.L. Macknik. . . . . [TAP1]

14:45-15:00 ***Reaction time used as a mean to asses perceptual latencies in cortical motion processing***. L. Gomez-Sena, R. Budelli, A. Maiche. . . . . [TAP2]

15:00-15:15 ***Physiological influences on the rate of subjective time - the case of hypercapnia***. D.T. Field, C. Whyborn, C.A. Scott. . . . . [TAP3]

15:15-15:30 ***Time in motion: speed channels and the colour-motion asynchrony***. J. López-Moliner, D. Linares. . . . . [TAP4]

15:30-16:00 **Coffe break.**

Symposium 6

Touch: behavioral data and brain activations

Moderator: **Soledad Ballesteros & José Manuel Reales.**

16:00-16:20 ***A descriptive model of horizontal gradient and oblique effect in the haptic parallelity task***. M. Fernández, D. Travieso. . . . . [TBDBA1]

16:20-16:40 ***The haptic horizontal-vertical illusion across adulthood***. M.A. Heller, J. Mayas, J.M. Reales, S. Ballesteros. . . . . [TBDBA2]

16:40-17:00 ***Neural correlates of textured stimuli using a discrimination task: An electrophysiological study***. F. Muñoz, M. Sebastián, J.M. Reales, S. Ballesteros. ..... [**TBDBA3**]

17:00-18:00 **Posters.**

20:00-23:00 **Banquet.**

FRIDAY, 10TH JULY

9:00-9:30 Wellcome Desk Open.

Symposium 7
Hearing and Speech
Moderator: **Luis Enrique Lopez Bascuas.**

9:30-10:30 ***The role of acoustic scale in the perception of musical notes and instruments***. Roy Patterson. (Invited speaker). ..... [**HS1**]

10:30-11:00 **Coffe break.**

11:00-11:15 ***Auditory discontinuities and the perception of vowel height in spanish back vowels***. L.E. López-Bascuas. ..... [**HS2**]

11:15-11:30 ***Psychoacoustical verification of current theories on the generation of human distortion product otoacoustic emissions***. E.A. Lopez-Poveda, P.T. Johannesen. . [**HS3**]

11:30-11:45 ***Vowel formant structure and speaker identification. A perceptual study***. M.J. Albalá, E. Battaner, J. Gil, J. Llisterri, M. Machuca, V. Marrero, C. de la Mota, M. Marquina, A. Ríos. ..... [**HS4**]

11:45-12:00 ***Asymmetry in Auditory Priming: Evidence from the Perception of Words, Sounds, and Talkers***. J.G. Alvarez, C.T. McLennan. ..... [**HS5**]

12:00-12:30 **Business meeting & closing.**

12:30-14:30 **Lunch.**

Poster Sessions

17:30-19:00 Wedsnesday, 8th July.

17:00-18:00 Thursday, 9th July.

Psychophysical correlates of bias in decision-making. J.L. Pardo-Vázquez, I. Padrón, J. Fernández-Rey, V. Leborán, C. Acuña. . . . . [**P1**]

Does illusory surface inclination affect eye movements?. L.P. Zapata, A. Aznar-Casanova H. Sùper. . . . . [**P2**]

How does illusory surface inclination affect the accuracy of orientation judgements?. L.P. Zapata, M. Moreno, H. Sùper, A. Aznar-Casanova. . . . . [**P3**]

The position of a reference matters when judging egocentric distances. R. Sousa, E. Brenner, J.B.J. Smeets. . . . . [**P4**]

Classification of face gender and expression in different spatial frequency bands. L. Aguado, S. Rodríguez, F.J. Román, I. Serrano-Pedraza. . . . . [**P5**]

Facilitation of object recognition: an effect of contextual cueing. M. van Asselen, J. Sampaio, M. Castelo-Branco. . . . . [**P6**]

Perceptual learning in humans: the use of same/different tasks. P.P. Faria, P.B. Albuquerque. . . . . [**P7**]

An exploratory study of diverse methodological factors related with the perception of beauty. P. Bustos, J. Christensen, N. Gut, A. Flexas, M. Nadal, E. Munar. . [**P8**]

The neural bases of the perception of beauty: differences and similarities between men and women. A. Flexas, J. Christensen, N. Gut, M. Nadal, P. Bustos, E. Munar. . . . . [**P9**]

Eye movement patterns during the scanning of emotional images. R. Cabestrero, P.Quirós, A. Crespo, P.A. Conde-Guzón. . . . . [**P10**]

Exploratory eye movements and the Müller-Lyer Illusion. A. Díaz, M.P. Aivar, D.M. Jacobs. . . . . [**P11**]

What fixations reveal about perceptual styles. M.S. Puig, L.P. Zapata, A. Aznar-Casanova, H. Super. . . . . [**P12**]

Learning to listen through another person's ears: a study of learning curves using non-individualised head-related transfer functions. J.A. Santos, C. Mendonça, C. Murteira, J.P. Ferreira, P. Dias, G. Campos. . . . . [**P13**]

Abstracts-Oral Sessions

Wednesday, 8th July

Recognition of body motion: from visual sequence analysis to structured dynamic motor representations

BM1

M.A. Giese[1]

[1]*Deptartment of Cognitive Neurology, Hertie Institute for Clinical Brain Research & CIN, Tübingen, Germany.*

The recognition of biological motion and actions integrates processes at multiple cortical levels. On the one hand, and consistent with physiologically inspired neural models, accumulating evidence suggests a critical influence of the visual processing of temporal sequences of form and motion patterns. On the other hand, a huge literature has emerged showing influences of motor representations on the visual recognition of imitable actions. The exact relationship between these different representations remains largely unknown. We will first show how learning-based visual processing mechanisms account not only for the processing of biological motion stimuli, but also for the recognition of goal directed actions, at the same time reproducing critical visual tuning properties of 'mirror neurons' in premotor cortex. We then show that biological motion recognition is influenced by concurrently executed motor behavior in a spatio-temporally highly selective manner. This indicates the existence of highly structured interactions between dynamic representations for the recognition and execution of motor behavior. We finally show how constraints, potentially resulting from the motor control of complex full-body movements, can be exploited for a detailed study of critical features that determine the perception of emotions from body movement.

Supported by HFSP, DFG, EC FP6 project COBOL and FP7 project SEARISE, and the Hermann und Lilly Schilling Foundation.

BM2 Multimodal Multimodal perception and action in biological motion

J.A. Santos[1], S. Mouta[1], C. Mendonça[1], J. Ferreira[2]

[1]*Deptartment of Psychology, University of Minho, Portugal.*

[2]*Deptartment of Industrial Electronics, University of Minho, Portugal.*

Most of the studies on biological motion perception are concerned with recognition issues and visual-only inputs. However, perceptual cues from several modalities and action related tasks are critical and common in everyday life situations. Here we present two research approaches, one on multimodal perception (visual and auditory) and the second on the role of observers' movement. In an audiovisual biological motion experiment, we found that sound strongly affects our final multimodal direction judgements. We used point-light-walkers with a strong bias in order to be perceived as walking towards the observer. We then combined these stimuli with congruent looming or receding auditory steps. In the audiovisual condition, we found that the bias was eliminated. In a time-to-passage (TTP) estimation experiment, a self-based TTP judgment between an external visual object and the observer was studied in static and walking conditions. Walking observers were more accurate and prompt to estimate time-to-passage when compared with static ones. In summary, both multimodal cues and action seems to play a relevant role in achieving accurate biological motion perception.

Translational biological motion stimuli for perceptual research BM3

B. Aragão[1], L. Fontes[1], R. Pereira[1], J.A. Santos[1], E. Soares[2], M.V. Correia[2,3]

[1]*Universidade do Minho, Instituto de Educação e Psicologia.*

[2]*Universidade do Porto, Faculdade de Engenharia.*

[3]*Instituto de Engenharia de Sistemas e Computadores.*

Since the studies of Johanson in 1973 the standard stimulus for biological motion perception has been the Point-Light Walker (PLW). This consists of a pattern of moving dots with the common translational component removed as if the target person was walking on a treadmill. The translational motion component has remained as a matter of interest only for researchers on biomechanics and its applications in fields such as rehabilitation, sports training or virtual actors design. Nevertheless, there are specific features of the translational path that may be useful for our visual system in several tasks like recognition, motion perception and action control. In this communication, we will highlight visual relevant features of the translational component in biological motion and we will address motion capture conceptual and methodological issues.

BM4 Neural correlates of 2D and 3D biological vs non-biological object perception: psychophysics, and neurophysiology

B. Graewe[1,2], R. Farivar[3], P. de Weerd[2], M. Castelo-Branco[1]

[1]*IBILI, Faculty of Medicine, Coimbra, Portugal.*

[2]*Department of Cognitive Neuroscience, Faculty of Psychology, University of Maastricht, The Netherlands.*

[3]*McGill University, Canada.*

Event related potential studies can provide important insights into the understanding of how and when the human brain differentiates between visual stimulus categories. Here, we ask the question whether ERP components related to object recognition show category specific responses. Many studies have concluded that faces elicit such category specific responses, based on the demonstration of a 'face-specific' negative ERP potential termed the 'N170', which is more pronounced for faces than for other visual stimuli. In the present study (8 participants), using static stimuli (photographs of faces and chairs and mooney faces) and manipulating their salience by different levels of masking, we found that the amplitude of the N170 could be modulated by the saliency of the stimuli. Hence, whether the N170 of faces was larger than for non-faces simply depended on the saliency level of the stimuli. Additionally, using structure-from-motion (SFM) defined face and chair stimuli, we found an object-related negative peak at 250 ms whose amplitude could be modulated by varying depth of the respective stimulus categories ('flattening' the stimuli leading to increasingly smaller amplitudes)). Moreover, a comparison between stimulus categories (faces, chairs and coherent motion) revealed that the N250 peak has a significantly larger amplitude for SFM chair stimuli than for SFM face stimuli (even for normal/optimized depth values in the two categories) and hence failed to show a face-specific effect. The object-sensitive N250 elicited by the SFM stimuli peaked around 80 ms later compared to the N170 in the static face condition, which can be well explained by a perceptual delay in perceiving SFM stimuli, i.e. the time needed in order to detect an object from the moving dot pattern. We therefore speculate that the N250 we found for SFM stimuli is a perceptual analogue of the N170 for static faces. Support for this claim comes from our finding that the N170 for static faces/chairs can also be shifted depending on the exact time of their presentation (in an experimental condition in which static stimuli become detectable later in the stimulus period, simulating the SFM condition). Taken together, these findings demonstrate a strong dependence of object-related ERP signals on depth/saliency of the respective stimulus category and a lack of an unambiguous relationship between the amplitude of object-sensitive ERP components and object categories.

VIC1 Illusions and illusionists: how to fool the brain with magic and other tricks

S. Martínez-Conde[1]

[1]*Barrow Neurological Institute, Phoenix, United States.*

All our life, every object we see, every person we know and every incident we experience, are just the product of our imagination. Each and every one of our thoughts and feelings are the result from brain processes, and not necessarily the result of an event in the real world. The same neural machinery that interprets the sensory inputs also creates our thoughts, imaginations and dreams; thus the world we experience and the world we imagine have the same physical bases in the brain. Just as physicists study the most minute subatomic particles and the largest galactic conglomerates to understand the universe, neuroscientists must examine the cerebral processes underlying perception to understand our experience of the universe. Visual illusions are one of our most important tools to understand how the brain builds our experience of reality. Likewise, the principles developed by magicians and illusionists throughout history can be very useful to manipulate attention and awareness in the laboratory. I will discuss how the visual and cognitive illusions developed by artists and magicians can be applied to the study of the neural bases of consciousness and perception.

Visual complexity and beauty VIC2

M. Nadal[1], E. Munar[1]

[1]*Human Evolution and Cognition. Associated group to IFISC (UIB-CSIC).*

The influence of complexity on aesthetic preference and the appreciation of beauty has been noted since Classical Antiquity. However, the scientific formulation of this influence dates to the late nineteenth and early twentieth centuries, with the birth of empirical aesthetics. Although the influence of complexity on the appreciation of beauty became pivotal in Daniel Berlyne's Psychobiological Aesthetics framework, empirical studies attempting to determine the nature of this relation have produced divergent results. Whereas in some instances the inverted-u function posited by Berlyne was found, in many other cases an ascending or descending linear relation resulted from the experiments. We will argue here that this discrepancy owes to differences in the way the concept of complexity has been defined and operationalized. Based on the notion that there are several different aspects of complexity, one related with the amount of elements in the stimulus, another with the organization of those elements, and another with symmetry, we obtained curve fit measurements for ratings of 60 images on a beauty scale and three complexity factors (amount of elements, organization, and symmetry). Results showed that these different forms of complexity had different effects on the appreciation of beauty. Whereas rated beauty increases linearly with the amount of elements, it had a u-shaped relation with organization, and an inverted-u relation with symmetry. We conclude from these results that a general concept, one that does not distinguish among these three aspects, is unsuited for studying the effects of visual complexity on people's appreciation of beauty.

VIC3 Adjustment strategies in the Vertical-Horizontal illusion

J.E. García-Albea[1], D. Rivera[1], J.M. Gavilán[1], M. Guasch[1], J. Demest[1]

[1]*Dept. of Psychology/CRAMC - Universitat Rovira i Virgili (Tarragona, Spain).*

One of the most persistently studied perceptual illusions is the Vertical-Horizontal (VH) illusion, according to which people tend to overestimate the length of a vertical line when compared with the length of a horizontal line of exactly the same magnitude. The most frequent procedure used to test the presence of the illusion and to assess its size is based on the psychophysical *method of adjustment*, by means of the resulting average error in trying to equate the length of a variable line (V or H) to the length of a standard one (H or V, respectively). The work presented here makes use of this method in order to examine the relative weight of different factors that may contribute to the illusory effect, such as (a) the frame of reference sorrounding the stimulus lines, (b) the proper direction of the length adjustment demanded by the task (V→ H or H→ V), and (c) the presence (or not) of supervised practice through feedback. Furthermore, the illusory effect has been tested and measured across four different VH configurations: (1) a cross, (2) an L, (3) an inverted T, and (4) a T rotated counterclockwise 90^o. Our data show that the size of the expected illusion increases from figure (1) to figure (2), and from the latter to figure (3), where it reaches its maximum; but in figure (4) the illusion reverses reaching a significant effect in the opposite direction. This pattern of results appears consistently across different stimulus and test conditions, even though the variability in the amount of illusory effect seems to be modulated by the intervention of the critical factors just examined. Their relevance for a better understanding of the mechanisms responsible of the illusion will be discussed, with a look at the modularist charcterization of the early visual processes.

Supported by AGAUR, SGR2005-471 (Generalitat de Catalunya)

What drives the first dominance phase in binocular rivalry? VIC4

M. Blanco[1], F. Valle-Inclán[2], J. Corral[3], I. Serrano-Pedraza[4]

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[2]*Departamento de Psicología, Universidad de La Coruña, Spain.*

[3]*Departamento de Psicología, Universidad de La Laguna, Tenerife, Spain.*

[4]*Institute of Neuroscience, Newcastle University, Newcastle upon Tyne, United Kingdom.*

When the stimuli presented to each eye cannot be fused, awareness alternates between the two monocular images. This perceptual alternation is generally assumed to involve interocular suppression and adaptation, but little is known about how one image initially overcomes the other. Plausible explanations are: asymmetric interocular suppression, interocular differences in adaptation rate, or a random process. The former two imply a clear perceptual bias favoring the selection of one eye's input, while no differences would appear if the later explanation is correct. Individual biases in onset rivalry were evident in 6 out of 8 observers tested, and they have also been reported previously (Carter Cavanagh, *PLoS ONE* 2(4), 2007). What is the explanation for these biases? We obtained the monocular contrast sensitivity for each participant, and there were no differences between the eyes. Then we assessed the contrast sensitivities when there was a mask in the other eye with contrast 30% higher than the base line threshold. The results show that thresholds increased in a differential manner for each eye. These interocular differences in masked thresholds were negatively correlated with the proportion of times participants selected one or the other eye (i.e., lower thresholds during dichoptic masking increased the probability of selecting that eye). These findings suggest that dichoptic masking and the processes responsible for initiating rivalry are mediated by the same mechanisms. Since dichoptic masking involves interocular suppression in V1 (Sengpiel & Vorobyoy, *Journal of Neuroscience*, 25(27), 2005), our results suggest that reciprocal inhibition in the primary visual area determines the onset of binocular rivalry, and that these inhibitory connections are biased.

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VIC5 Illusory reverse-motion caused by converging moving objects

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[2]*Sección Biomatemática, Facultad de Ciencias, Universidad de la República, Montevideo-Uruguay.*

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In recent works (included a companion presentation to this conference) we proposed the existence of a facilitation wave that could be on the basis of motion perception. A mechanism of pre-activation of neighboring areas of the cortex by a moving object seems to be a good candidate to explain our main result: the time needed to detect a target is diminished when its presentation is preceded, in a certain spatio-temporal window, by a moving object that would converge to the same spot. Based on this finding we designed a specific stimulus configuration that induces a powerful motion illusion: we perceive apparent motion from 2 simultaneous targets (Gaussian patches) when one of them is preceded by a primer motion. This is probably due to a facilitation wave that is consistent with neurophysiology data concerning long-range horizontal connections, supporting the influence of these connections on motion perception. We explore more deeply this effect by asking subjects to indicate the perceived direction of apparent motion of two targets while the time between them was varied systematically according to the constant stimuli method. Targets are always preceded by moving Gabor patches. One of them arrive just near the location where one of the targets would appear (primer) and the other moving Gabor patch stops further away from the second target. Results show that the advance in time that the primer provokes to the perceptual appearance of the target is in the order of 40 milliseconds. This is probably due to the fact that the primer facilitates the spot where the target would appear. Thus, if the primer affects the first target the direction of apparent motion is more clearly perceived; but if the primer affects the second target the apparent motion is perceived in the reverse direction. This illusory reverse-motion supports the hypothesis that there is a further facilitation wave leading any moving object and permits also make some predictions about the perceived durations of targets affected by motion. We expect to present here also some preliminary data about predicted overestimation of duration of targets when they are preceded by motion sequences.

Three factors in visual complexity

VIC6

E. Munar[1], M. Nadal[1]

[1]*Human Evolution and Cognition, associated group to IFISC (UIB-CSIC).*

Visual complexity is a very complicated concept. Our perspective in this study was from the observer viewpoint and not as a quantifiable property of the visual array. The hypothesis refers to the relations between different features of the visual complexity. We selected seven complexity dimensions we believed could relate to different aspects of visual complexity: unintelligibility of the elements, disorganization, amount of elements, variety of elements, asymmetry, variety of colours, and three-dimensional appearance. The participants were asked to rate each stimulus on a 1 to 9 Likert scale for each scale separately. Factor analysis was performed in order to assess the relations among the seven dimensions of complexity. Factor 1 received high loadings from complexity dimensions of “amount of elements”, “variety of elements”, “variety of elements” and “three-dimensional appearance”. Factor 2 received high loadings from dimensions “unintelligibility of the elements” and “disorganization". Additionally, dimension “asymmetry” showed unsatisfactory relations with both factors and formed the factor 3. We refer these factors as “elements”, “organization”, and “asymmetry”. Thus, our results add further support to the idea that two or three processes contribute to the formation of subjective visual complexity. Probably the most important one is the determination of the number and variety of elements. The second one refers to the difficulty with which the elements are identified and organized into a coherent scene. Although previous studies have subsumed asymmetry within organizational processes, our results showed this was not an adequate solution for our data, and hence, we chose to include it as a separate factor.

VP1 Ambivalence and ambiguity in facial expresion of emotions

M.A. Cahill[1], M.A. Aguilar[1]

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Perception of mixed emotions in pure and mixed facial expressions was studied. In Experiment 1, participants gave independent evaluations of positive and negative valence and of familiarity of a set of pure (anger, disgust, fear, happiness and sadness) and artificially constructed mixed expressions. Mixed expressions were composed of an upper or lower happy half face and an upper or lower half face corresponding to each of the four negative emotions. Mixed expressions were evaluated as being more ambivalent (positive and negative simultaneously) than pure expressions and this was specially so for expressive mixes containing a happy mouth. In Experiment 2, the extent to which each expression was recognised as showing different emotions at the same time (emotional ambiguity) was studied. Participants had to identify the expression of each face, choosing from various terms that made reference to basic emotions and cognitive states (surprise, strangeness). Participants were significantly more accurate in identifying pure than mixed expressions. Moreover, they identified two different emotions more frequently in mixed than in pure expressions, though, especially in the case of fear faces, two emotions were also identified in some pure expressions. In most cases of double identification, "surprise" appeared as one of the expressions identified. In the case of mixed expressions this happened with faces showing happiness in the lower face. In Experiment 3, sensitivity of expression identification to the immediately precedent linguistic context was studied. Each expression was preceded in different trials by the name of different emotions that acted as a prime, being the task of each participant to indicate to what extent the face showed that specific emotion. Even though the resulting emotion profiles showed in general that mixed expressions were more ambiguous than pure expressions, the participants also perceived different emotions in the pure expressions, especially in the case of fear expressions, that were recognised as showing fear and surprise at the same rate. Our results show a considerable degree of ambivalence and ambiguity in perception of emotional expression and suggest that the immediate context where an expression takes place can have a profound influence on the affective meaning assigned to that expression.

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Modulation of perceptual processing by the affective meaning of faces: an erp (event-related potentials) study

VP2

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Using an associative learning task we studied how facial expression and acquired emotional value modulate the face-specific N170, an event-related potential (ERP) characteristic of visual perception of faces. Participants had to learn and associate the identity and expression (angry, happy or neutral) in a series of neutral-expressive pairs of faces. Our results show modulation of the N170 over occipito-temporal sites due to facial expression (happy and angry vs neutral). Furthermore, this modulation was also sensitive to expressive value (happy vs angry). Modulation of the N170 was also observed by the identity of faces, depending on the associated expression. It was also observed an attenuation of the N170 response to angry faces after repetition of exposures. Similar results were obtained at fronto-central locations within the N170 time window for both expressive and neutral associated faces. These results show the effect of both intrinsic and acquired affective meaning of faces on early perceptual face processing and have important implications for current theories on face processing and the relationship between emotion and cognition.

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VP3 Neural correlates of ambiguous face detection

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The visual processing of faces and objects has received considerable attention in recent years. We have used event related technology (EEG/ERP) to help identify the processes underlying the emergence of a coherent face percept under ambiguous conditions. It has been hypothesized that these processes relate to neural synchrony in the Gamma band (30-80 Hz) close to the moment of perception. Here we aimed to investigate this hypothesis by dissociating stimulus from perceptual factors in the face perception process. EEG data were recorded from 21 subjects (64/128 channel Quick-Cap, NeuroScan). During the task (experiment 1), subjects viewed 12 s movies of rotating ambiguous Mooney faces and were instructed to report the moment of face detection by pressing a button. The data were segmented into epochs locked to the response (moment of perception). Decision locked event related potentials (ERP) were obtained, and time-frequency as well as phase synchrony analysis on the gamma band range were carried out across distinct electrode sets. In experiment 2 face stimuli comprised one frame. Two additional noise frames were added for backward/forward masking. The behavioural results of experiment 1 show a mean response time of 4.23 $\pm$ 2.98 s which corresponds approximately to 85^o angle of stimulus rotation - just near the horizontal meridian, suggesting holistic processing of the stimuli (mean accuracy 90.78 $\pm$ 9.36 %). In experiment 2, jittered face stimuli were always perceived as more salient in the absence of forward masking. Spatially distributed activation in the high gamma band (60-70 Hz) was observed in the time-frequency plots and synchrony bursts (30-45Hz) were also observed, close to the moment of detection. Similar findings were obtained in experiment 2. In conclusion, our data supports that gamma-band activity are related with perceptual decision and not only with perception of low level features *per se*.

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Perception of radial motion relies on detecting spatial displacements VP4

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It has been shown that unconfounding the use of motion from spatial displacement information is possible for lateral motion (Nakayama & Tyler, 1981). Here we test whether this is also possible for radial motion. In order to do so, we adapted the paradigm previously used by Nakayama and Tyler to obtain detection thresholds for lateral and radial motion by adjusting the displacement amplitude of random dots patterns. In agreement with previous studies, we found that the detection of lateral motion relies on either motion or displacement depending on the range of temporal frequency and stimulated area. However, the detection of radial motion was always consistent with detecting a displacement threshold.

CV1 Colour categories in infancy and early childhood

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The origin and nature of colour categories in language and cognition has been the concern of researchers from a range of disciplines such as psychology, anthropology, cognitive science, linguistics and philosophy for many decades. One major issue is whether the colour spectrum is arbitrarily carved up into categories, or whether there are universal constraints on where these categories form. In support of the argument that there are constraints on how language categorises colour, there is converging evidence for categorical responding to colour before the acquisition of colour terms (e.g., Franklin & Davies, 2004; Franklin, Pilling & Davies, 2005). This talk will outline a series of studies which have attempted to establish the nature and underlying mechanisms of these pre-linguistic categories. In one study the Event-Related-Potential technique is used to identify the neural markers and underlying mechanisms of categorical responding to colour in 7-month old infants (Clifford, Franklin, Davies & Holmes, 2009). Another set of studies have considered how pre-linguistic colour categories are lateralized in the human brain. Whilst categorical responding to colour in adults is stronger in the left hemisphere (e.g., Gilbert, Regier, Kay & Ivry, 2005), in 4-6 month-old infants the category effect is lateralised to the right hemisphere (Franklin, Drivonikou, Bevis, Davies, Kay & Regier, 2008). The change in lateralization appears to be related to language as there is a right hemisphere bias for toddlers who do not know the terms for the relevant categories, yet a left hemisphere bias for those who have learnt the terms (Franklin, Drivonikou, Clifford, Kay, Regier & Davies, 2008). These findings suggest that there is a right-hemisphere substrate for categorical responding to colour that is replaced or suppressed by the mechanisms of language once colour terms learnt. The implications for our understanding of the origin and nature of colour categories in language and cognition are discussed.

Clifford, A., Franklin, A., Davies, I.R.L. Holmes, A. (2009). Electrophysiological markers of color categories in the infant brain. *Brain and Cognition*, in press.
Franklin, A. Davies, I.R.L. (2004). New evidence for infant colour categories. *British Journal of Developmental Psychology*, 22, 349-377.
Franklin, A., Drivonikou, G.V., Bevis, L., Davies, I.R.L., Kay, P. Regier, T. (2008). Categorical Perception of color is lateralized to the right hemisphere in infants, but to the left hemisphere in adults. *Proceedings of the National Academy of Sciences*, USA, 105, 3221-3225.
Franklin, A., Drivonikou, G.V., Clifford, A., Kay, P., Regier, T. Davies, I.R.L. (2008). Lateralization of Categorical Perception of color changes with color

term acquisition. *Proceedings of the National Academy of Sciences*, USA, 47, 18221-18225.
Franklin, A., Pilling, M. Davies, I.R.L. (2005). The nature of infant colour categorisation: Evidence from eye-movements on a target detection task. *Journal of Experimental Child Psychology*, 91, 227-248.

CV2 A categorical colour effect in the brown-orange boundary

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A colour categorical effect appears when, for similar inter-stimuli distance, it is detected a bigger perceptual change for stimuli belonging to different categories (inter-category change) than between stimuli belonging to the same category (intra-category change). Our research framework was the brown-orange transition. All the stimuli we used had the same chromatic co-ordinates (u' =0.32; v'=0.53), but varied in luminance. In the first experiment stimuli were named using brown or orange (forced choice) and were presented on two different backgrounds (articulated or non-articulated). Background type influenced the luminance value where the brown-orange transition appeared. Its value was bigger for the articulated background. Such result agrees with the predictions derived from the Gilchrist's anchoring theory on lightness perception and indicates that L^* calculus must consider the background type where a stimulus is presented. A second experiment detected a categorical perception effect using a visual searching task. Such task required observers to localise (right or left) a target stimulus. Shorter times and fewer errors appeared when target and distractors belonged to different categories (inter-category change). On the other hand, and differing with other works results, no evidence of laterality was found (the categorical effect appeared both for stimuli on the right and on the left).

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The relationship between categorical colour perception and shift towards prototype

CV3

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Discrimination among stimuli is affected by systematic biases in detecting the precise properties of stimuli. These biases include: central tendency (Hollingworth, 1910); shift towards prototype (STP; Huttenlocher *et al*., 2000); and category truncation (Huttenlocher, 2007). These biases could underlie perceptual warping (Harnad, 1987) evidenced in categorical perception (CP): better discrimination of stimuli from different categories than stimuli from the same category. However, Pilling *et al*., (2003), using a same-different discrimination task, found clear evidence of both central tendency and categorical perception, but argued that the two were independent. Here, based on reanalysis of Özgen and Davies's learning experiments and a matching to sample memory task, we report evidence that STP could be the basis of newly learned CP. In Experiment 1, subjects practised a successive same-different task on stimuli differing in hue or lightness, where the average of the stimuli and the category prototype(s) coincided. There was clear evidence of bias towards the coincident point. In subsequent experiments, subjects learned to divide either blue or green into two new categories, with the new boundary at the category prototype. After training, in discrimination tests using a successive same-different task, the average of the test stimuli again coincided with the blue or green prototype, and untrained subjects showed the same bias towards the centre as in Experiment 1. Trained subjects showed enhanced discrimination across the new boundary (CP), but also showed bias in the opposite direction from the test-stimuli average. This change in direction of bias could be due to bias towards newly abstracted prototypes. In the matching-to-sample task, stimuli ranged from yellow to purple with the average at the blue-green boundary. Judgements showed both a bias towards prototypes, and a bias towards the centre of the test range. The relationship among the various perceptual biases and CP will be discussed.

CV4 Color categorical perception and color metrics

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Color categorical perception (CP) refers to the idea that pairs of colors belonging to different categories can be discriminated faster and/or more accurately than pairs of colors belonging to the same category. Unlike studies investigating the CP of speech sounds, which are usually specified using a physical metric, research into color CP typically uses stimuli specified in perceptual metrics. The most widely used perceptual color metric, and the one considered to show the highest degree of perceptual uniformity, is the Munsell system (Munsell, 1905: Newhall, Nickerson & Judd, 1943). It is suggested here that specifying stimuli using perceptual color metrics presents some significant challenges for research into color CP. First, much experimental evidence for color CP rests on the assumption that the perceptual metrics used are uniform. But research suggests that this is not the case (e.g. Indow, 1988, Indow & Kanazawa, 1960). This implies that much of the evidence for color CP can alternatively be interpreted as evidence of irregularities in the color metrics used. Second, there seems no reason to suppose that color CP is not 'built into' the color metrics used. This presents additional difficulties for some theories of color CP.

Indow, X. Kanazawa, K. (1960). Multidimensional mapping of Munsell colors varying in hue, chroma, and value. *Journal of Experimental Psychology*, 59, 330-336.

Indow, T. E (1988). Multidimensional studies of Munsell color solid. *Psychological Review*, 95(4), 456 - 470.

Munsell, A. H. (1905). A Color Notation. An illustrated System Defining All Colors and their Relations by Measured Scales of Hue, Value, and Chroma. Boston.

Newhall, S. M., Nickerson, D. & Judd, B. D. (1943). Final report of the O.S.A. subcommittee on the spacing of the Munsell colours. *Journal of the Optical Society of America*, 33(7), 385-418.

Category training affects colour discrimination CV5

G.V. Drivonikou[1], A. Clifford[1], A. Franklin[1], E. Özgen[2], I. Davies[1]

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Categorical Perception (CP) of colour is shown when discrimination is faster and more accurate for two colours from the different colour category than for two colours from same categories, even when chromatic separation sizes are equated. There is indirect evidence that categorical colour perception may be learned. For instance, CP is only shown if the category boundary is marked in the subject's language (e.g., Roberson *et al*., 2000). There is also evidence CP can be induced across a newly learned boundary (Özgen & Davies, 2002), as indicated by performance on a successive same-different discrimination task. However, as the latter measure could be influenced by high level process such as labelling, or other forms of on-line language influence, here we replicate and extend Özgen and Davies's category learning study, to try and pinpoint the nature of the changes underlying category learning. Subjects learned to divide the green region into two new categories 'yellow-green' / 'blue-green' across four days. Together with a control group, they were then tested on green and blue regions, using a target detection task where coloured targets were presented on same- or different-category backgrounds. The trained group showed CP across the new boundary on the target detection task, whereas the controls did not. Moreover, CP was stronger for right visual field targets than for left visual field targets (cf. Drivonikou *et al*. 2007). The results suggest that learning to categorise stimuli alters their perception at an early stage of visual processing .The findings are related to the debate about the nature and origin of colour CP.

Drivonikou G.V., Kay, P., Regier, T., Ivry, R.B., Gilbert, A.L., Franklin, A., Davies, I. (2007). Further evidence that Whorfian effects are stronger in the right visual field than the left. *PNAS*, 104, 1097-1102.

Ozgen, E., Davies, I. (2002). Acquisition of categorical color perception: A perceptual learning approach to the linguistic relativity hypothesis. *Journal of Experimental Psychology: General*, 131, 477-493.

Roberson, D., Davies, I. Davidoff, J. (2000). Colour categories are not universal: Replications and new evidence from a Stone-age culture. Journal of Experimental Psychology: General, 129, 369-398.

CV6 Chromatic diversity of indoor scenes rendered with CIE illuminants and white LEDs

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The colour quality of a light source is typically evaluated by the colour rendering index (CRI), a quantity with well known limitations. The goal of this work was to evaluate the quality of lighting by estimating instead the chromatic diversity light sources produce in indoor scenarios, using CIELAB and DIN99 colour spaces. Reflectance spectra of objects typically found in indoor scenes (like books, coloured fabrics, children toys, fruits, indoor plants, among others) were obtained using an hyperspectral imaging system with a low noise cooled digital camera with a spatial resolution of 1024 (H) x 1344 (V) pixels and a fast tunable filter with an infrared filter in front of the lens. Images were acquired from 400 to 720 nm in 10 nm steps. Care was taken to avoid shadows and multiple reflections. Chromatic diversity was estimated for 60 illuminants, 55 CIE illuminants and 5 LED light sources (Luxeon, Philips Lumileds Lighting Company, USA),), by computing the CIELAB and DIN99 colour volumes of the objects and by counting the number of non-empty unitary cubes of the segmented volumes. A large variation in chromatic diversity was found across illuminants; in addition, a low degree of correlation between the number of discernible colours and the CRI of the illuminant was also found. The best illuminant was CIE FL3.8, producing about 7.5% more colours than CIE illuminant A and 8% better than D65 if CIELAB was considered and CIE FL11 producing about 7.4% more colours than CIE illuminant A and 4% better than D65 if DIN99d was considered. These results suggest that normal observers may benefit with a careful choice of the illuminant to maximize the chromatic diversity perceived in indoor scenes and this choice is not necessarily based on the CRI.

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Thursday, 9th July

The role of temporal processing and feedback in visual attention and awareness

TAP1

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The mammalian visual system includes numerous brain areas that are profusely interconnected. With few exceptions, these connections are reciprocal. Anatomical feedback connections in general outnumber feedforward connections, leading to widespread speculation that feedback connections play a critical role in visual awareness. However, temporal processing evidence from physiological experiments suggests that feedback plays a modulatory role, rather than a driving role. I will discuss theoretical constraints on the significance of feedback's anatomical numerical advantage, and describe theoretical limits on feedback's potential physiological impact. These restrictions confine the potential role of feedback in visual awareness and rule out some extant models of visual awareness that require a fundamental role of feedback. I will propose that the central role of feedback is to maintain visuospatial attention, rather than visual awareness. These conclusions highlight the critical need for experiments and models of visual awareness that control for the effects of attention.

TAP2 Reaction time used as a mean to asses perceptual latencies in cortical motion processing

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In a previous work we showed that a moving object (primer) whose trajectory intersects the trajectory of another objet (target) increases the magnitude of the flash lag illusion. Based on those results we argued that a pre-activation mechanism could be involved in the generation of the illusion, given by the combination of the feed-forward sensory input and intra-cortical horizontal connections, which result in a reduced perceptual latency. A consequence of this mechanism would be that the reaction time (RT) to the detection of a target should be less when it is preceded, in a certain time window and spatial surround, by a moving object that converges to the same spot. We showed, inducing motion illusion with short sequences of gabor patches and varying the spatial and temporal relations between them and the target that the RT is, indeed, modulated in a manner consistent with the pre-activation mechanism. In the limit, when just one primer is present, we get the configuration studied by Polat and Sagi (1993) where two gabor patches were presented flanking a central target. They showed that the flankers, depending on the lateral distance and timing, reduce the threshold for target detection. We carried out similar experiments using RT and we obtained similar qualitative and quantitative results getting further support to our approach. Interestingly Polat and Sagi relate their findings to contour integration and we relate ours to motion perception. Naturally, the same circuitry is activated in both cases and the outcome of the processing will depend on contextual elements and the reciprocal connections with other areas. A neural pattern will prevail, emerging from those dynamic interactions, which will ultimately determine the effective percept.

Physiological influences on the rate of subjective time - the case of hypercapnia

TAP3

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For short intervals, subjective time is a linear function of real time, and this is often explained by proposing the existence of a pacemaker in the brain that generates timing pulses. As a biological mechanism, the rate at which the pacemaker produces pulses is thought to be influenced by various physiological factors, such as arousal, the actions of various drugs, and body temperature. For example, a reduction of body temperature slows the rate of subjective time, which is thought to be due to a reduced rate of pulse production from the pacemaker. Likewise, an increase in body temperature increases the rate of subjective time due to an increase in the rate of pulse production. We present the first investigation of the effects of a hypercapnia on the rate of subjective time. Hypercapnia is a physiological change induced either by breathing air with a higher than normal percentage of CO2 or by breath holding (used here). Hypercapnia changes the physiological environment of the brain by increasing the proportion of CO2 in the blood, and by producing vasodilation leading to an increase in cerebral blood volume. In the experiment, participants made verbal estimates of auditory stimuli with durations in the range 150msec to 950msec. Auditory stimuli were either continuous filled tones, or two brief clicks defining an empty interval. Previous research has indicated that filled intervals appear longer than unfilled intervals (the so called “filled duration illusion”), and this has been explained by suggesting that the pacemaker runs faster for filled than unfilled intervals (Wearden *et al*., 2007). We replicated the filled duration illusion under conditions of normocapnia, and found that hypercapnia abolished the filled duration illusion by shortening estimates of filled intervals relative to normocapnia while leaving estimates of unfilled intervals unchanged relative to normocapnia. A plausible interpretation of this pattern of results is that hypercapnia prevents the pacemaker running at the higher rate it normally runs at for filled durations.

TAP4 Time in motion: speed channels and the colour-motion asynchrony

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Motion has intricate effects on time-related judgements. One of the most known effects is the colour motion asynchrony illusion (CMA): when colour and motion direction changes occur in synchrony at a high rate we perceive these changes as happening asynchronously. We have suggested (Linares *et al*, 2006 *Journal of Vision* 6 974-981) that the opponency mechanisms that underlie motion perception are the cause of the CMA. Assuming little cross-talk between the processing of slow and fast speeds (van der Smagt *et al*, *Nature Neuroscience* 2 585-596), our interpretation would gain support if the perceived CMA was reduced by using different speeds (e.g. slow-downwards and fast-upwards). To test this, observers had to pair colour (red/green) with direction (upwards/downwards) of moving plaids. We sampled ten phase differences between colour and motion within a cycle of 600 ms in three speed conditions: slow-slow, fast-fast and slow-fast. The results confirmed a perceptual effect that can be acknowledged by eye inspection only: the reduction of the CMA (about 40 ms) when the speeds in the two directions were different (slow-fast). These results not only provide support for the role of motion opponency in the CMA illusion, but also add further evidence for slow and fast speed segregation.

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A descriptive model of horizontal gradient and oblique effect in the haptic parallelity task

TBDBA1

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Previous research on the properties of haptic space has shown systematic deviations when performing parallel matching tasks, depending on horizontal distance and orientation of the bars, that are described as deformations of Euclidean space, or better a non-Euclidean space. In addition, a haptic oblique effect, that is, increments in the deviations when matching oblique orientations, has been shown. There are several models developed to describe this striking effect. Cuijpers, Kappers and Koenderink (2003), and Kappers and Volvic (Kappers and Volvic, 2007; Volcic and Kappers, 2008), understand haptic spatial performance as a representational problem: in these matching tasks the perceived orientation of a reference bar is represented spatially in some frame-of-reference, and then has to be reproduced in the orientation of a test bar. Experimental results in parallel matching tasks show that performance can be described through neither an egocentric frame-of-reference, nor an allocentric one, but with a complex composition of both reference frames. There are two main weaknesses in the above mentioned models. First, the general descriptive model by Cuijpers and cols. (o.c.) do not consider the strong individual differences in performance, whereas Kappers and Volvic (o.c.) present an additive model with a strong inferential level based on representations. In addition, none of these models give account of the oblique effect that is systematically found in the task. Our study presents data of the standard haptic parallelity task for 5 subjects and develops an additive linear model of performance, including the oblique effect. Through the maximum likelihood method, subjects are the assigned to 1 out of 3 jerarquical models which reflects the amount of the deviations as well as the strength of the oblique effect in performance.

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TBDBA2 The haptic horizontal-vertical illusion across adulthood

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The haptic vertical-horizontal illusion is not dependent on the visual status or visual imagery, since similar illusory overestimation of the vertical occurs independently of the visual status (early blind, later blind, and low vision) of the perceiver (Heller *et al*., 2003). The present study was conducted to investigate whether this spatial misperception remains stable or increases across adulthood and the old age. In the present study participated young adults (22-40 years), middle age adults (41-59 years) and older adults (60-75 years). Participants examined unimanually or bimanually in a counterbalanced order 5 horizontal and 5 vertical curved shapes varying in size, and made size (horizontal/vertical) estimates using two sliding rulers. The results suggest that the illusion is independent of age: 1) all groups overestimated the vertical; 2) the illusion did not change as a function of stimulus size; and 3) the mode of exploration (unimanual or bimanual) did not affect the illusion.

Neural correlates of textured stimuli using a discrimination task: An electrophysiological study

TBDBA3

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In the present study, we investigate the cortical modulations involved in tactile roughness perception using a tactile texture discrimination task. Twenty-two volunteers were presented with rough and smooth surfaces using a classical odd-ball paradigm (target, P=0.2 and standard, P=0.8). The textured surfaces were mounted on a specifically designed apparatus (the *Haptic Spinning* Wheel) which moved at a constant velocity under the static index fingertip of the perceiver. Participants counted mentally the number of targets perceived. The ERP results showed an increased P300-like component for attended compared to unattended stimuli. A time-frequency analysis yielded strong synchronization in the theta band (3-7 Hz) at an early time window (around 200 ms), followed by desynchronization in the alpha band (8-12 Hz) along the 400-800 ms interval. LORETA source analysis showed a higher neural activation when processing targets compared to standard stimuli at somatosensory, occipital, and frontal cortices. These findings suggest that top-down processes may modulate the information processing of tactile stimuli by increasing and decreasing particular brain oscillations in different cortical areas.

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Friday, 10th July

The role of acoustic scale in the perception of musical notes and instruments HS1

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This talk is about the sounds made by musical instruments and how we perceive those sounds. It is intended to explain the basics of musical note perception; that is, why instruments come in families; what determines 'register' within families; and why we hear distinctive differences between members of a given instrument family - even when they are playing the same note. On the surface, the answers to these questions may seem obvious; one could say that brass instruments all make the same kind of sound because they are all made of brass, and the different members of the family sound different because they are different sizes. But there is a deeper explanation involving three acoustic properties of musical sounds, as they occur in air. The talk describes these properties (with audio demos) and explains why they are particularly useful in (a) summarizing the physics of note production by instruments, on the one hand, and (b) explaining the dimensions of musical note perception, on the other hand.

HS2 Auditory discontinuities and the perception of vowel height in spanish back vowels

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A wide-spread approach to the study of speech perception entails binding phonological categorization to some sort of auditory discontinuities. Consistent with this view, some authors made an attempt to connect the "center of gravity effect" (CGE) (Chistovich and Lublinskaya, 1979) to the perception of vowel height, suggesting that the [+/- high] boundary might be based around a "quantal" region of the auditory space. In particular, Syrdal and Gopal (1986) found that productions of American vowels could be divided into the phonological categories [+/- high] by a boundary at 3-3.5 Bark F1-f0 distance (which corresponds to the limit of integration of the CGE). Later, in a perceptual study using front vowels, Hoemeke and Diehl (1994) found that the boundary for the phonological feature [+/- high] was indeed at 3-3.5 Bark F1-f0 distance. However, Fahey and López-Bascuas (1994) and López-Bascuas *et al*. (1995) found that the 3-3.5 Bark F1-f0 boundary does not seem to be effective for Spanish front vowels neither in production nor in the perception of the [+/- high] phonological contrast. Moreover, in English, results obtained with back vowels do not seem to support clearly the 3-3.5 Bark hypothesis (Fahey, Diehl and Traunmüller, 1996). In this study, our previous results with front vowels are extended to Spanish back vowels. F1 and f0 were measured from Spanish vowel productions in order to estimate the F1-f0 Bark value that separates out the [+/- high] back vowel categories. Our acoustic analyses agree well with our perceptual results and do not support the hypothesis of a 3-3.5 Bark F1-f0 integrator playing a significant role in the psychological organization of the [+/- high] distinction.

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Psychoacoustical verification of current theories on the generation of human distortion product otoacoustic emissions

HS3

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When two pure tones (or primaries) of slightly different frequencies (f1 and f2) are presented to the ear, new frequency components are generated by nonlinear interaction of the primaries in the cochlea. These new components can be heard and emitted from the cochlea back to the ear canal. The level of the 2f1-f2 emitted distortion is regarded as an indicator of the physiological state of the cochlea. This indicator, known as the distortion product otoacoustic emission or DPOAE, is most sensitive when the primaries have levels that evoke maximal-level DPOAEs. Efforts have been directed to obtain these levels empirically but the optimal primary-level combination is still controversial. The controversy could be clarified by elucidating the cochlear mechanical conditions that maximize DPOAE levels. The current view is that maximal-level DPOAEs occur for primaries producing equal excitation at the cochlear place tuned to f2, but this conjecture cannot be tested directly in living humans because it is impossible to record cochlear motion while monitoring ear canal DPOAE levels. Here, the conjecture is tested using psychoacoustical methods like those used to infer human peripheral compression. Results support the current view for f2 frequencies of 1 and 4 and for levels below around 65 dB SPL. The present approach may be extended to test other uncertainties on the generation mechanisms of human DPOAEs.

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HS4 Vowel formant structure and speaker identification. A perceptual study

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This study belongs to VILE Project (Acoustic and Perceptual Study of Variation within and between Speakers in Spanish), whose goal is to validate -acoustically and perceptually- relevant cues to establish the individuality of speakers, in order to apply the results to automatic speech recognition and to judicial practice (Battaner *et al*. 2003; Marrero *et al*. 2003). On this occasion we'll present the results of a natural vowel 2IAX discrimination test. Stimuli were extracted from the acoustic database used in VILE-1st part. 40 pairs (4 vowels -/i,e,a,o/- $*$ 2 accents -stressed/unstressed- $*$ 5 acoustic parameters -F0/F1/F2/F3/F4-), as similar as possible in all acoustic parameters except for the one under study were presented to 46 judges (34 women and 12 men) aged 18-35. Stimuli were delivered via headphones in soundproof radio cabin using Paradigm software (Lopez-Bascuas *et al*. 1999). Results show 94.53% of hits when stimuli were the same, and 72,97% for different stimuli. Concerning the four vowels, the proportion of errors was 28.47 for /o/; 27.01 /a/; 26,48% /e/; 26,14 /i/. As for the acoustic parameters, the biggest error rate corresponds to F4 (39.97%), F3 (35.35%) and F1 (31.09). On the contrary, F0 ratio is only 13.73% and F2 14.70%. So, our findings seem to indicate the prevalence of F0 and F2 as main cues for speaker identification across different vowel categories. In the conclusion, implications of these results for future research are discussed.

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Asymmetry in Auditory Priming: Evidence from the Perception of Words, Sounds, and Talkers HS5

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Marsolek and colleagues have found support for two dissociable and parallel neural subsystems underlying the recognition of written words, visual objects, and visual shapes: an abstract-category subsystem that operates more effectively in the left cerebral hemisphere (LH), and a specific-exemplar subsystem that operates more effectively in the right cerebral hemisphere (RH). Thus, in the visual domain, evidence of this asymmetry exists for linguistic (words, pseudoword forms) and non-linguistic (objects) stimuli. Our work in this area was originally motivated by the idea that asymmetry may not be limited to the visual domain. Indeed, we have since obtained hemispheric differences in priming effects in the auditory domain for linguistic (spoken words) and non-linguistic (environmental sounds) stimuli. More precisely, we observed specificity effects when listeners heard auditory stimuli in their left ear (RH), but not when they heard these same stimuli in their right ear (LH). Furthermore, our more recent data on talker identification once again reveal this same pattern of asymmetry. Taken together, this consistent pattern of data from both domains may be indicative of a more general property of the human perceptual processing system.

Abstracts-Poster Session

Psychophysical correlates of bias in decision-making P1

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The sensory information required to make a decision can be inferred before obtaining evidence about it. Formally, this is the probability or prior that one of the hypothesis to make a decision is true before obtaining evidence about it. How to reveal this bias and what and where are their neural correlates?. To address these questions we have design a task in which the prior probability that a given response is correct depends on a visual cue. Subjects performed in a discrimination reaction-time task in which they had to decide whether the length of a line (S2) is larger or shorter than another one showed a few milliseconds before (S1). Subjects communicate their decision by clicking one of two buttons of a computer mouse. A bias in the response is introduced by manipulating the prior probability that one of the responses is correct. The color of two circles displayed at both sides of the screen changed from block to block (64 trials/block): when the color is blue (low bias) S2 will be shorter in 75% of trials; red (large bias) S2 shorter in 25% trials; gray (neutral trials) S2 shorter in 50% trials. Five subjects (1 male and 4 females, ages 21-24) were tested in the task, nine sessions each. Psychophysical and signal detection theory analyses suggest that this task induces and reveals the subjects' bias during decision-making. Biases related to probability and decision making significantly affect our everyday behavior. Furthermore, our task allow us to measure cognitive responses that depends on memory traces left by visual stimulus and to study the neural correlates of these processes.

Supported by MCINN to CA and by INCITE-Xunta de Galicia (Spain) to JF-R and CA.

P2 Does illusory surface inclination affect eye movements?

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Binocular vision requires that we foveate both eyes on the relevant visual information to fuse the foveal images into one single image. Other points in space do not fall on corresponding retinal locations, and the visual system uses this binocular disparity to extract depth information. Besides binocular disparity, the visual system employs monocular cues like texture gradients and perspective to extract depth information. In perceptual illusions the monocular and binocular depth cues are different, which may cause a conflict for the visual system. Binocular depth cues make the eyes to converge on the physical plane (screen) while the monocular cues produce a convergence on the induced depth plane.In this work we registered eye movements in observers that looked at a point presented on different inclinations and slants of surfaces, induced by means different gradient textures. The preliminary results suggest that there are differences in eye positions during the first 80 ms. After this initial fixation an adjust occurs where the eyes return to fixate at the screen plane. Thus it appears that the oculomotor system programs the eye movement first based on the induced depth perception, and only after that the visual system is able to correct this 'depth illusion'.

How does illusory surface inclination affect the accuracy of orientation judgements? P3

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A possible description of our surrounding is a spatial disposition of surfaces that differ in orientation, size, reflectance, texture and spatial location. When the slant of the surface is known our visual system can improve greatly the precision and accuracy of the spatial location, orientation and distances of stimuli. To correctly perceive our surrounding the visual system has to do different geometric transformations between surfaces. Here two of these transformations were studied. In the first task a segment (or the end-points of a segment) is shown on an induced inclinated surface (created by a texture gradient; presentation plane) and the observer was asked to transpose it onto a frontal surface (test plane). In the complementary task a segment was shown on a frontal surface and the observer needed to transpose it onto an induced inclinated surface. The results demonstrate that, for the first transformation, the accuracy has a better fit for a linear model where the error increased for more inclinated surfaces, i.e. for larger differences between the presentation plane and the test plane. However, for the second transformation, the precision was better described by a non-linear model. The results suggest there are different mechanisms for tilt (2D orientation) and inclination processing (3D orientation).

P4 The position of a reference matters when judging egocentric distances

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When subjects have to point at a sphere in total darkness, with only vergence providing information about the position of the sphere, their judgements are biased. To examine whether the presence of other visible structures would reduce the bias we examined two additional conditions. In one of the conditions there was a reference cube at a fixed position (within each session). In the other condition a similar cube was presented at a random position for each new sphere. We found that regardless of whether the reference cube's position was stable or not, it improves the accuracy of responses. However, the improvement depended on the reference's position relative to the target. When the cube was further away from the subject than the target, the pointing responses became more accurate, but when the cube was closer to the subject than the target it did not make any difference. It appears that subjects only use objects that are further away to calibrate distance.

Supported by FCT.

Classification of face gender and expression in different spatial frequency bands

P5

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The role of different spatial frequency bands on gender and expression categorization was studied in three experiments. Reaction times were measured for unfiltered, low-pass (cut-off frequency of 1 cycle/deg) and high-pass (cut-off frequency of 3 cycles/deg) filtered faces. Filtered and unfiltered faces were equated in root-mean-squared contrast. For low-pass filtered faces reaction times were higher than unfiltered and high-pass filtered faces in both categorization tasks. In the expression task, these results were obtained with expressive faces presented in isolation (Experiment 1) and also with neutral-expressive dynamic sequences where each expressive face was preceded by a briefly presented neutral version of the same face (Experiment 2). For high-pass filtered faces different effects were observed on gender and expression categorization. While both speed and accuracy of gender categorization were reduced comparing to unfiltered faces, the efficiency of expression classification remained similar. Finally, we found no differences in reaction times between the effects of spatial frequency filtering on gender categorization with expressive and non expressive faces (Experiment 3). These results show a common role of information from the high spatial frequency band in the categorization of gender and expression.

This study was supported by the project SEJ2006-01576/PSIC.

P6 Facilitation of object recognition: an effect of contextual cueing

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Implicit contextual cueing refers to a top-down mechanism in which visual search is facilitated by learned contextual features. In the current study we aim to investigate the mechanisms underlying object based implicit contextual cueing by studying eye movements. A visual search task was used in which participants (n = 16) had to locate a target object (abstract line drawing with an opening) among a number of distractors (closed abstract line drawing). In half of the trials the set of objects presented was repeated (Repeated trials), whereas in the other trials a new set of objects was used (New trials). The location of the objects was randomly defined and the objects in the Repeated and New trials were repeated the same number of times. Eye movements were recorded with an iViewX High-speed Eye-Tracker. Subjects located the target faster in the Repeated trials as compared with New trials ($p<0.001$), indicating that the sets of objects were memorized and search was facilitated. Shorter fixation durations were found for the repeated trials than for the new trials [t (20) = 3.6, $p < 0.01$]. Furthermore, the Time from Last Fixation until Button Press (TLFBP) was significantly shorter in the repeated than in the new trials [t (20) = 4.6, $p = 0.001$]. No effect was found for the Number of Fixations and the Saccade Amplitude. This indicates that object recognition is facilitated when object information is used as contextual cue.

Perceptual learning in humans: the use of same/different tasks P7

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Perceptual learning refers to discrimination improvement between two very similar stimuli seen after non-supervised preexposure to these stimuli. Moreover, if two similar stimuli are preexposed in several alternated trials discrimination is maximized, compared to several blocked preexposure of each stimulus - the intermixed/blocked effect. Recent studies in this area have used same/different tasks - in which the preexposed stimuli are shown in succession and participants have to classify them as being the same or different stimuli - to evaluate the effect of preexposure in stimuli discrimination by human subjects. Following this kind of experiments, Mitchell, Nash, & Hall (2008) propose a model of attention modulation and differential codification of features in memory as the framework for the intermixed/blocked effect. Inserted in a broader study with the objective of testing this hypothesis, the experiment presented here, using one such task, demonstrates that: (a) the analysis of the learning that might take place during test seems to demonstrate an effect of preexposure in the increase of discriminability from trial to trial, regardless of preexposure condition; (b) overall performance in this kind of task is no different after blocked preexposure versus no preexposure; and (c) discrimination between stimuli, one preexposed in block and another preexposed intermixed is worse than discrimination between two intermixed stimuli. Possible implications for the use of this kind of task in perceptual learning studies in humans are discussed.

The work reported here was included in a Master's thesis submitted by the first author to the Universidade do Minho, Portugal. Research supported by a grant from the Portuguese Foundation for Science and Technology (FCT) to the second author.

P8 An exploratory study of diverse methodological factors related with the perception of beauty

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Recently there has been a great growth of the interest on the neural basis of visual beauty perception. However, neuroimaging procedures differ from the usual behavioral procedures, particularly, in the use of different scales to measure responses (dichotomous vs. Likert beauty judgements). The objective of this experiment is to explore whether any of the possible methodological options produced differences in the way 64 university students (32 men and 32 women) respond to a beauty rating task. We analyzed their responses on Likert (1 to 9 points) and dichotomous (beauty- non beauty) scales, order (dichotomous first or Likert first) and kind of visual stimuli: artistic (impressionist, postimpressionist, abstract, realist paintings) and none artistic (photographs). Our results reveal that differences between sexes are only appreciable using a Likert scale, particularly in relation to the time that men and women take to decide about the beauty of realist paintings, and responses to postimpressionist paintings. On the other hand, order has an effect only on reaction times to photographs, impressionist paintings on the Likert scale, and to photographs on the dichotomous scale. However, there is no interaction between order and sex regarding reaction times and responses on either scale. Conversely a high correlation between responses on dichotomous and Likert scales for both sexes is observed. This suggests that order of presentation of the visual stimuli has an influence on the way participants perceive beauty and that it must be taken into account in future research.

The neural bases of the perception of beauty: differences and similarities between men and women

P9

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Perception of beauty (aesthetic judgment) appears to be one of humans' most distinctive traits. Neuroimaging techniques are proving to be instrumental in the understanding of the biological basis of this trait. Results of recent studies suggest that a broad array of brain regions are involved in our appreciation of beauty. However, the use of different techniques makes it difficult to compare across studies. Our objective in the present work was to examine sex-related differences in the neural underpinnings of beauty appreciation by means of functional Magnetic Resonance Imaging (fMRI), and to compare these results with those of an analogous study carried out earlier by means of magnetoencephalography. Here we recorded the BOLD signal of 12 male and 12 female participants while they decided whether diverse visual stimuli were beautiful or not-beautiful. Our results suggest that there are interesting differences in specific brain regions and in lateralization. However, in both men and women, fMRI revealed occipito-temporal activity that could not be registered with magnetoencephalography due to its limitations measuring activity below cortical surface. The present results are discussed in relation to a model of beauty appreciation of visually-perceived objects.

P10 Eye movement patterns during the scanning of emotional images

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A narrow relation between the eye movements and the emotional experience exist. Hermans, Vansteenwegen & Eelen (1999) found that during visual scanning of spider images spider anxious participants exhibited a different exploration patterns than controls. Isaacowitz (2005) identified different attentional preferences of optimists and pessimists to negative emotional stimuli (looking a melanoma image). Xing e Isaacowitz (2006) reported shorter fixations durations when participants, to whom emotional regulation processes were induced, look to negative emotional stimuli, in relation to positive ones. The aim of this study was to determine if the emotional content of a stimuli induces differential gaze patterns and if they were related to the emotional valence and activation ratings. Eye movements of 125 participants (89 women and 36 men) were recorded while looking to 16 emotional images belonging to the IAPS (International Affective Picture System). Pictures were selected taking into account the extreme ratings given to them by the Spanish sample (Moltó *et al*., 2001) on the orthogonal dimensions of valence and activation. Results indicated that valence dimension affected the images scanning pattern. Those with negative emotional content obtained more fixations and shorter fixation durations, as well as, shorter scanning times.

Exploratory eye movements and the Müller-Lyer illusion P11

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Eye movements are often considered in explanations of visual illusions. In the case of the Müller-Lyer illusion, though, explanations based on eye movement were largely abandoned when it became apparent that the illusion also occurs under retinal stabilization (Evans & Marsden, 1966). Even so, recently there has been a renewal of interest in the analysis of the patterns of exploration that occur while observing Müller-Lyer configurations (e.g., van Doorn *et al*., 2009). This interest derives from Goodale and Milner's dual model (Goodale & Milner, 1992), which holds that information is processed separately depending on whether it is related to conscious perception or needed for the control of action. One of the lines of evidence for this dual model is that illusions, it is argued, affect perception but not action. However, van Doorn et al. observed differences in the exploratory eye movements that underlie perception and action. This seems to imply that the differential effects of illusions on perception and action are at least partly due to the use of different informational variables, rather than only to the differential processing of information as proposed by Goodale and Milner. With the present study we aim to provide more detail about the relation between exploratory eye movements and illusory effects. Participants observed Müller-Lyer configurations during 2 seconds, without any constraints on eye movements, before they performed a length estimation task. In agreement with previous results, we found that the amplitude of saccades is significantly influenced by the configuration of the figure (wings-in versus wings-out). Furthermore, our results show different patterns of exploratory movements for different individuals. Some of these exploratory patterns seem to be more effective than others, because the errors in the estimation task are much smaller for some participants than for others.

P12 What fixations reveal about perceptual styles

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Perceptual style refers to the way we perceive information and how we use this information to solve problems. At the extremes of perceptual style scores, two styles can be distinguished: field dependence and field independence. In the latter case, observers have a strong tendency for visual detail (local) processing whereas in the first case observers perceive more globally. Such a difference is reflected in superior performance for embedded figures test for field independent subjects. These subjects are better in detecting a simple figure embedded in a complex shape than field dependent subjects. So, independent observers are less influenced by the context of a visual stimulus than dependent observers. Besides perception, it is well known that the context of a stimulus also affects eye movements, e.g. during visual search. Until now there is no evidence whether field dependent and independent observer display different gaze patterns, and whether it relates to their discrepancy in visual performance. Therefore, in the first part of this study we registered eye movements of observers performing an embedded figure test, and analyzed their gaze pattern in relation to the embedded figure. In the second part we recorded eye gaze of field dependent and independent observers, as characterized by the Witkin test, during an embedded figure test. The results are discussed in terms of different visual strategies for solving the embedded figure test, and in terms of characterizing perceptual style.

Learning to listen through another person's ears: a study of learning curves using non-individualised Head-Related Transfer Functions

P13

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Virtual Reality (VR) environments traditionally aim at visual immersion, but the development of convincing VR simulations requires that other senses alsobe considered. Aural immersion, orauralisation, is the natural next step in the evolution of VR systems. Auralisation relies onanechoic soundsource recordings processedto mimic the influence of theacoustic propagation environment (absorption, reflections, reverberation). The listener's head, pinna and torsohave a crucial effect whichcan be described byHead-Related Transfer Functions (HRTF), different for each individual. Earphone presentation makes it possible to auralise sounds processed using HRTF other than the listener's own.In our study we usednon-individualised HRFT, obtained from mannequins equipped with ear microphones. Subjects were asked to indicate the perceived source position forsounds processedtosimulate different azimuth angles: from 0^o (front) to 90^o (right).Several sessionswere carried out for each participant. The goal was to find howtheir localisation accuracy varied over time, as it was hypothesised that exposure would induce a learning effect. Preliminary data indicate that 3D localisation does indeed improve with exposure but the learning curves evidence a plateau effect, beyond which further exposure does not lead to additional improvement.

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