Fechner Day 2014
Abstracts

Theme sessions

Theme session: **Individual differences in psychophysics**

Convenor / organizer: Leah Fostick (Ariel University, Israel)

Cover abstract: The mean or average is generally considered to be representative of the performance of the entire group of individuals and the standard deviation reflects the distribution of performance scores within the group. Using a single measure to reflect the performance of different individuals also suggests that in general they all use the same perceptual and cognitive mechanisms to perform the task. Therefore, any deviation from the mean reflects error. However, individuals might differ from one another in their perceptual abilities and in the way they perform the task.

The scientific literature identifies different factors by which individual differences are identified. Among these factors are: 1) peripheral sensory deficit, such as hearing impairment; 2) talents, such as high intelligence or photographic memory; 3) the emotional state or motivation of the participant while performing the task; or 4) the strategy used for task performance.

By emphasizing group statistics only, e.g., the mean and standard deviations, one may overlook important individual differences that reflect the use of very different means for task performance. The aim of the current theme session is for researchers to present data in a variety of psychophysical areas that address the question of whether using group data alone might obscure information regarding different possible factors that affect performance. A session that covers different areas of psychophysics that reflect the influence of individual differences might encourage other researchers to look for individual differences in their data, and elicit a better understanding of the role of individual differences in perceptual strategies.

Talk titles and speakers:

Different perceptual strategies in performing spectral TOJ

Leah Fostick

Department of Communication Disorders Ariel University, Ariel, Israel.

Perceptual synthesis of lip and sound input: Individual differences

Jennifer Lentz[1], Nicholas Altieri[2], and James T. Townsend[3]

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Individual differences in production effect

Yaniv Mama

Department of Psychology, Ariel University, Ariel, Israel.

Universality versus individuality: Place for inter-individual differences?

Jiří Wackermann

Department of Empirical and Analytical Psychophysics, Institute for Frontier Areas of Psychology and Mental Health, Freiburg, Germany.

Individual differences in processing capacity under perceptual load

Daniel Fitusi

Department of Psychology, Ariel University, Ariel, Israel.

Conclusions and future directions

Harvey Babkoff

Department of Psychology, Ashkelon Academic Center, Ashkelon, Israel.

Theme session: **Crossmodal and supramodal psychophysics**

Convenor / organizer: Åke Hellström (Stockholm University, Sweden).

Cover abstract: Whereas the study of crossmodal correspondences, analogies, and associations has a long history, the psychophysical aspects deserve more attention than they currently get. The framework for this session is given by such questions as: To what extent is it possible to match, compare, and discriminate subjective magnitudes from different modalities? Do intramodal stimulus order effects have crossmodal analogs? Do stimuli in one modality affect judgments of stimuli in another? Can 'generalized' subjective magnitude be measured?

Talk titles and speakers:

Cross-modal measures–the literary evidence

Helen Ross

Department of Psychology, University of Stirling, Scotland.

The popular understanding of psychophysics and cross-modal measures can be found in literary examples that give comparisons between different sense modalities. Sometimes the quotations are more than similes, because one sensation is scaled against another. Many examples concern weight and the sensation of heaviness. Weighing scales are a symbol of justice, and can be used to weigh souls or weigh good and bad deeds. Heaviness is often used as a metaphor for other sensations and emotions, particularly grief, perhaps because of the physiological effects of grief

and depression. Taste and smell are used to describe bad events as sour or bitter. Emotions and desires are sometimes quantified in monetary terms, as in modern economic studies into the value of certain places and activities. Thus psychophysical scaling is not just an abstruse laboratory activity, but is also practised to some extent by the general public.

Putting feelings into psychophysics: Theodor Lipps (1905) on the perception of weight and other modalities

David J. Murray[1] and Marissa E. Barnes[2]

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Theodor Lipps (1851-1910) is known for his theory that, when a person views, say, the Müller-Lyer stimulus-pattern, the illusion of expansion or contraction of equal straight lines arises because the person processes them with "feelings" of growth or obstruction associated with their end-fins (Lipps, 1897). This "feeling-in" or *Einfühlung* was translated by Titchener (1909) and by Ward (cited by Myers, 1909) as "empathy." But Lipps (1905) also developed a psychophysical theory concerning the conscious events that accompanied a judgment that stimulus A was "just noticeably different" from stimulus B. His examples were taken from discrimination tasks involving differences in luminance-intensities, tone-intensities, and area-sizes. He argued, however, that discrimination tasks involving the judgment of "heaviness" of lifted weights differed from those other tasks by being unusually subject to influences determined less by sensations than by "feelings" of effort made in anticipation of a lift (Müller & Schumann, 1889).

A range model and a schematized conception for intermodal comparisons

Gunnar Borg.

Stockholm University, Sweden.

The Value of crossmodal matching in developing an integrated model of perceived magnitude

Robert Teghtsoonian.

Smith College, USA.

Intramodal and crossmodal pairing and anchoring in comparisons of successive stimuli

Åke Hellström and Caroline Cederström.

Stockholm University, Sweden.

Theme session: **What's new in pain perception?**

Convenors / organizers: Rosana M Tristão[1] and José Aparecido Da Silva[2]

[1]University of Brasilia, Brazil. [2]University of São Paulo, Brazil.

Cover abstract: Pain is a universal phenomenon experienced from birth to the end of life. It exists from the simplest type that is mild and inconsequential to an intolerable type that requires treatment as well as persistent chronic type of pain that is beyond cure. Understanding the underlying processes of sensation and perception of pain by is challenging and different areas are now involved in decipher the pain matrix or the pain code. This session has the aim to present the advances in pain measurements, scales and equipments; the psychophysics of pain, and also it has the aim to present some important variables to be considered in pain perception analyses. What's new in pain perceptions and the challenge of pain will be the two main topics that will open the session and bring the field to discussion.

Talk titles and speakers:

Borg CR10 scale, what's new in pain perception scale?

Gunnar Borg

Stockholm University, Sweden.

The challenge of pain

José Aparecido Da Silva

Universidade de São Paulo, São Paulo, SP, Brazil.

The potential of mobile pain perception monitoring for life enhancement

Diana Kornbrot

University of Hertfordshire, UK.

Empirically driven improvement of the linearity of extant faces pain scales

Armando Luís Dinis Mónica de Oliveira

Universidade de Coimbra, Portugal.

The impact of sleep disorders on the perception of pain

Rosana M Tristão

University of Brasilia, Faculty of Medicine, Brazil.

Individual talks and posters

Parameter estimation for model-based psychometric functions of perceived duration

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Subjective time duration is often represented as a random variable whose mean is a power function that maps objective time onto perceived time and whose standard deviation is proportional to duration. Along with perceptual aspects, models of performance on time-perception tasks typically incorporate a decision-response process that involves at least one additional parameter. It has been shown that when these models are used with a paired-comparison ternary task, the resulting psychometric functions reflect different processes in an identifiable way, leading to experimentally testable predictions. Yet, the utility of this framework ultimately depends on whether model parameters can be recovered from data with sufficient accuracy so as to discriminate among alternative scenarios. In this work we investigate the properties of parameter estimates using simulation techniques. Our preliminary results show that model parameters can be recovered from data with the usual number of trials in empirical studies.

Does training in interpreting improve capacity of working memory and/or executive function?

Stanislava Antoniijevic-Elliott and Susan Folan

National University of Ireland, Galway.

Language interpretation is the process of converting an expression from a source language into a comparable expression in a target language. Interpretation requires simultaneous operating with relatively large chunks of language putting significant strain on working memory (WM) and requiring excellent executive control. To examine whether intensive training in interpreting improves the capacity of WM computerised forward, and backward digit span test were implemented. Digits were simultaneously presented auditory and visually. Percentage correct for each length, and the mean span was calculated. Executive function was tested using numeric Stroop test. In computerised task participants were asked to report either the numeric value of words or the number of words presented. Congruent and incongruent conditions were presented in six separate randomised blocks. Reaction times and accuracy were measured. Comparison of measures taken before and after the training indicated improvement in executive function, but not in the capacity of WM.

Stimulus parameters determining the shape of spectral TOJ threshold distributions

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Spectral and spatial temporal order judgment (TOJ) paradigms were designed to measure auditory temporal processing. We suggest that spectral TOJ performance involves at least two different perceptual mechanisms: 1) the holistic judgment of the pattern of two tones (thresholds of ISI<5msec); and 2) the direct judgment of the order of the tones (thresholds of ISI=60-90msec). In this study, we examined the impact of: frequency range and stimulus duration on the form and shape of spectral TOJ threshold distributions.

Spatial TOJ threshold distributions appear almost classically Gaussian, with the mode at ISI=6-59msec or 60-119msec. In contrast, spectral TOJ threshold distributions are very Poisson-like, with the mode at ISI=0-5msec. Low frequency tone-pairs (300-600Hz) increase ISI=0-5msec thresholds and higher range tone-pairs (1-3.5kHz) decrease the mode at ISI=0-5msec and make the distributions Gaussian. Poisson-like distributions were observed with tone durations of 10msec or longer, but shorter tone durations (5msec) yielded almost Gaussian distributions.

Does listening in a second language mimic aging? Evidence from the timeline for segregating a speech target from a background masker.

Boaz M. Ben-David[1,2,3], Meital Avivi-Reich[2], and Bruce A. Schneider[2]

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[3]Toronto Rehabilitation Institute, Canada.

In a previous study (Ben-David & al, 2012), older adults were as capable as younger adults taking advantage of the delayed onset of the speech target when the masker is noise, but not when the masker was babble. In the current study, we used the same task with two groups of 30 younger non-native English speakers, late and early immigrants. Comparing the two studies, native and non-native younger listeners are comparable in the speed for segregating speech from both noise and babble maskers. Moreover, significant age-related effects were observed. With a babble masker, word recognition 50%-thresholds were lower (better) for younger non-native speakers than for older native speakers. But, with a noise masker, the function relating thresholds with onset delay was higher (worse) for younger late immigrants (immigrated to Canada after age of 15) than for older native speakers. Finally, we discuss the difficulties these groups experience in stream segregation.

Axiomatic evaluation of time perception: Investigating numerical distortion

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If the adjustments of a ratio production experiment satisfy the measurement axiom of multiplicativity (Narens, 1996), the numerals as used by the participants and in the experimental instructions can be interpreted as scientific numbers. For the perception of short durations,

however, multiplicativity was found to be violated in 32% of the tests (Birkenbusch, Ellermeier, & Kattner, 2013).

Following a proposal by Steingrimsson and Luce (2007) assuming a 'numerical distortion' instead of veridical interpretation of numbers, it was therefore investigated, whether the relationship between scientific numbers and numerals as used by the participants can be described by a power function with a constant exponent, i.e. whether the somewhat weaker axiom of *k*-multiplicativity holds.

Data analyses based on three different duration production experiments showed k-multiplicativity to hold for most of all tests. Separate tests for fractions ($p < 1$) yielded exponents > 1, whereas integers ($p > 1$) yielded exponents < 1 for mapping overt numerals onto the implicit internal ratio scale of number.

Scaling loudness with the Borg CR100 Scale®

Elisabet Borg and Charlotte Carlberg

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The Borg CR Scales® are a general intensity scale suitable for most kinds of experiences and symptoms. The scales are constructed to give ratio data and exponents that mimic what is obtained with magnitude estimation (ME). To also give level determinations and for interindividual comparisons, verbal labels are placed on the scale in congruence with the ratio scale from 0 (nothing at all) to 100 (”Maximal"). Since the present Borg CR100 scale® has not previously been tested on loudness, 36 university students partook in a loudness experiment with the Borg CR100 Scale. All sounds (40; 50; 60; 70; 80; 90; 100 dB SPL) were presented four times in the same randomized order. The average power function, computed from individual geometric means, was $R = 61.7 \times S^{0.42}$ ($r = 0.912$) and so the obtained exponent was very close to what is commonly obtained with ME. The Borg CR100 scale thus worked well as a direct scaling method for loudness.

Evaluating elite performance with the Borg CR100 Scale® in a Swedish championship in diving

Elisabet Borg and Chantella Love

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Subjective assessment is used for performance evaluation in many sports, as for example is the case in diving. Usually ordinary category scales are used. However, the Borg CR100 Scale®, a general intensity scale from 0 to 100 may be a better alternative. "Maximal" (100), is then anchored in a "perfect dive". Six judges used the Borg CR100 scale together with the traditional scale for 4 men and 6 women who partook in the semi-finals in the Swedish Championships in diving (2012). Strong significant correlations between the traditional scale and the Borg CR100 scale® ($r = 0.80$) and with the contest results (0.63 and 0.62) were obtained. With the Borg

CR100 scale® several dives had been assessed with a more precise differentiation between the dives. Since the CR100 is more finely graded, the scale gives a better flexibility in the judgments.

The reinforcement magnitude of stimulus affects temporal discrimination and interferes with omission effects in rats

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Reinforcement omission effects (ROEs) have been interpreted as behavioral facilitation after nonreinforcement induced by frustration or behavioral inhibition after reinforcement induced by temporal control. According to frustration theory, ROEs depends on the reinforcement magnitude. In this study, rats were trained on a fixed-interval with limited hold signaled schedule: correct responses were followed by 0.5 or 0.05 ml of a 0.15% saccharin solution. Data showed that there was a discriminative temporal control during the signal, producing different response distributions depending on the reinforcement magnitude anticipated; and the responding was higher after larger reinforcement omission than smaller one. Thus, the manipulation of reinforcement quality using the flavor of saccharin corroborates with the hypothesis that the reinforcement magnitude operates in temporal discrimination and omission effect. But, it was not obtained any increase in the responding after nonreinforcement compared with those immediately preceding ones, which did not support the behavioral facilitation approach of ROEs.

The characteristics and mechanisms of subjective rhythmization

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Subjective rhythmization is the perceptual illusion that the monotone sounds of metronome sequence have different intensity and that these differences follow a regular pattern. Resonance theory, a dynamical systems theory of rhythm perception introduced by Large and Jones (1999), has been used to explain why subjective rhythmization occurs. The present study aimed to test a number of predictions developed using the resonance theory explanation. Nine female and 21 male participants were asked to attend to isochronous sequences of click sounds, presented at ISIs ranging from 150 ms to 2000 ms, and to report the first grouping that he or she experienced. A number of predictions developed from resonance theory were confirmed by the experiment. There was a strong correlation between participant's responses in the subjective rhythmzation task and timing performance in a synchronization task. From a resonance theory perspective this is explained by that rhythm perception and rhythm production share a common neural substrate.

Perceptual judgment of stimulus depth during fixation and saccadic eye movement

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It has been known that spatial perception undergoes systematic changes during a short time window (about 100ms) prior to a saccadic eye movement. A notable example is saccadic compression (or expansion) of perceived 2-dimensional location of stimuli that are presented immediately before (or after) saccades. In this study, we measured the perceptual judgment of stimulus depth in saccadic and steady fixation conditions. The results showed that (1) saccade caused perceived depth compression toward fixation plane, (2) the presence of reference itself on fixation plane also caused compression, (3) the amount of compression was inversely proportional to sensitivity of each experimental condition, and (4) without saccade and without presence of reference, the phenomenon of compression against veridical depth of the stimuli was seen in this short term memory task. These results indicated that the perceived location of presaccadic target is mislocalized toward the fixation plain in three-dimension.

Investigating sensory processes with transcranial direct current stimulation (tDCS)

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tDCS is a non-invasive brain stimulation technique that induces polarity dependent modulation of brain activity and has increasing popularity in basic neuroscience and neurorehabilitation research. It may be applied before or during behavioral tasks without discomfort or interruption of the underlying brain activity. It allows the establishment of stronger causal brain / behavior links, complementing imaging and electrophysiological methods. The present talk will discuss the state of the art of sensory processing research using tDCS, emphasizing the use of behavioral and psychophysical methods. Relevant examples of research on the five senses and multisensory integration will be presented. We will argue that coupling tDCS and psychophysical methods represent a precious strategy in current sensory processing research (although it is still underused), presenting a critical approach on how to effectively apply it. Its advantages and limitations in face of other brain stimulation techniques will also be discussed.

The role of V1 in size and depth judgment: a transcranial direct current stimulation (tDCS) study.

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Recent research suggests that V1 plays an active role in judgment of size and depth. Nevertheless, no research was done using direct brain stimulation of V1 to address this issue. We used tDCS to directly modulate V1 while measuring size and depth perception with a psychophysical scaling method of magnitude estimation in a repeated-measures design. Fourteen subjects received anodal, cathodal and sham tDCS (Oz-Cz, 0.06mA/cm2) in separate sessions randomly starting with size or depth judgment tasks. Power functions were fit to the data and slopes, y-intercepts and R2 were compared with repeated measures ANOVAs. Anodal tDCS significantly decreased slopes and increased y-intercepts, apparently disrupting size and depth perception. Results further suggest V1 involvement in the judgment of size and depth, suggesting that an increase in V1 activity leads to disrupted size and depth judgment. Specificity and relevance of these findings in face of current literature will be discussed.

Perceptual analysis of the logos of the host cities of the World Cup 2014: a study of the attributes attractiveness and representativeness.

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The aim of this study was to perform a perceptual and cognitive analysis of logos of the host cities of the World Cup 2014. For this purpose, two perceptual tests regarding ranking and magnitude of the attributes attractiveness and representativeness were performed, and also a cognitive test of visual association where the subject linked the image to the host city. These tests were applied to 50 people, 10 professionals and 40 students in the Tourism area. The logos were extracted from the FIFA official page, and considering all the host cities 12 logos were obtained (Belo Horizonte - MG, Brasília - DF, Cuiabá - MT, Curitiba - PR, Fortaleza - CE, Manaus -AM, Natal - RN, Porto Alegre - RS, Recife - PE, Rio de Janeiro - RJ, Salvador - BA, São Paulo - SP). The results obtained in the tests show that in relation to attractiveness the city of Cuiabá was the best ranked among students with an average score of 4.0, and among professionals Sao Paulo was first placed with an average of 3.9, and in both groups Recife ranked second with 4.3 and 4.9, respectively. In relation to the representativeness, the city of São Paulo, with an average of 3.8, was the best placed among students, and Salvador, with an average of 3.0, ranked first among professionals. In magnitude tests regarding attractiveness attribute, Cuiabá ranked first among students, with an average of 17,450, and Sao Paulo ranked first among professionals, with an average of 19.8. In relation to the representation attribute, Sao Paulo was first placed among students, with an average of 16,250, and Cuiabá was first ranked among professionals, with an average of 18.2. In cognitive testing among students Sao Paulo ranked first with 37 points, and among professionals Cuiabá, Curitiba and Sao Paulo tied with 10 hits each. These results indicate that some logos have achieved to be attractive and represent through visual association elements of the city to be advertised. They also showed that some logos such as Porto Alegre and Fortaleza failed to be either attractive or representative. Therefore, this study aimed to point out positive

and negative aspects of each logo, being a guideline for other international events that Brazil will host.

Some research tips from 55 years' psychophysics

Hannes Eisler

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I shall list some problems I met and how I solved them, illustrated by already published research. For instance: basic contra applied research, context effects, the validity of obtained results, data equivalence, the physicalistic trap, observers as a problem, structure vs. content, mathematics vs. statistics, creative research vs. gap filling research, individual vs. group data, serendipity, time perception (in humans and rats). I shall wind up with a lesson on how to boast elegantly.

Temporal aspects of subjective visual experience: Evidence from stimulus-evoked hallucination

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Our understanding of human visual perception generally rests on the assumption that conscious visual states represent, in some qualitative fashion, the complex interaction between spatially structured variations in the ambient optic array and our visual nervous systems. The existence of visual hallucinations (or purely subjective visual experience) in a number of pathologies as well as in experimental contexts questions the assumption that what we see in the environment is necessarily determined by spatial structure in the distal stimulus. The experimental data go further by showing that conscious states of apparent vision (i.e., apperception) are triggered by temporal stimulation that does not ultimately relate to what the observer 'sees' in the apperceptive field. We have shown that the subjective experience of complex colour and forms is evoked by flickering light and, critically that the incidence and type of subjective experience varies with flicker frequency and phase (Becker & Elliott, 2006; Becker et al., 2008; Elliott et al., 2012). In this contribution, I shall outline evidence that subjective experiences, perhaps also hallucinations, arise from dynamic systems states with very well defined temporal structure. This structure is both measurable and refers to well known perceptual timing quanta – leading in turn to novel and perhaps radical conclusions about the relationship between dynamic systems and perceptual (and perhaps more generally psychological) experience.

Investigating the temporal and phase structure of oscillatory mechanisms in auditory binding

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This study examined the psychophysical mechanisms concerned with combining tonal signals into auditory Gestalten. Previous research revealed a rate (33 Hz) and time-specific reaction-time (RT) enhancement for inharmonic tones. The present study investigates an enhancement effect that is dependent on a temporal relationship defined by the frequency of the oscillatory response, thus is not confined to oscillations of 33Hz. Using a priming paradigm to establish controlled auditory gamma-band oscillatory activity, participants (N = 13) responded as rapidly and accurately as possible to the presence or absence of a target tone in the second of a sequence of two sounds. The results revealed an inharmonic enhancement effect that was evident for all frequencies. By converting the ISIs for each level of rate into fractions of the evoked oscillatory cycle and mapping the reaction time data for the inharmonic as a function of this cyclic phase, an anti-phase relationship was revealed.

Distances between modulating keys also shorten subjective time estimations in real music stimuli

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Real and long music stimuli are not common in music cognition and subjective time literatures. In prior study, we found longer retrospective time reproductions for an excerpt of Berio's 'Symphony for Eight Voices and Orchestra' than for an excerpt of Mahler's 'Symphony #2' (90s-long). Berio handled Mahler's symphony inserting complexity in all its musical structures. Cognitive-storing time-models such as storage-size, attentional, and contextual-change, or even internal-clock model explain these data predicting longer time estimation for greater amount of information. Afterwards, we found synthetic music (20s-long) eliciting time estimations in inverse function of the distance between its modulating keys with major impact for sudden ones. We proposed the Expected Development Fraction (EDF) Model based upon the disproportion between expected and perceived time. In this study, we handled the interkey distance of the piece 'Inspiração' (90s-long) by Brazilian composer Garoto. Results confirmed the EDF Model and did not confirm the information-based models.

Navigating New York: Children's maps of real vs. virtual environments

Michelle Galanter

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Distilling a 3 dimensional multi-sensory experience into a 2 dimensional representation constitutes a set of cognitive skills peculiar to human beings. Through physical experiences in the

real world, even young children are able to draw letters, pictures and maps. However, as technology becomes more advanced, the animated 3 dimensional simulations on computers have not only become more convincing than they once were, but can be convenient for learning structural properties of the physical world in a crowded classroom. In this pilot study, we investigate how effective it is for children to explore a virtual world versus physical reality, by comparing the accuracy of maps made by children who physically walk through a complex physical environment with those of children who explored a computer-based representation of that environment.

Effects of magnitude on grasping

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It has been suggested that the processing of numerical value and of stimulus magnitude in general are mediated by a dedicated set of regions within the parietal lobe. An overlapping set of regions mediates online control of actions. Previous research has shown that the fingers' aperture during grasp is affected by the numerical values of the numbers embedded in the grasped objects. Numerically larger digits lead to larger grip apertures compared with smaller digits during initial stages of the grasp. We present research from our lab suggesting that numerical magnitude affects grasping preparation in an automatic fashion. In addition, we show that the effect on grasping of numerical magnitude is not limited to visual presentation of the numbers and can be found for auditory presentation. These findings suggest that the processing of magnitude information is intimately interconnected with the way that object size is computed for visually-guided action.

Hemisphere specialization for response to positive and negative facial emotional expressions

Luiz G Gawryszewski, Sarah Carvalho de Oliveira, Larissa Verônica Kamarowski, Marinna Garcia Repossi, Douglas de Miranda Pereira, and Tacy Goes de Martins

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Hemispheric specialization for responding to Happy and Sad faces centrally presented was investigated in forty volunteers. Choice Manual Reaction Time (MRT) when the right hand responded to a Happy face and left hand to a Sad face was compared to the reverse arrangement. The MRT were ordered and divided in quintiles. The means of MRT in each quintile were submitted to a repeated-measure ANOVA with factors: Emotion, Response hand and Quintiles. All main factors were significant. Happy face MRT was shorter than Sad face MRT, left hand was faster than right hand and MRT increased with Quintiles. Post-hoc analyses showed that right hand response to Sad face was the slowest one and that Happy and Sad face MRT differed only in first quintiles. These effects may be due to automatic withdrawal reactions elicited by negative emotions which are compensated by faster processing of Sad faces by the right hemisphere.

Deciphering the time code of the brain: From behavioral time invariants to laws of neural organization

Hans-Georg Geissler

University of Leipzig, Germany.

In functional brain research, global principles of neural organization are getting into focus as a basis for capturing perceptual-cognitive dynamics. I here suggest that this enterprise ought to be complemented by reverse inference, from behaviorally identifiable time invariants to putative correlates in cyclic brain activity. Specifically, this applies to psychophysical laws of temporal range formation. Integer-ratio dissections and recursive enlargements of the smallest temporal range are shown to agree with EEG bands in absolute terms and on the individual level. Different from traditional accounts, the so predicted cascade of cyclic activity is fundamentally asymmetric and open to cross-range organization. Task-specific processing regimes are envisaged to emerge through rapid selection from large manifolds of pre-activated options, with functional engagement of bands being sensitive to direction and context of activation.

We don't compare apples to oranges (or chicken wings to pizza)

Nancy Greene, Sarah Lyons, and Debra Zellner

Montclair State University, USA.

The effect of consuming a well-liked food on liking for a less-well-liked subsequently consumed food was examined. Experimental group subjects consumed a barbequed chicken wing (well-liked) prior to consuming a slice of pizza (less well-liked). Control group subjects just consumed the pizza. All subjects received a cream puff on a chocolate cookie after consuming the pizza. Subjects rated liking for the foods they consumed. Half of the experimental subjects and half of the control subjects were told that they would be rating a series of "foods" and the other half were told that they would be consuming a meal composed of either an appetizer, entrée, and dessert (experimental subjects) or an entrée and a dessert (control subjects). There was no difference between the groups' liking ratings for the pizza. Thus, eating the well-liked chicken wing did not affect liking for the subsequently eaten pizza.

Selective attention under Stress: Evidence from the Stroop effect

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It is well known that the Stroop effect is sensitive to a wealth of contextual factors. A well known factor is the proportion of congruent stimuli in the set: The larger this proportion, the larger the Stroop effect. How does stress affect this relation between context and the magnitude of the Stroop effect? In the study, the Stroop effect was tested under low- and high-stress conditions with high and moderate values of proportion congruence. The results showed faster response times under high stress then under low stress and larger Stroop effects under high congruency for both the high and low stress conditions. The signature finding of the study is the comparable effect of proportion congruity under high and low stress. This result impacts our understanding of how stress affects the selectivity of attention.

Psychophysical training effects on young children with autism

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We review and examine two studies of children diagnosed on the Autism Spectrum to determine the effectiveness of selective Psychophysical training. These studies, funded by grants from the Timberlawn Psychiatric Research Foundation, were conducted at the Autism Treatment Center in Dallas, TX. Sensory processing disorders, probably associated with inadequate brain region interconnectivity, are common underlying issues for children with autism. We employ a psychophysical training program that exercises each child's unique psychosensory capacity to navigate their visual and neuromuscular fields. This approach strengthens needed sensory system functionality, coordination, and CNS interconnectivity. Currently one in six children are diagnosed with neurodevelopmental delays. We propose effective and affordable psychophysical intervention that can enhance normal development.

The varieties of momentum-like experience

Timothy L. Hubbard

Cognition and behavior exhibit biases consistent with future expectations, and some of these biases result in momentum-like effects and have been linked with the idea of momentum. These momentum-like effects include representational momentum, operational momentum, attentional momentum, behavioral momentum, and psychological momentum. Effects of several variables on each momentum-like effect are considered, and similarities of different momentum-like effects are considered. It is suggested that representational, operational, and attentional momentum reflect similar or overlapping mechanisms based on a perceptual time-scale and extrapolation primarily across space, and that behavioral and psychological momentum reflect similar or overlapping mechanisms based on a longer time-scale and extrapolation primarily across time. These forms of momentum-like effect may reflect a more general mechanism, and speculation regarding properties of such a mechanism is offered. Importantly, such a mechanism clearly reveals an influence of the physics of the world on the psychological representation of the world.

Context effects in perception and discrimination of paired bounce heights.

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The role of surface properties on perception of bounce height was studied in two experiments using the method of paired comparisons. Participants observed animations of a ball bouncing on a surface plane with either matte or shiny features. Each trial comprised an animation of two ball bounces in temporal sequence, one with a ball bouncing on a rough plane, and one with a ball bouncing on a smooth plane. The heights of the two bounces in each stimulus pair were varied systematically in semi factorial combination. The findings include characteristic asymmetries that were found to change systematically in magnitude depending on the surface properties of the plane; bounce height was perceived to be higher for smooth as compared to rough surfaces, for both matte and shiny materials. The results are interpreted in terms of Hellström's (1979) Sensation Weighting model.

Perceived exertion and heart rate during long term ergometer work of young and older subjects

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To explore the effect of more frequent but shorter compared to less frequent but longer breaks on physical strain, 29 participants aged between 27 to 37, 43 to 51 and 61 to 71 years took part in experiments working on a bicycle ergometer. In a preliminary test designed to estimate the individual exercise capacity, participants cycled for 28 minutes with systematically varied loads between 25 and 175 Watt. In two subsequent sessions with different activity-rest schedules they cycled for 7 hours at low to medium load, interrupted by brief peak loads at high exertion levels, while perceived exertion, heart rate and experienced fatigue were recorded. Results indicate neither general nor age-related break effects at subjectively equal straining load. However, heart rate was found to be lower at some periods in the frequent-short break condition while perceived exertion was lower in the condition with less frequent but longer breaks.

Proprioceptive performance of the hands in Cartesian space

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Proprioceptive performance of the hands has been investigated almost exclusively in the horizontal plane. In the current study, proprioceptive discrimination ability of both right (preferred) and left (non-preferred) hand movements was assessed in medio-lateral (ML), antero-posterior (AP), superior-inferior (SI) directions. A linear apparatus was used to present two of movement extents: 21.9cm (noise) and 22.9cm (signal) that were judged without the aid of vision. Participants classified each movement using one of four response ratings: 'Certain-Short', 'Uncertain-Short', 'Uncertain-Long' and 'Certain-Long'. The area under the ROC curve was used as the measure of proprioceptive acuity. A significant interaction showed superior performance for the right (preferred) hand for the two directions (ML+AP) in the horizontal plane but superiority for the left (non-preferred) hand in vertical direction (SI). These hand performance differences for the directions were confirmed by post-hoc tests. Such asymmetries in hand performance can be seen as reflecting a side-dependent task specificity of proprioceptive performance for right-handed individuals.

Theory of ideals and its application

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Clyde Coombs created the idea of an Ideal against which two stimuli are compared in order to overcome intransitivities that often occurred in Thurstonian paired comparison matrices. Clyde's genius was to observe that when two stimuli are not compared against each other, as is required in Thurstonian and Fechnerian comparative judgments, but each is compared against an Ideal, the stimulus nearer the Ideal is the one more likely to be chosen as most characteristic of the Ideal. This idea is generalized in the sequential model of subjective comparisons known as Wave Theory. Applications to several experiments prove the validity of the idea and empirical consequences that invalidate many routine applications of statistical methods to the analysis of data.

Gassendi, the apparent size, and the sun illusion

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Pierre Gassendi advocated, to explain the illusion of the sun at the horizon, the dilatation of the pupil, a theory that Leonardo da Vinci had supported a century before. His theory emerged in four letters to Naudèe, Licetus, Boulliau e Chapelain, written between 1636 and 1640, and published in 1642. Anyway, the theory received little credit, and was criticized early by Molyneaux (1687), Diderot and D′Alembert on the Encyclopedie were ironic about it, and Porterfield (1759) spoke of "so very gross an error". Unfortunately, this aspect of Gassendi's theory has completely concealed his contribution to the problem of size-distance invariance. In this respect his analysis is subtle and sound as the ones elaborated by Descartes and Malebranche.

According to Gassendi, the apparent size is not a matter of sense organs, but of higher cognitive processes. This work aims to reevaluate this neglected aspect of his work.

Distance is not objective: Distance differences between and within objects

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High-level visual functions depend on one's ability to parse and organize the visual field into meaningful structural representations, i.e. objects and groups. Given their fundamental role in cognitive processes objects have been the subject of studies since the early days of scientific psychology. The current study examines how objects affect and even distort the spatial characteristics of the visual field. Specifically, we found that distances between two dots inside the same object are perceived as significantly smaller than the distance between equivalently spaced dots inside two separate objects. Furthermore, we obtained different psychophysical power functions for between- vs. within- objects distances. The contribution of these perceptual differences to higher cognitive processes is discussed.

Reappraisal of magnitude estimation as an adjunct method for functional measurement

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Functional measurement is derived from preliminary measures of the dependent variable of a factorial experiment. These preliminary measures are obtained using an adjunct method, typically the rating method with anchors. This paper presents the finding that magnitude estimation can also be used as an adjunct method for functional measurement. However, it is argued that magnitude estimation is more likely to produce unreliable results.

A mathematical model to explain the quantity of Velvet Hand Illusion.

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You can easily feel the Velvet Hand Illusion (VHI) if you hold a coarse wire net between your hands and move the both hands simultaneously on the net. You feel the surface of the contralateral hand very soft and smooth. The purpose of the study was to infer the brain mechanisms which produce the VHI and to propose a mathematical model to explain the quantity

of VHI based on experimental data. Stimuli, used in the experiment, were instruments which had two straight rods stretched parallel to each other. The participant held the two rods between his/her hands and moved the hands simultaneously in the orthogonal direction toward the rods and responded the quantity of VHI by the magnitude estimation method. The mathematical model was fitted well to the obtained data.

Learning mental rotation

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Women practiced mental rotation using projections of non-standard three-dimensional figures, and then took a mental rotation test (MRT). Practice sessions and the MRT consisted of 24 items. Participants indicated which two of four alternative figures were rotations of a target, picture plane or in depth rotation. Correct responses required marking both target rotations. The incorrect alternatives were rotated mirror images and structurally different figures. Correct responses decreased over three sessions and increased then increased over three. Alternatively, d' showed a more stable, though non-monotonic, increasing measure of accuracy. From last practice to first presentation of the actual MRT, correct response scores increased 26%, *d*' scores increased 126%. Unlike correct response scores, *d*' distinguishes between incorrect responses and blank responses. The different methods of scoring seem to emphasize different skill acquisition.

Neural substrate analysis for visual motion perception and subjective timing

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Previous laboratory studies showed that the greater the body movement in a static image, the longer the time perceived. This study carried out MRI-analyses searching neural substrates for visual motion perception and subjective time. Stimuli were static images of Degas ballerinas of the Body Movement Ranking Scale with the values 1.5, 3.0, and 6.0 points. Each undergraduate participant observed only one stimulus lasting 27s and then reproduced its time duration. This task was performed inside the MRI scanner. Results revealed different activations of MT/V5 cortical brain areas in both hemispheres which were obtained according to the movement score increasing. Frontal areas (BA6 and BA9) were more activated for the 3.0- and 6.0-point stimuli. Neural activation was lesser during the time-estimation task than during the image-observation

task, probably because of the different strategies used by participants while estimating time. These results revealed that motion and time perception have comparable neural mechanisms.

Simultaneous timing: differential attentional processes and auditory dominance

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Accuracy decreases when two time intervals are estimated simultaneously, presumably because of attention sharing. Estimation of both intervals is disturbed as the effect is bidirectional. Two experiments test this effect with two partially overlapping intervals. 57 participants had to produce two target intervals (both 2500 ms) in each trial. The first production was initiated by the participant; 750, 1250 or 1750 ms later, a stimulus began the second production. In some trials, the stimulus never occurred. Stimulus modality (auditory; visual) defining the two productions varied. Analyses suggest that different processes were affected in the two productions: first productions lengthen with later occurrence of the stimulus starting the second interval, suggesting an expectancy effect. Attention sharing seemed to influence the second productions as they lengthened with longer overlap between the productions. Results also support auditory dominance in timing as processing of two simultaneous auditory intervals led to the most accurate productions.

On the magnitude of the placebo effect for pain

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The placebo effect on pain is widely reported. It is induced when subjects are untruthfully told that they have been modified (e.g., given a drug) so that painful stimuli will hurt less than they ordinarily would. The result is that the stimuli are rated as less painful after these instructions than they had been previously. Although the literature on this topic is large, none of the research explicitly investigates the perceptual magnitude of the effect -- how much less painful the placebo effect has made a stimulus. Rather, researchers simply report reductions in pain ratings. Some of the literature and some possible relevant experiments are discussed.

Some remarks on the fitting of psychometric functions to psychophysical data on perception of duration

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Time perception is governed by two established principles: (1) Subjective duration differs from objective duration, so that time seems to fly or slow down under certain conditions, and (2) the standard deviation of subjective duration increases with objective duration, something known as the scalar property. Time perception is investigated by collecting psychophysical data with methods that explicitly or implicitly assume a certain type of psychometric function. Yet, the mathematical form of the psychometric functions typically used for this purpose is incompatible with the two principles stated above: Time perception is explicitly assumed to be veridical and the standard deviation of perceived duration is explicitly assumed to be constant and invariant with objective duration. This paper describes the theoretical consequences of this practice and proposes and investigates the outcomes of an alternative procedure that does justice to widely accepted principles of time perception.

Perceptual learning in patients with macular degeneration

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Macular degeneration (MD) leads to a loss of central vision and, in most cases, to the use of eccentric fixation at the so-called preferred retinal locus (PRL). We investigated whether perceptual learning enhances visual abilities at the PRL. We also determined the neural correlates of learning success using fMRI. Twelve MD patients were trained on a texture discrimination task (TDT) over six days. Patients underwent three fMRI sessions, before, during and after training the TDT task. Visual acuity (Vernier task) and contrast sensitivity were also assessed before and after training. With only one exception, all patients showed improved performance in the trained TDT task. We found a positive correlation between the change in fMRI signal in the visual cortex and patients' performance enhancements. Enhanced TDT performance also correlated with improvements in the Vernier task. The results suggest that perceptual learning can enhance eccentric vision and cortical processing in MD patients.

The role of duration in global loudness evaluation of rising and falling-intensity sounds

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How do listeners create global loudness evaluation of long-duration sounds that change over time? Which temporal integration rules are involved into this perceptual process? The present study examined the role of duration in the global loudness evaluation of 1-kHz rising and falling intensity tones. Three psychophysical experiments were conducted using Absolute Magnitude Estimation procedures (AME) to assess the global loudness of these sounds with durations between 1 and 16s. A loudness asymmetry was observed between the two types of stimuli at all

durations. Besides, our results suggest that listeners' evaluations of rising and falling tones are primarily based on a temporal integration of the loudness peak combined with a "peak-end rule" that weakens the integration when performed at the beginning of the sound. An attempt is made to consider these findings into a more general context, and to identify underlying perceptual and cognitive processes involved in global loudness judgments.

No evidence for an ISI-induced interference effect on temporal processing of empty intervals

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The present study was designed to experimentally test the notion that confusion in temporal processing of two successively presented empty intervals is increased if the duration of these intervals is close to that of the interstimulus interval (ISI). For this purpose, performance on duration discrimination was assessed for base durations ranging from 400 to 1400 msec presented with an ISI of 900 msec. To control for a potential effect of psychophysical task, a 2AFC and a reminder task were applied. In two experiments, a total of 96 participants discriminated the duration of auditory and visual empty intervals, respectively. There was no indication for an interfering effect on discrimination performance caused by the 900-msec ISI. This held for both auditory and visual empty intervals irrespective of psychophysical task. Findings clearly argue against the idea of an ISI-induced interference effect on temporal processing of empty intervals.

Adaptation-level theory in retrospect: a modern evaluation

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The "adaptation-level" *(AL*) in psychophysics is the central concept of Harry Helson´s context-effect theory in sensation and perception (Helson, 1938, 1947, 1964). This approach assumes a so-called neutral stimulus (zero-response reference) which is a function of different sensory and/or perceptual classes of psychophysical stimuli (psychological relativity). The major advantages and disadvantages of the mathematical *AL* model until today will be presented and discussed from a modern perspective (cf. also Sarris, 2006, 2012).

Beware of the bear: Cultural and linguistic differences in the perception of emotional speech

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The identification of emotions in speech is part and parcel of spoken communication. Emotions in speech are conveyed via two auditory dimensions: The lexical content of the words (semantics) and the prosody (i.e., rhythm, stress, and intonation of speech). How is each dimension weighed perceptually? Is the rating of one impacted by the other? Differences in the rules for combining dimensions can be linked to cultural differences in prosody/semantic dominance. Recently, Ben-David et al. presented a comprehensive paradigm that examines the interplay between these two dimensions, Test of Rating of Emotions in Speech (T-RES). This work describes the process of "translating" this paradigm to a different language and culture. Furthermore, we compare the separate weights different cultures assign to these dimensions and the impact of the interplay between these two dimensions on the perception of emotional speech.

On psychometric function with the extreme value distribution

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The psychometric function describes a relationship between physical intensities of stimulus and the possibility of detection the stimulus by participants. The Weibull distribution, the Gumbel distribution, and the Normal distribution were used normally to describe the psychometric function. In my studies of visual detection task, the Extreme Value distribution was used because of following reasons. Firstly, a detection task can be described mathematically by the extreme value theory; Secondly, the cumulative distribution function of the minimum form of the Extreme Value distribution provided a better data fitting than other functions; Thirdly, the Extreme Value distribution is a generalization form of the Weibull distribution, the Gumbel distribution, and the Frechet distribution. The cumulative distribution function of the minimum form of the Extreme Value distribution, $G(x) = 1 - \exp(-(1 + r(-x - b) / a)^{(-1 / r)})$, $1 + r(-x - b) / a > 0$, has three parameters a, b, and r. Parameter a is the scale parameter (slope), b is the position parameter (threshold), and r is the shape parameter.

Effects of distribution of durations of the leading tones on the perceived length of following tone.

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When a puretone lasts for 1000ms is presented with leading puretone of shorter duration than 1000ms, the point of subjective equality to the former is larger than 1000ms. In the context of Adaptation-Level theory, this phenomenon can be considered as anchoring effect; and the PSE to 1000ms represents the Adaptation-Level of the perceived tonal length. In this study, the Adaptation-Level of the perceived tonal length was examined as a function of the distribution of durations of leading tones. As a result, the distributions of durations of the leading tone made

some remarkable differences in Adaptation-Level of the perceived tonal length. This result suggests that the perceived length of standard tone is dependent on not only one duration of leading tone in each comparative judgment but also distribution of durations of all leading tone used in experiment.

Investigating the breakpoint in the timing of sub-second intervals

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Previous research suggests that the timing of short and long sub-second intervals is supported by distinct mechanisms. However, only preliminary research has been conducted on the interval range of the breakpoint demarcating these different mechanisms. Multiple studies with different methods have suggested that this break point is between 300 and 500ms. Here I will describe ongoing research using different interval discrimination tasks. This research aims to identify the interval range of this breakpoint and whether it is similar across tasks. These results have the potential to shed light on differences in the timing of sub-second intervals.

The priming effects of structural information on pitch interval judgements

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A priming experiment was conducted in which participants judged pitch intervals at the end of a short target melody. In each trial (192 in total), the target was preceded by a prime melody that was either transformationally related to the target (transposed, inverse, retrograde) or unrelated. An inter-stimulus interval (ISI) of three different durations separated the prime and the target. 32 participants (9 male, 23 female) were recruited from the University of Roehampton. Analysis revealed that responses to pitch intervals were faster when the target was related to the prime. Further analysis of trials involving related primes only found an interaction between type of transformation and ISI. The implication is that structural transformations of melodic stimuli are processed automatically, and may direct listeners' attention. In addition, it is proposed that the processing of different types of transformation follow distinct cognitive pathways.

Does the NFCS react similarly to physiological indicators under the psychophysical parameters' view point?

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Introduction: NFCS is a neonatal pain assessment tool. We didn't found evidence relating NFCS with the psychophysical parameters. The aim of this study was to evaluate the psychophysical behavior of the parameters intensity, reactivity and regulation in the NFCS.

Methods: NFCS and it subscores of 41 newborns videotaped before, during and, one and two minutes after heel prick were carried out of clinical setting. Intensity was calculated by the mean of scores at each period of observation, reactivity by the difference of scores between the periods before and during heel prick and the regulation by the difference of scores between the periods during and at one and two minutes after heel prick. Nonparametric tests verified the statistical significance.

Results and Conclusion: NFCS and its subscores met the parameters intensity and reactivity. NFCS and the majority of its subscores met the parameter regulation. A minute after heel prick tongue protrusion and chin quiver didn't met the regulation parameter and two minutes after only the tongue protrusion.

A diagnostic of the size-weight illusion by lines of subjective equality

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We studied the size-weight illusion by a variant of the psychophysical method of constant stimuli, setting the participant a three-choice discrimination task. We hypothesized a trinomial logistic response model for estimating (by maximum likelihood) lines of subjective equality, thought of as a two-dimensional extension of the basic psychophysical concept of point of subjective equality. The estimates obtained specified the relative contribution of size and weight to apparent heaviness as well as order errors. The results of our experiment show that the relative contribution of size to apparent heaviness differs for stimulus sets differing in size and weight, but it is independent of the method used for comparing objects (consecutive vs. simultaneous weighing). The first finding implies that a linear model cannot describe the integration of size and weight information in the illusion; the second finding is evidence for the low-level character of the integration process.

The lightness of "Ebbinghaus like" figures with illusory contours

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The phenomenally enhanced lightness, at the basis of the appearance of "anomalous" figures (Parks, 1980), has been modified through the illusory modification of their size (Zanuttini & Daneyko, 2010). A white disk, in an Ebbinghaus like figure, looks larger and lighter when surrounded by smaller disks (Danejko, Zavagno. & Zanuttini, 2011). It has been assumed that the packs, generating an anomalous figure (Kanizsa, 1976), can behave as inducing circles in an Ebbinghaus display (Zanuttini, 2012). "Anomalous" disks, created by black packs of increasing size and conventional disks of the same geometrical size, one darker and one lighter than the

background, were presented in pairs. Thirty observers evaluated the magnitude of the disks and their lightness (which one looked larger/lighter). According to the results the magnitude of a figure, that has only a phenomenal existence, can be illusorily modified and its lightness can be affected, without any change in surface luminance.

IAMFaRR: A tool for assessing maximum range of face recognition

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Individuals with visual impairments are often assessed via high-contrast letter acuity charts (ETDRS, Landolt-C). However, those who experience difficulty recognizing faces may not be accurately assessed by these methods due to the fundamentally different nature of the face and letter recognition tasks. Currently, there exists no clinical tool to quantify face recognition deficits. To fill this void, we developed the Individual Assessment of Maximum Face Recognition Range (IAMFaRR) test, which estimates the maximum distance at which one can recognize a face. IAMFaRR incorporates an 8AFC face-matching task where the size of the target face varies according to an interleaved staircase procedure. Threshold face size is then converted into an estimate of maximum face recognition range. After testing participants having a range of visual acuities, we found a non-linear relationship between IAMFaRR results and visual acuity, in agreement with our previous findings.

The mind in the cave: Perception of paleolithic paintings and petroglyphs

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Characteristics of images painted on cave walls or chipped onto rocky surfaces have been suggested to provide insight into the cognitive capacities of human ancestors (e.g., Mithen, 1996), and in an examination of such artwork, Dobrez (2013) suggested the representational space of Paleolithic artwork resulted in perceived looming of the depicted images. This latter notion was tested in two experiments that presented pictures of cave paintings and petroglyphs. In both experiments, a target image followed by a probe image was presented. The viewpoint of the probe was closer, the same as, or further from the artwork than the viewpoint of the target. In Experiment 1, participants judged whether the probe was the same as or different from the target; in Experiment 2, participants judged whether the viewpoint of the probe was closer than, the same as, or further than that of the target. Results suggest memory for the target was displaced away from participants (toward a more distant viewpoint). A model for looming effects is proposed that involves an initial boundary extension followed by a mismatch of remembered (displaced) information and perceived information during subsequent perception.