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volume 1 issue 1, pages 1-7

Face adaptation: Changing stable representations of familiar faces within minutes?



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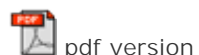
#### ABSTRACT

Three experiments are reported showing that the perception and the assessment of veridicality of familiar faces are highly adaptive to new visual information. Subjects were asked to discriminate between real photographs and altered versions of celebrities. Exposing participants to extremely deviated versions changed the usually stable representations of the famous faces within a very short time. In Experiment 1, exposure to an extreme face version resulted in identity decisions shifted towards the exposed one. Experiment 2 revealed that the effects are not short lasting. In Experiment 3, we showed that the effect also generalizes to different pictures of the same famous person. Together the experiments seem to indicate that the brain permanently adapts to new perceptual information and integrates new data within already elaborated representations in a fast way.

Keywords: face recognition, face representation, adaptation effect, learning, memory

volume 2 issue 1, pages 1-5

Trends and styles in visual masking



1

volume 2 issue 2-3, pages 99-102

Music Performance



pdf version

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1

volume 2 issue 4, pages 239-253

Heuristics and representational change in two-move matchstick arithmetic tasks



pdf version

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#### ABSTRACT

Insight problems are problems where the problem solver struggles to find a solution until \*aha! \* the solution suddenly appears. Two contemporary theories suggest that insight problems are difficult either because problem solvers begin with an incorrect representation of the problem, or that problem solvers apply inappropriate heuristics to the problem. The relative contributions of representational change and inappropriate heuristics on the process of insight problem solving was studied with a task that required the problem solver to move two matchsticks in order to transform an incorrect arithmetic statement into a correct one. Problem solvers (N = 120) worked on two different types of two-move matchstick arithmetic problems that both varied with respect to the effectiveness of heuristics and to the degree of a necessary representational change of the problem representation. A strong influence of representational change on solution rates was found whereas the influence of heuristics had minimal effects on solution rates. That is, the difficulty of insight problems within the two-move matchstick arithmetic domain is governed by the degree of representational change required. A model is presented that details representational change as the necessary condition for ensuring that appropriate heuristics can be applied on the proper problem representation.

Keywords: insight, heuristics, representational change

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volume 3 issue 3, pages 363-373

Emotion and memory: Event-related potential indices predictive for subsequent successful memory depend on the emotional mood state



pdf version

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## ABSTRACT

The present research investigated the influences of emotional mood states on cognitive processes and neural circuits during long-term memory encoding using event-related potentials (ERPs). We assessed whether the subsequent memory effect (SME), an electrophysiological index of successful memory encoding, varies as a function of participants' current mood state. ERPs were recorded while participants in good or bad mood states were presented with words that had to be memorized for subsequent recall. In contrast to participants in bad mood, participants in good mood most frequently applied elaborative encoding styles. At the neurophysiological level, ERP analyses showed that potentials to subsequently recalled words were more positive than to forgotten words at central electrodes in the time interval of 500-650 ms after stimulus onset (SME). At fronto-central electrodes, a polarity-reversed SME was obtained. The strongest modulations of the SME by participants' mood state were obtained at fronto-temporal electrodes. These differences in the scalp topography of the SME suggest that successful recall relies on partially separable neural circuits for good and bad mood states. The results are consistent with theoretical accounts of the interface between emotion and cognition that propose mood-dependent cognitive styles.

Keywords: episodic memory, emotion, cognitive styles, subsequent memory effect, event-related potentials

Visual masking and the dynamics of human perception, cognition, and consciousness. A century of progress, a contemporary synthesis, and future directions.



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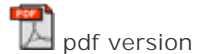
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## ABSTRACT

The 1990s, the "decade of the brain", witnessed major advances in the study of visual perception, cognition, and consciousness. Impressive techniques in neurophysiology, neuroanatomy, neuropsychology, electrophysiology, psychophysics and brain-imaging were developed to address how the nervous system transforms and represents visual inputs. Many of these advances have dealt with the steady-state properties of processing. To complement this "steady-state approach", more recent research emphasized the importance of dynamic aspects of visual processing. Visual masking has been a paradigm of choice for more than a century when it comes to the study of dynamic vision. A [recent workshop](#), held in Delmenhorst, Germany, brought together an international group of researchers to present state-of-the-art research on dynamic visual processing with a focus on visual masking. This special issue presents peer-reviewed contributions by the workshop participants and provides a contemporary synthesis of how visual masking can inform the dynamics of human perception, cognition, and consciousness.

Keywords: vision, motor control, masking, subliminal priming, consciousness, attention

## The role of spatial and temporal information in biological motion perception



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### ABSTRACT

Point-light biological motion stimuli provide spatio-temporal information about the structure of the human body in motion. Manipulation of the spatial structure of point-light stimuli reduces the ability of human observers to perceive biological motion. A recent study has reported that interference with the spatial structure of point light walkers also reduces the evoked event related potentials over the occipitotemporal cortex, but that interference with the temporal structure of the stimuli evoked event-related potentials similar to normal biological motion stimuli. We systematically investigated the influence of spatial and temporal manipulation on 2 common discrimination tasks and compared it with predictions of a neurocomputational model previously proposed. This model first analyzes the spatial structure of the stimulus independently of the temporal information to derive body posture and subsequently analyzes the temporal sequence of body postures to derive movement direction. Similar to the model predictions, the psychophysical results show that human observers need only intact spatial configuration of the stimulus to discriminate the facing direction of a point-light walker. In contrast, movement direction discrimination needs a fully intact spatio-temporal pattern of the stimulus. The activation levels in the model predict the observed event related potentials for the spatial and temporal manipulations.

Keywords: biological motion, model, task dependency, event-related potentials

2

volume 1 issue 1, pages 9-16

## Influence of gaze direction on pointing to unseen proprioceptive targets



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### ABSTRACT

The question of how sensory information is encoded and integrated for goal-directed movements is a major topic in action research. Here we studied the influence of the direction of gaze on a task in which healthy individuals were required to point to their own unseen fingertip. An effect of the position of gaze on pointing, leading to pointing errors in the direction opposite to the gaze position, was obtained in the range of 11° but vanished for 22°. These results suggest that targets of aiming movements performed with an unseen arm may be encoded in retinal coordinates even when the target is encoded in a nonvisual modality and remains unseen.

Keywords: gaze, pointing, proprioceptive, retinal coordinates, sensori-motor

2

volume 2 issue 1, pages 7-19

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**ABSTRACT**

The masked prime task was used to investigate low-level inhibitory motor control processes in two groups of children (7-8 years and 11-12 years) and in older adolescents/young adults (16-23 years). Masked prime stimuli, presented below the level of conscious awareness, systematically affected reaction times (RTs) to subsequent supraliminal target stimuli: RTs were longer when prime and target were mapped to the same response than when they were mapped to different responses. This negative compatibility effect did not differ significantly between age groups, consistent with the hypothesis that the underlying low-level inhibition processes are already fully developed in children as young as seven years of age. In contrast, performance differences between response repetition and response alternation trials were significantly larger in children, consistent with the hypothesis that higher-level control processes are less effective in children. Results provide converging evidence that whereas the latter processes are mediated by late-maturing (prefrontal cortical) areas, the former processes are mediated by earlier-maturing (possibly subcortical) structures.


Keywords: Masked priming, inhibition, development

2

volume 2 issue 2-3, pages 103-112

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Music performance anxiety: New insights from young musicians

 pdf version

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**ABSTRACT**

Music performance anxiety (MPA) is a relatively neglected psychological phenomenon that rarely appears in mainstream psychological journals or textbooks. To date, this field of inquiry has focused primarily on professional and amateur adult musicians or college level music students. With the exception of a small number of recent additions to the literature, there have been few studies examining the experience of MPA in younger musicians. In this paper, we review our work on MPA in general, and summarize our recent work with young musicians. We argue that the experience of MPA may begin early in a musical career and that the characteristics of this experience are qualitatively similar to those experienced by adult musicians. There are therefore compelling reasons to address MPA early and to take a strong preventive focus on a condition that to date shows persistence over time and only modest response to available treatments.

Keywords: music performance anxiety, young musicians, assessment, cognition

2

volume 2 issue 4, pages 255-267

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Failure of the extended contingent attentional capture account in multimodal settings

 pdf version

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## ABSTRACT

Sudden changes in our environment like sound bursts or light flashes are thought to automatically attract our attention thereby affecting responses to subsequent targets, although an alternative view (the contingent attentional capture account) holds that stimuli only capture our attention when they match target features. In the current study, we examined whether an extended version of the latter view can explain exogenous cuing effects on speed and accuracy of performance to targets (uncued-cued) in multimodal settings, in which auditory and visual stimuli co-occur. To this end, we determined whether observed effects of visual and auditory cues, which were always intermixed, depend on top-down settings in "pure" blocks, in which only one target modality occurred, as compared to "mixed" blocks, in which targets were either visual or auditory. Results revealed that unimodal and crossmodal cuing effects depend on top-down settings. However, our findings were not in accordance with predictions derived from the extended contingent attentional capture account. Specifically, visual cues showed comparable effects for visual targets in pure and mixed blocks, but also a comparable effect for auditory targets in pure blocks, and most surprisingly, an opposite effect in mixed blocks. The latter result suggests that visual stimuli may distract attention from the auditory modality in case when the modality of the forthcoming target is unknown. The results additionally revealed that the Simon effect, the influence of correspondence or not between stimulus and response side, is modulated by exogenous cues in unimodal settings, but not in crossmodal settings. These findings accord with the view that attention plays an important role for the Simon effect, and additionally questions the directness of links between maps of visual and auditory space.

Keywords: insight, heuristics, representational change with spatial attention, multimodal, mixed-blocked

2

volume 3 issue 1-2, pages 9-20

[Visual masking: past accomplishments, present status, future developments](#)  pdf version

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## ABSTRACT

Visual masking, throughout its history, has been used as an investigative tool in exploring the temporal dynamics of visual perception, beginning with retinal processes and ending in cortical processes concerned with the conscious registration of stimuli. However, visual masking also has been a phenomenon deemed worthy of study in its own right. Most of the recent uses of visual masking have focused on the study of central processes, particularly those involved in feature, object and scene representations, in attentional control mechanisms, and in phenomenal awareness. In recent years our understanding of the phenomenon and cortical mechanisms of visual masking also has benefited from several brain imaging techniques and from a number of sophisticated and neurophysiologically plausible neural network models. Key issues and problems are discussed with the aim of guiding future empirical and theoretical research.

Keywords: masking, neural networks, nonconscious/conscious processing, object perception

2

volume 3 issue 3, pages 375-387

[Orientation tuning of a two-stimulus afterimage: Implications for theories of filling-in](#)  pdf version

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**ABSTRACT**

Sequential viewing of 2 orthogonally related gratings produces an afterimage related to the first grating (Vidyasagar, Buzas, Kisyarday, & Eysel, 1999; Francis & Rothmayer, 2003). We investigated how the appearance of the afterimage depended on the relative orientations of the 2 stimulus gratings. We first analyze the theoretical explanation of the appearance of the afterimage that was proposed by Francis and Rothmayer (2003). From the analysis, we show that the model must predict a rapid drop in afterimage occurrence as the gratings deviate from orthogonal. We also show that the model predicts that the shape of the afterimage should always be orthogonal to the second grating. We then report on 2 experiments that test the properties of the model and find that the experimental data are strikingly different from the model predictions. From these discrepancies we identify the key deficits of the current version of the model.

Keywords: afterimage, brightness perception, filling-in

2

volume 3 issue 4, pages 429-448

Attentional demand influences strategies for encoding into visual working memory



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**ABSTRACT**

Visual selective attention and visual working memory (WM) share the same capacity-limited resources. We investigated whether and how participants can cope with a task in which these 2 mechanisms interfere. The task required participants to scan an array of 9 objects in order to select the target locations and to encode the items presented at these locations into WM (1 to 5 shapes). Determination of the target locations required either few attentional resources ("popout condition") or an attention-demanding serial search ("non pop-out condition"). Participants were able to achieve high memory performance in all stimulation conditions but, in the non popout conditions, this came at the cost of additional processing time. Both empirical evidence and subjective reports suggest that participants invested the additional time in memorizing the locations of all target objects prior to the encoding of their shapes into WM. Thus, they seemed to be unable to interleave the steps of search with those of encoding. We propose that the memory for target locations substitutes for perceptual pop-out and thus may be the key component that allows for flexible coping with the common processing limitations of visual WM and attention. The findings have implications for understanding how we cope with real-life situations in which the demands on visual attention and WM occur simultaneously.

Keywords: attention, working memory, interference, encoding strategies

3

volume 2 issue 1, pages 21-35

Investigating neurophysiological correlates of metacontrast masking with magnetoencephalography





## ABSTRACT

Early components of visual evoked potentials (VEP) in EEG seem to be unaffected by target visibility in visual masking studies. Bridgeman's reanalysis of Jeffreys and Musselwhite's (1986) data suggests that a later visual component in the VEP, around 250 ms reflects the perceptual effect of masking. We challenge this view on the ground that temporal interactions between targets and masks unrelated to stimulus visibility could account for Bridgeman's observation of a U-shaped time course in VEP amplitudes for this later component. In an MEG experiment of metacontrast masking with variable stimulus onset asynchrony, we introduce a proper control, a pseudo mask. In contrast to an effective mask, the pseudomask should produce neither behavioral masking nor amplitude modulations of late VEPs. Our results show that effective masks produced a strong U-shaped perceptual effect of target visibility while performance remained virtually perfect when a pseudomask was used. The visual components around 250 ms after target onset did not show a distinction between mask and pseudomask conditions. The results indicate that these visual evoked potentials do not reveal neurophysiological correlates of stimulus visibility but rather reflect dynamic interactions between superimposed potentials elicited by stimuli in close temporal proximity. However, we observed a postperceptual component around 340 ms after target onset, located over temporal-parietal cortex, which shows a clear effect of visibility. Based on P300 ERP literature, this finding could indicate that working memory related processes contribute to metacontrast masking.

Keywords: Metacontrast masking, MEG, object visibility, working memory



## ABSTRACT

Musical performances by concert soloists in the Western classical tradition are normally memorized. For memory to work reliably under the pressures of the concert stage, the performance must be practiced until it is thoroughly automatic. At the same time, the performance must be fresh and spontaneous in order to communicate emotionally with the audience. The resolution of this apparent contradiction is provided by longitudinal case studies of concert soloists preparing new works for performance. Like expert memorists in other domains, experienced musicians use highly practiced retrieval schemes to accomplish their extraordinary feats of memory. Performers have a mental map of the piece in mind as they perform that tells them where they are and what comes next - a series of landmarks, hierarchically organized by the sections and subsections of the music. The musician attends to these performance cues in order to ensure that the performance unfolds as planned. Performance cues are established by thinking about a particular feature of the music during practice so that it later comes to mind automatically. Performance cues help the soloist consciously monitor and control the rapid, automatic actions of playing, while adjusting to the needs of the moment. During practice, the musician attends mostly to basic performance cues representing critical technical features (e.g., fingerings), and interpretive performance cues, representing phrasings, and changes in dynamics, tempo, and timbre. During performance, the musician hopes to attend mainly to expressive performance cues representing the musical feelings to be conveyed to the audience (e.g. excitement). We

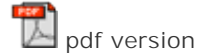
illustrate this analysis with a typical case study of a concert pianist learning J.S. Bach's Italian Concerto (Presto).

Keywords: music performance, expert memory, skill learning

3

volume 2 issue 4, pages 269-276

Exogenous and endogenous response priming with auditory stimuli



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#### ABSTRACT

Exogenous and endogenous response priming were investigated by comparing performance on stimulus-response compatibility (SRC) and response-effect compatibility (REC) tasks using a repeated measures design. In the SRC task, participants made finger taps at high or low locations in response to centrally presented visual stimuli paired with high- or low-pitched tones. In the REC task, the tones were triggered by responses instead of being presented with the visual stimuli, and hence effects of REC on response times reflect the anticipation of forthcoming tones. Results indicated that response times were shorter with compatible mappings between tones and responses than with incompatible mappings in both tasks. Although these SRC and REC effects did not differ reliably in magnitude, they were uncorrelated across participants. Thus, although exogenous and endogenous response priming may be functionally equivalent at the level of the group, it is unclear whether this is the case at the level of the individual.

Keywords: priming, stimulus-response compatibility, response-effect compatibility, auditory perception, auditory imagery

3

volume 3 issue 1-2, pages 21-31

What should a quantitative model of masking look like and why would we want it?



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#### ABSTRACT

Quantitative models of backward masking appeared almost as soon as computing technology was available to simulate them; and continued interest in masking has led to the development of new models. Despite this long history, the impact of the models on the field has been limited because they have fundamental shortcomings. This paper discusses these shortcomings and outlines what future quantitative models should look like. It also discusses several issues about modeling and how a model could be used by researchers to better explore masking and other aspects of cognition.

Keywords: backward masking, dynamic vision, modeling

3

volume 3 issue 3, pages 389-397

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**ABSTRACT**

This study investigated the effect of the environmental structure (circular vs. square environment) on spatial knowledge acquisition in a desktop virtual situation in which self-determined movement was allowed with a total of 120 participants: 7-, 8-year-old children; 11-, 12-year-old children, and adults. In all measurements of spatial knowledge acquisition an overall developmental performance increase from younger children to adults was found. In contrast to that, the exploration and learning behavior did not differ between adults and children. Furthermore, the environmental structure influenced the number of trials needed to learn the two routes used and the distance walked to the determined landmarks. All these tasks were easier in a circular than in a square environment. This influence of the environmental structure was absent in the direction estimations task. The advantage of spatial knowledge acquisition in a circular environment in three of four tasks is discussed.

Keywords: spatial cognition, spatial knowledge, children, development, virtual environments

3

volume 3 issue 4, pages 449-465

Electrophysiological activation by masked primes: Independence of prime-related and target-related activities

 pdf  
version

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**ABSTRACT**


Visual stimuli that are made invisible by metacontrast masking (primes) have a marked influence on behavioral and psychophysiological measures such as reaction time (RT) and the lateralized readiness potential (LRP). 4 experiments are reported that shed light on the effects that masked primes have on the LRP. Participants had a go-nogo task in which the prime was associated with 1 of 2 responses even if the target required participants to refrain from responding. To analyze the electrophysiological responses, we computed the LRP and applied an averaging method separating the activation due to the prime and the target. The results demonstrated that (a) masked primes activate responses even in a nogo situation, (b) this prime-related activation is independent of masking, (c) and is also independent of whether prime and target require the same responses (congruent condition) or different responses (incongruent condition).

Keywords: metacontrast, EEG recording, LRP, Go/Nogo

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volume 2 issue 1, pages 37-45

Priming from novel masked stimuli depends on target set size

 pdf version

[Andrea Kiesel](#)<sup>1</sup>, Wilfried Kunde<sup>2</sup>, Carsten Pohl<sup>1</sup>, & Joachim Hoffmann<sup>1</sup>

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## ABSTRACT

When objects denoted by target words are classified as belonging to a certain category (e.g., to be either small or large) responding is faster when the target word is preceded by a masked prime word belonging to the same rather than a different category. Recently, there has been some controversy on whether such masked priming effects are confined to primes that are practised as targets as well, or whether they transfer to other novel prime words. We report data which show that the transfer of unconscious priming to unpractised stimuli depends on the size of the target set. Priming does transfer to novel (unpractised) primes with a large target set (40 different target words), whereas no transfer to novel primes occurs with a small target set (4 different target words). We conclude that the size and structure of the target set crucially determine the way participants handle a task and thus, determine how unconscious stimuli are processed.

Keywords: Masked priming, novel stimuli, action trigger account

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volume 2 issue 2-3, pages 131-143

### The KTH synthesis of singing



pdf version

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## ABSTRACT

This is an overview of the work with synthesizing singing that has been carried out at the Speech Music Hearing Department, KTH since 1977. The origin of the work, a hardware synthesis machine, is described and some aspects of the control program, a modified version of a text-to-speech conversion system are reviewed. Three applications are described in which the synthesis system has paved the way for investigations of specific aspects of the singing voice. One concerns the perceptual relevance of the center frequency of the singer's formant, one deals with characteristics of an ugly voice, and one regards intonation. The article is accompanied by 18 sound examples, several of which were not published before. Finally, limitations and advantages of singing synthesis are discussed.

Keywords: singing voice, formants, voice source, music performance, analysis-by-synthesis

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volume 3 issue 1-2, pages 33-40

### Common-onset masking simulated with a distributed-code model



pdf version

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## ABSTRACT

A distributed-coding model incorporating lateral inhibition in a simulated nerve network has been successful in accounting for many properties of backward masking (Bridgeman, 1971, 1978), linking modeling with neurophysiology and psychophysics. Metacontrast is a variety of backward masking that is of particular interest in uncovering properties of visual coding because target and mask do not overlap in time or space, and it is the first stimulus that is reduced in visibility, not the second. The lateral inhibitory model can also simulate common-onset masking, where a target and mask appear simultaneously but the mask disappears after a variable delay, and it can reproduce qualitatively the effects of attention on object substitution by varying the time interval over which sensory codes are analyzed.

Keywords: masking, metacontrast, lateral inhibition, mathematical model, object substitution,

volume 3 issue 3, pages 399-407

Further evidence that not all executive functions are equal



pdf version

Christopher A. Was

*Department of Educational Foundations and Special Services, Kent State University, Kent, Ohio, USA***ABSTRACT**

The current study presents a comparison of 2 structural equation models describing the relationship between the executive functions of updating and inhibiting. Although it has been argued that working memory capacity is defined by one's ability to control the focus of attention, the findings of the current study support a view of the executive control of attention that reflects updating and inhibiting as not entirely dependent on the same resources.

Keywords: working memory, executive functions

volume 2 issue 1, pages 47-59

The role of direct parameter specification and attentional capture in near-threshold priming of motor reactions



pdf version

Blandyna Skalska<sup>1</sup>, Piotr Jaśkowski<sup>1</sup>, and Rob H. J. van der Lubbe<sup>2</sup><sup>1</sup> *Department of Cognitive Psychology, University of Finance and Management Warszawa, Poland*<sup>2</sup> *Department of Cognitive Psychology, University of Twente, Enschede, The Netherlands***ABSTRACT**

The priming of motor responses can be induced by preceding visual stimuli that have been made invisible by metacontrast masking ('primes'). According to the concept of direct parameter specification (DPS; Neumann, 1990), strong similarity between prime and target results in the processing operations that are to be applied to the target being also induced by the prime. As targets have to be attended to, this also implies that attention is captured by the location of a prime, thereby facilitating motor priming effects. This hypothetical effect may be viewed as a form of top-down attentional capture. In some subliminal priming experiments (e.g. Jaśkowski, Skalska, & Verleger, 2003), however, attentional capture may have been unrelated to target identity, as stimuli with unique features (singletons) are known to induce bottom-up attentional capture. Three experiments were performed that largely confirmed the view that the results of these earlier experiments were due to top-down attentional capture, in line with DPS. However, the priming effect was also evoked by a singleton irrelevant to the participants' task, although this effect was weaker than in case of strong similarity between prime and target. Priming effects remained when singletons were absent from one side of the visual field, suggesting that the presence of singletons is not a requirement for the observation of motor priming effects.

Keywords: Subliminal priming, direct parameter specification, visuo-spatial attention

volume 2 issue 2-3, pages 145-161

Overview of the KTH rule system for musical performance



pdf version

Anders Friberg, Roberto Bresin, and Johan Sundberg

**ABSTRACT**

The KTH rule system models performance principles used by musicians when performing a musical score, within the realm of Western classical, jazz and popular music. An overview is given of the major rules involving phrasing, micro-level timing, metrical patterns and grooves, articulation, tonal tension, intonation, ensemble timing, and performance noise. By using selections of rules and rule quantities, semantic descriptions such as emotional expressions can be modeled. A recent real-time implementation provides the means for controlling the expressive character of the music. The communicative purpose and meaning of the resulting performance variations are discussed as well as limitations and future improvements.

Keywords: Music performance modeling, rule system, expression

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volume 3 issue 1-2, pages 41-55

Binding binding: Departure points for a different version of the perceptual retouch theory



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**ABSTRACT**

In the perceptual retouch theory, masking and related microgenetic phenomena were explained as a result of interaction between specific cortical representational systems and the non-specific sub-cortical modulation system. Masking appears as deprivation of sufficient modulation of the consciousness mechanism suffered by the target-specific signals because of the temporal delay of non-specific modulation (necessary for conscious representation), which explicates the later-coming mask information instead of the already decayed target information. The core of the model envisaged relative magnitudes of EPSPs of single cortical cells driven by target and mask signals at the moment when the nonspecific, presynaptic, excitatory input arrives from the thalamus. In the light of the current evidence about the importance of synchronised activity of specific and non-specific systems in generating consciousness, the retouch theory requires perhaps a different view. This article presents some premises for modification of the retouch theory, where instead of the cumulative presynaptic spike activities and EPSPs of single cells, the oscillatory activity in the gamma range of the participating systems is considered and shown to be consistent with the basic ideas of the retouch theory. In this conceptualisation, O-binding refers to specific encoding which is based on gamma-band synchronised oscillations in the activity of specific cortical sensory modules that represent features and objects; C-binding refers to the gamma-band oscillations in the activity of the non-specific thalamic systems, which is necessary for the O-binding based data to become consciously experienced.

Keywords: masking, consciousness, perceptual retouch, thalamic modulation, synchronization, gamma-oscillations

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volume 3 issue 3, pages 409-417

Conditional accuracy in response interference tasks: Evidence from the Eriksen flanker task and the spatial conflict task



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## ABSTRACT

Two well-known response interference tasks are the Eriksen flanker task and the spatial conflict task. The tasks are logically equivalent, and comparable effects of current and previous stimulus type (congruent or incongruent) have been shown with regard to reaction time (RT). Here, we investigated whether interference and sequential trial effects also had comparable effects on accuracy. We specifically tested whether these effects interacted with the speed of responding using conditional accuracy functions (CAFs). The CAFs revealed that in both tasks congruency and sequential trial effects on accuracy are found only in trials with fast responses (< 600 ms). Sequential trial effects on accuracy were weaker for the flanker task than for the spatial conflict task. In very fast trials (< 400 ms) response activation by distracting flankers led to below-chance performance in the flanker task, but response activation by incongruent spatial location did not lead to below-chance performance in the spatial conflict task. The pattern of results hints at subtle differences in processing architecture between the tasks.

Keywords: response interference, sequential analysis, accuracy, Simon task, flanker

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volume 2 issue 1, pages 61-76

Shifts of visuospatial attention to invisible (metacontrast-masked) singletons:  
Clues from reaction times and event-related potential



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## ABSTRACT

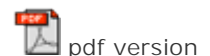
In the current study, we tested whether a masked and, thus, invisible singleton-cue captures attention in a stimulus-driven manner or in a top-down contingent manner. The manual RT (Reaction Time) capture effect with the invisible singleton-cue decreased substantially when a match between the singleton-cue and the top-down controlled set of searched-for target features was also decreased. By contrast, with the PCN (Posterior Contralateral Negativity), an electrophysiological measure of the capture of visuospatial attention by the invisible singleton-cue, no significant decrement was observed. Taken together, the results support the assumption that an invisible singleton-cue can capture attention in a stimulus-driven manner, and that different delays in the deallocation of attention (i.e., attention is deallocated more efficiently from a cue that does not match the top-down controlled set than from a cue that does match the same set) account for the weaker manual RT capture effect with a set-nonmatching invisible singleton-cue.

Keywords: Choice reaction time, ERP, vision, attention

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volume 2 issue 2-3, pages 163-181

Rate limits of sensorimotor synchronization



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## ABSTRACT

Empirical evidence for upper and lower rate limits of sensorimotor synchronization (typically, finger tapping with an auditory or visual event sequence) is reviewed. If biomechanical constraints are avoided, the upper rate limit can be as high as 8-10 Hz (sequence event onset intervals of 100-125 ms) with auditory stimuli, but has been found to be less than 2.5 Hz (> 400 ms) with simple visual stimuli (flashes of light). The upper rate limit for auditory stimuli


varies with task difficulty and musical experience; that for visual stimuli requires further investigation. The lower rate limit, according to one definition, tend to be at about 0.56 Hz (1800 ms), regardless of modality. Attentional, perceptual, and sensorimotor explanations of these limits are considered. Rate limits of sensorimotor synchronization place important constraints on musical ensemble performance and other forms of rhythmic coordination.

Keywords: synchronization, tapping, timing, rhythm, rate limits

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volume 3 issue 1-2, pages 57-65

An analysis of visual masking, with a defense of "Stopped Processing"

 pdf version

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**ABSTRACT**

The use of a backward mask (a patterned mask which follows the target in time) to "stop the processing" of the target illustrates an important application of masking - the study of the "microgenesis" of visual perception, that is, visual processing over about the first one-fifth of a second. This paper provides evidence for stopped processing and some applications of this to object recognition and letter detection. The paper also discusses the notion of an "active filter" which may help to account for Type-A masking but at best can only account for Type-B masking in part. I conclude that masking, while illuminating various areas of vision science, is under-utilized, perhaps because the theoretical justification for such masking is still uncertain, and perhaps because of the care needed to establish that the mask does indeed "stop" processing.

Keywords: masking, metacontrast, stopped processing

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volume 2 issue 1, pages 77-85

Spatial interactions determine temporal feature integration as revealed by unmasking

 pdf version

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<sup>2</sup> *Institut für Kognitionswissenschaft, Universität Osnabrück, Germany*

<sup>3</sup> *Institut für Theoretische Neurophysik, Universität Bremen, Germany*

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**ABSTRACT**


Feature integration is one of the most fundamental problems in neuroscience. In a recent contribution, we showed that a trailing grating can diminish the masking effects one vernier exerts on another, preceding vernier. Here, we show that this temporal unmasking depends on neural spatial interactions related to the trailing grating. Hence, our paradigm allows us to study the spatio-temporal interactions underlying feature integration.

Keywords: Spatio-temporal integration, unmasking, visual system

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volume 2 issue 2-3, pages 183-198

Coordination of perception and action in music performance

 pdf version

Peter Q. Pfordresher



### ABSTRACT

This review summarizes recent research on the way in which music performance may rely on the perception of sounds that accompany actions (termed auditory feedback). Alterations of auditory feedback can profoundly disrupt performance, though not all alterations cause disruption and different alterations generate different types of disruption. Recent results have revealed a basic distinction between the role of feedback contents (musical pitch) and the degree to which feedback onsets are synchronized with actions. These results further suggest a theoretical framework for the coordination of actions with feedback in which perception and action share a common representation of sequence structure.

Keywords: music performance, sequence production, auditory feedback

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volume 3 issue 1-2, pages 67-84

A theory of moving form perception: Synergy between masking, perceptual grouping, and motion computation in retinotopic and non-retinotopic representations



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### ABSTRACT

Because object and self-motion are ubiquitous in natural viewing conditions, understanding how the human visual system achieves a relatively clear perception for moving objects is a fundamental problem in visual perception. Several studies have shown that the visible persistence of a briefly presented stationary stimulus is approximately 120 ms under normal viewing conditions. Based on this duration of visible persistence, we would expect moving objects to appear highly blurred. However, in human vision, objects in motion typically appear relatively sharp and clear. We suggest that clarity of form in dynamic viewing is achieved by a synergy between masking, perceptual grouping, and motion computation across retinotopic and non-retinotopic representations. We also argue that dissociations observed in masking are essential to create and maintain this synergy.

Keywords: moving form perception, dynamic form perception, visual masking, perceptual grouping, motion

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volume 2 issue 1, pages 87-97

Perceptual latency priming and illusory linemotion: Facilitation by gradients of attention?



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### ABSTRACT

The phenomena of illusory line motion and perceptual latency priming are both assumed to reflect a facilitation of perceptual latency. The explanation of illusory line motion presupposes that attention is distributed in a gradient fashion whereas this is not a necessary part of the explanation of perceptual latency priming. Two experiments test whether an attentional gradient is present in perceptual latency priming. Evidence for a gradient was found within 2.5° of visual angle around the attended location, but not at a distance of 5° and more.

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Music-reading deficiencies and the brain



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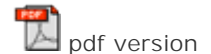
**ABSTRACT**

This paper reviews the literature on brain damage and music-reading for the past 25 years. Acquired patterns of selective loss and sparing are described, including both the association and dissociation of music and text reading, and association and dissociation among components of music reading. As well, we suggest that developmental music - reading deficiencies may be isolated in a form analogous to developmental dyslexia for text or congenital amusia for auditory music processing. Finally, we propose that the results of brain damage studies can contribute to the development of a model of normal music reading.

Keywords: music reading, brain damage, music dyslexia

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Spatial processing and visual backward masking



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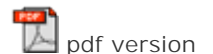
**ABSTRACT**

Most theories of visual masking focus primarily on the temporal aspects of visual information processing, strongly neglecting spatial factors. In recent years, however, we have shown that this position is not tenable. Spatial aspects cannot be neglected in metacontrast, pattern and un-masking. Here, we review these results.

Keywords: temporal processing, verniers, unmasking, metacontrast

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Focal dystonia in musicians: From phenomenology to therapy



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**ABSTRACT**

Background: Musician's dystonia is a task-specific movement disorder which manifests itself as a loss of voluntary motor control in extensively trained movements. In many cases, the disorder terminates the careers of affected musicians. Approximately 1% of all professional musicians are affected. Etiology and Pathophysiology: The pathophysiology of the disorder is still unclear. Findings include (a) reduced inhibition in different levels of the central nervous system, (b) maladaptive plasticity, e.g. in the somatosensory cortex and in the basal ganglia, and (c) alterations in sensorimotor processing. Epidemiological data demonstrated a higher risk for those musicians who play instruments requiring maximal fine-motorskills. For

instruments where workload differs across hands, focal dystonia appears more often in the more intensely used hand. In psychological studies, musicians with dystonia had more perfectionist tendencies than healthy musicians. These findings strengthen the assumption that behavioral factors may be involved in the etiology of musician's dystonia. Hereditary factors may play a greater role than previously assumed. Preliminary findings suggest a genetic contribution to focal task-specific dystonia with phenotypic variations including musician's dystonia. Treatment: Treatment options for musician's dystonia include pharmacological interventions such as administration of Trihexyphenidyl or Botulinum Toxin-A as well as retraining programs and ergonomic changes in the instrument. A long-term follow-up study was performed in 144 patients with musician's dystonia. The outcome was revealed on average 8.4 years after onset of symptoms. Outcome was assessed by patients' subjective rating of cumulative treatment response and response to individual therapies. Seventy-seven patients (54%) reported an alleviation of symptoms: 33% of the patients with Trihexyphenidyl, 49% with Botulinum Toxin, 50% with pedagogical retraining, 56% with unmonitored technical exercises, and 63% with ergonomic changes. In embouchure dystonia, only 15% of patients reported improvement. The results demonstrate that the situation of musicians with focal hand dystonia may be significantly improved. Positive results after retraining and unmonitored technical exercises underline the benefit of an active involvement of patients in the treatment process. Only exceptionally, however, can musicians with focal dystonia return to normal motor control using the currently available therapies.

Keywords: musicians' cramp; focal dystonia, treatment, botulinum-toxin, trihexyphenidyl

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volume 3 issue 1-2, pages 93-105

Visual backward masking: Modeling spatial and temporal aspects



pdf version

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### ABSTRACT

In modeling visual backward masking, the focus has been on temporal effects. More specifically, an explanation has been sought as to why strongest masking can occur when the mask is delayed with respect to the target. Although interesting effects of the spatial layout of the mask have been found, only a few attempts have been made to model these phenomena. Here, we elaborate a structurally simple model which employs lateral excitation and inhibition together with different neural time scales to explain many spatial and temporal aspects of backward masking. We argue that for better understanding of visual masking, it is vitally important to consider the interplay of spatial and temporal factors together in one single model.

Keywords: visual backward masking

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volume 2 issue 2-3, pages 221-231

Neural correlates of rhythmic expectancy



pdf version

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<sup>2</sup> *Department of Psychiatry, VA Boston Healthcare System/Harvard Medical School*

### ABSTRACT

Temporal expectancy is thought to play a fundamental role in the perception of rhythm. This review summarizes recent studies that investigated rhythmic expectancy by recording neuroelectric activity with high temporal resolution during the presentation of rhythmic patterns. Prior event-related brain potential (ERP) studies have uncovered auditory evoked responses that reflect detection of onsets, offsets, sustains, and abrupt changes in acoustic properties such as frequency, intensity, and spectrum, in addition to indexing higher-order processes such as auditory sensory memory and the violation of expectancy. In our studies of rhythmic expectancy, we measured emitted responses - a type of ERP that occurs when an expected event is omitted from a regular series of stimulus events - in simple rhythms with temporal structures typical of music. Our observations suggest that middle-latency gamma band (20-60 Hz) activity (GBA) plays an essential role in auditory rhythm processing. Evoked (phase-locked) GBA occurs in the presence of physically presented auditory events and reflects the degree of accent. Induced (non-phase-locked) GBA reflects temporally precise expectancies for strongly and weakly accented events in sound patterns. Thus far, these findings support theories of rhythm perception that posit temporal expectancies generated by active neural processes.

Keywords: meter, temporal expectancy, auditory perception, gamma-band activity, electroencephalography, rhythm, perception, attention

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volume 3 issue 1-2, pages 107-109

Grouping based feature attribution in metacontrast masking



pdf version

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**ABSTRACT**

The visibility of a target can be strongly suppressed by metacontrast masking. Still, some features of the target can be perceived within the mask. Usually, these rare cases of feature mis-localizations are assumed to reflect errors of the visual system. To the contrary, I will show that feature "mis-localizations" in metacontrast masking follow rules of motion grouping and, hence, should be viewed as part of a systematic feature attribution process.

Keywords: metacontrast masking, feature attribution, feature integration, motion grouping, attention

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volume 2 issue 2-3, pages 233-237

"Musical Excellence: Strategies and techniques to enhance performance"  
**BOOK REVIEW**



pdf version

Dianna T. Kenny

*Australian Centre for Applied Research in Music Performance Sydney Conservatorium of Music, University of Sydney*

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volume 3 issue 1-2, pages 111-123

The mechanisms of feature inheritance as predicted by a systems-level model of visual attention and decision making



pdf version

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## ABSTRACT

Feature inheritance provides evidence that properties of an invisible target stimulus can be attached to a following mask. We apply a systems level model of attention and decision making to explore the influence of memory and feedback connections in feature inheritance. We find that the presence of feedback loops alone is sufficient to account for feature inheritance. Although our simulations do not cover all experimental variations and focus only on the general principle, our result appears of specific interest since the model was designed for a completely different purpose than to explain feature inheritance. We suggest that feedback is an important property in visual perception and provide a description of its mechanism and its role in perception.

Keywords: feature inheritance, attention, decision making, feedback, VSTM, computational model

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volume 3 issue 1-2, pages 125-152

[The role of feedback in visual masking and visual processing](#)



pdf version

Stephen L. Macknik and Susana Martinez-Conde

*Barrow Neurological Institute, Phoenix, USA*

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## ABSTRACT

This paper reviews the potential role of feedback in visual masking, for and against. Our analysis reveals constraints for feedback mechanisms that limit their potential role in visual masking, and in all other general brain functions. We propose a feedforward model of visual masking, and provide a hypothesis to explain the role of feedback in visual masking and visual processing in general. We review the anatomy and physiology of feedback mechanisms, and propose that the massive ratio of feedback versus feedforward connections in the visual system may be explained solely by the critical need for top-down attentional modulation. We discuss the merits of visual masking as a tool to discover the neural correlates of consciousness, especially as compared to other popular illusions, such as binocular rivalry. Finally, we propose a new set of neurophysiological standards needed to establish whether any given neuron or brain circuit may be the neural substrate of awareness.

Keywords: visual, masking, feedback, humans, monkeys, metacontrast, paracontrast, electrophysiology, optical imaging, fMRI, psychophysics, vision, awareness, attention, consciousness, standing wave

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volume 3 issue 1-2, pages 153-165

[Spatio-temporal low-level neural networks account for visual masking](#)



pdf version

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*Goldschleger Eye Research Institute, Tel-Aviv University, Sheba Medical Center, 52621 Tel-Hashomer, Israel*

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## ABSTRACT

Temporal masking is a paradigm that is widely used to study visual information processing. When a mask is presented, typically within less than 100 msec before or after the target, the response to the target is reduced. The results of our psychophysical and visual evoked potential (VEP) experiments show that the masking effect critically depends on a combination of several factors: (1) the processing time of the target, (2) the order of presentation of the target and the mask, and (3) the spatial arrangement of the target and the mask. Thus, the masking effect depends on the spatio-temporal combination of these factors. Suppression was observed when the mask was positioned within a spatial range that was found to evoke

inhibition, and when the temporal separation between the target and the mask was short. In contrast, lateral facilitation was observed when the mask was presented at a spatial separation that did not evoke inhibition from the target's vicinity and with a temporal sequence that preceded the target, or when it was presented simultaneously with it, but not when the target preceded the mask. We propose that masking effects, either suppression or facilitation, reflect integration into the spatial and the temporal domains of the feedforward response to the target and the lateral inputs evoked by the mask (excitatory and/or inhibitory). Because the excitation evoked by the mask develops and propagates slowly from the mask's location to the target's location, it lags behind the response to the target. On the other hand, inhibition that is produced in the vicinity of the target evolves more rapidly and follows the onset and offset of the stimulus more closely. Thus, lateral excitation that overcomes the inhibition may facilitate the grouping of local elements into a global percept by increasing the survivability of the object and its accessibility for perceptual awareness.

Keywords: temporal processing, visual masking, spatio-temporal interactions, temporal masking, visual evoked potentials, psychophysics

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volume 3 issue 1-2, pages 167-176

The power of the feed-forward sweep



pdf version

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**ABSTRACT**

Vision is fast and efficient. A novel natural scene can be categorized (e.g. does it contain an animal, a vehicle?) by human observers in less than 150 ms, and with minimal attentional resources. This ability still holds under strong backward masking conditions. In fact, with a stimulus onset asynchrony of about 30 ms (the time between the scene and mask onset), the first 30 ms of selective behavioral responses are essentially unaffected by the presence of the mask, suggesting that this type of "ultra-rapid" processing can rely on a sequence of swift feedforward stages, in which the mask information never "catches up" with the scene information. Simulations show that the feed-forward propagation of the first wave of spikes generated at stimulus onset may indeed suffice for crude recognition or categorization. Scene awareness, however, may take significantly more time to develop, and probably requires feed-back processes. The main implication of these results for theories of masking is that pattern or metacontrast (backward) masking do not appear to bar the progression of visual information at a low level. These ideas bear interesting similarities to existing conceptualizations of priming and masking, such as Direct Parameter Specification or the Rapid Chase theory.

Keywords: natural scenes, ultra-rapid categorization, pre-attentive recognition, backward masking, feed-forward, processing, spike timing

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volume 3 issue 1-2, pages 177-179

Visual masking by transcranial magnetic stimulation in the first 80 milliseconds



pdf version

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**ABSTRACT**

Stimulation of the occipital cortex with transcranial magnetic stimulation (TMS) can interfere

with visual processing and may cause masking comparable to visual masking. The effect is most pronounced when the TMS pulse is delivered with stimulus onset asynchronies (SOAs) of 80-100 ms. In a few experiments a second time window of TMS-induced visual masking has been identified with its maximum around an SOA of 40 ms. The existence of two masking windows has been taken as evidence for two distinct visual processes taking place in V1: an early feedforward component and a later re-entrant feedback component. The evidence for the existence of two separate TMS time windows is reviewed. The early time window was not reproducible in all the attempts to characterize TMS masking effects. Interindividual anatomical differences in the location of V1 might contribute to the heterogeneous results.

Keywords: visual cortex, masking, feedforward, re-entrant, magnetic stimulation

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volume 3 issue 1-2, pages 181-192

What determines the direction of subliminal priming



pdf version

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### ABSTRACT

Masked stimuli (primes) can affect the preparation of a motor response to subsequently presented target stimuli. Reactions to the target can be facilitated (straight priming) or inhibited (inverse priming) when preceded by a compatible prime (calling for the same response) and also when preceded by an incompatible prime. Several hypotheses are currently under debate. These are the self-inhibition (SI) hypothesis, the object-updating (OU) hypothesis, and mask-triggered inhibition (MTI) hypothesis. All assume that the initial activation of the motor response is elicited by the prime according to its identity. This activation inevitably leads to straight priming in some cases and the mechanisms involved are undisputed. The hypotheses differ, however, as to why inverse priming occurs. The self-inhibition (SI) hypothesis assumes that the motor activation elicited by a prime is automatically followed by an inhibition phase, leading to inverse priming if three conditions are fulfilled: perceptual evidence for the prime has to be sufficiently strong, it has to be immediately removed by the mask, and the delay between the prime and target has to be long enough for inhibition to become effective. The object-updating (OU) hypothesis assumes that inverse priming is triggered by the mask, provided that it contains features calling for the alternative response (i.e. the one contrasting with the response induced by the prime). The MTI hypothesis assumes that the inhibitory phase is triggered by each successive stimulus which does not support the perceptual hypothesis provided by the prime. Based mostly on our own experiments, we argue that (1) attempts to manipulate the three factors required by the SI hypothesis imply changes of other variables and that (2) indeed, other variables seem to affect priming: prime-mask perceptual interaction and temporal position of the mask. These observations are in favor of the MTI hypothesis. A limiting factor for all three hypotheses is that inverse priming is larger for arrows than for other shapes, making it doubtful as to what extent the majority of studies on inverse priming, due to their use of arrows, can be generalized to other stimuli.

Keywords: subliminal priming, inverse and straight priming, backward masking

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Disentangling neural processing of masked and masking stimulus by means of event-related contralateral-ipsilateral differences of EEG potentials




pdf version

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## ABSTRACT

In spite of the excellent temporal resolution of event-related EEG potentials (ERPs), the overlapping potentials evoked by masked and masking stimuli are hard to disentangle. However, when both masked and masking stimuli consist of pairs of relevant and irrelevant stimuli, one left and one right from fixation, with the side of the relevant element varying between pairs, effects of masked and masking stimuli can be distinguished by means of the contralateral preponderance of the potentials evoked by the relevant elements, because the relevant elements may independently change sides in masked and masking stimuli. Based on a reanalysis of data from which only selected contralateral-ipsilateral effects had been previously published, the present contribution will provide a more complete picture of the ERP effects in a masked-priming task. Indeed, effects evoked by masked primes and masking targets heavily overlapped in conventional ERPs and could be disentangled to a certain degree by contralateral-ipsilateral differences. Their major component, the N2pc, is interpreted as indicating preferential processing of stimuli matching the target template, which process can neither be identified with conscious perception nor with shifts of spatial attention. The measurements showed that the triggering of response preparation by the masked stimuli did not depend on their discriminability, and their priming effects on the processing of the following target stimuli were qualitatively different for stimulus identification and for response preparation. These results provide another piece of evidence for the independence of motor-related and perception-related effects of masked stimuli.

Keywords: event-related potentials, masking, masked priming, N2pc, LRP, N2cc

[Visual similarity in masking and priming: The critical role of task relevance](#)  pdf version

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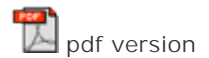
## ABSTRACT

Cognitive scientists use rapid image sequences to study both the emergence of conscious perception (visual masking) and the unconscious processes involved in response preparation (masked priming). The present study asked two questions: (1) Does image similarity influence masking and priming in the same way? (2) Are similarity effects in both tasks governed by the extent of feature overlap in the images or only by task-relevant features? Participants in Experiment 1 classified human faces using a single dimension even though the faces varied in three dimensions (emotion, race, sex). Abstract geometric shapes and colors were tested in the same way in Experiment 2. Results showed that similarity reduced the visibility of the target in the masking task and increased response speed in the priming task, pointing to a double-dissociation between the two tasks. Results also showed that only task-relevant (not objective) similarity influenced masking and priming, implying that both tasks are influenced from the beginning by intentions of the participant. These findings are interpreted within the framework of a reentrant theory of visual perception. They imply that intentions can influence object formation prior to the separation of vision for perception and vision for action.

Keywords: masking, priming, task-relevance, visual similarity, reentrant processing



## The negative compatibility effect: A case for self-inhibition



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In masked priming, a briefly presented prime stimulus is followed by a mask, which in turn is followed by the task-relevant target. Under certain conditions, negative compatibility effects (NCEs) occur, with impaired performance on compatible trials (where prime and target indicate the same response) relative to incompatible trials (where they indicate opposite responses). However, the exact boundary conditions of NCEs, and hence the functional significance of this effect, are still under discussion. In particular, it has been argued that the NCE might be a stimulus-specific phenomenon of little general interest. This paper presents new findings indicating that the NCE can be obtained under a wider variety of conditions, suggesting that it reflects more general processes in motor control. In addition, evidence is provided suggesting that prime identification levels in forced choice tasks - usually employed to estimate prime visibility in masked prime tasks - are affected by prior experience with the prime (Exp. 1) as well as by direct motor priming (Exp. 2 & 3).

Keywords: masked priming, negative compatibility effect, inhibition

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## Temporal processes in prime-mask interaction: Assessing perceptual consequences of masked information



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Visual backward masking is frequently used to study the temporal dynamics of visual perception. These dynamics may include the temporal features of conscious percepts, as suggested, for instance, by the asynchronous-updating model (Neumann, 1982) and perceptual-retouch theory (Bachmann, 1994). These models predict that the perceptual latency of a visual backward mask is shorter than that of a like reference stimulus that was not preceded by a masked stimulus. The prediction has been confirmed by studies using temporal-order judgments: For certain asynchronies between mask and reference stimulus, temporal-order reversals are quite frequent (e.g. Scharlau, & Neumann, 2003a). However, it may be argued that these reversals were due to a response bias in favour of the mask rather than true temporal perceptual effects. I introduce two measures for assessing latency effects that (1) are not prone to such a response bias, (2) allow to quantify the latency gain, and (3) extend the perceptual evidence from order reversals to duration/interval perception, that is, demonstrate that the perceived interval between a mask and a reference stimulus may be shortened as well as prolonged by the presence of a masked stimulus. Consequences for theories of visual masking such as asynchronous-updating, perceptual-retouch, and reentrant models are discussed.

Keywords: masked priming, attention, visual backward masking, metacontrast, perceptual latency, perception of time

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**ABSTRACT**

According to the sensorimotor supremacy hypothesis, conscious perception draws on motor action. In the present report, we will sketch two lines of potential development in the field of masking research based on the sensorimotor supremacy hypothesis. In the first part of the report, evidence is reviewed that masked, invisible stimuli can affect motor responses, attention shifts, and semantic processes. After the review of the corresponding evidence ? so-called masked priming effects ? an approach based on the sensorimotor supremacy hypothesis is detailed as to how the question of a unitary mechanism of unconscious vision can be pursued by masked priming studies. In the second part of the report, different models and theories of backward masking and masked priming are reviewed. Types of models based on the sensorimotor hypothesis are discussed that can take into account ways in which sensorimotor processes (reflected in masked priming effects) can affect conscious vision under backward masking conditions.


Keywords: masked priming, vision, sensorimotor processing, attention

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Measuring unconscious cognition: Beyond the zero-awareness criterion

 pdf version

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**ABSTRACT**

Visual masking can be employed to manipulate observers' awareness of critical stimuli in studies of masked priming. This paper discusses two different lines of attack for establishing unconscious cognition in such experiments. Firstly, simple dissociations between direct measures (D) of visual awareness and indirect measures (I) of processing per se occur when I has some nonzero value while D is at chance level; the traditional requirement of zero awareness is necessary for this criterion only. In contrast, double dissociations occur when some experimental manipulation has opposite effects on I and D, for instance, increasing priming effects despite decreasing prime identification performance (Schmidt & Vorberg, 2006). Double dissociations require much weaker measurement assumptions than other criteria. An attractive alternative to this dissociation approach would be to use tasks that are known to violate necessary conditions of visual awareness altogether. In particular, it is argued here that priming effects in speeded pointing movements (Schmidt, Niehaus, & Nagel, 2006) occur in the absence of the recurrent processing that is often assumed to be a necessary condition for awareness (for instance, DiLollo, Enns, & Rensink, 2000; Lamme & Roelfsema, 2000). Feedforward tasks such as this might thus be used to measure the time-course of unconscious processing directly, before intracortical feedback and awareness come into play.

Keywords: response, priming, masking, visual awareness, dissociations, feedforward sweep

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Top-down modulation of unconscious "automatic" processes: A gating framework

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**ABSTRACT**

In classical theories of automaticity, automatic processes are usually thought to occur autonomously and independently of higher level topdown factors (e.g., Posner & Snyder, 1975). However, already Neumann (1984) pointed out that the cognitive system has to be configured in a certain way for automatic processes to occur. In extension of his work, I propose a gating framework to account for the influence of top-down factors such as attention, intention and task set on automatic processes such as masked response or semantic priming. It is assumed that task representations held in prefrontal cortex regulate the gain of neurons in visual and semantic association cortex thereby modulating the effects of unconsciously perceived masked stimuli on further "automatic" information processing steps. In support of the postulated gating framework, recent studies demonstrated a top-down modulation of automatic processes. Behavioral and electrophysiological studies with the masked response priming and semantic priming paradigms show that masked priming effects crucially depend (i) on temporal attention to the masked prime, (ii) on intentions or action plans and (iii) on the task set active immediately before masked prime presentation. For instance, masked semantic priming was only observed when the preceding task set required the orientation to semantic word features, but not when it required orientation to perceptual word features. These results support the view that unconscious automatic processes are modulated by top-down factors. They are suggestive of a gating mechanism which orchestrates the conscious and unconscious information processing streams.

Keywords: automatic processes, unconscious perception, masked semantic, priming, masked response priming, top-down control

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Mechanisms of subliminal response priming



pdf version

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**ABSTRACT**

Subliminal response priming has been considered to operate on several stages, e.g. perceptual, central or motor stages might be affected. While primes' impact on target perception has been clearly demonstrated, semantic response priming recently has been thrown into doubt (e.g. Klinger, Burton, & Pitts, 2000). Finally, LRP studies have revealed that subliminal primes evoke motor processes. Yet, the premises for such prime-evoked motor activation are not settled. A transfer of priming to stimuli that have never been presented as targets appears particularly interesting because it suggests a level of processing that goes beyond a reactivation of previously acquired S-R links. Yet, such transfer has not always withstood empirical testing. To account for these contradictory results, we proposed a two-process model (Kunde, Kiesel, & Hoffmann, 2003): First, participants build up expectations regarding imperative stimuli for the required responses according to experience and/or instructions. Second, stimuli that match these "action triggers" directly activate the corresponding motor responses irrespective of their conscious identification. In line with these assumptions, recent studies revealed that non-target primes induce priming when they fit the current task intentions and when they are expected in the experimental setting.

Keywords: subliminal priming, priming mechanism, action trigger account

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Masked stimuli can prime responses to subsequent target stimuli, causing response benefits when the prime is similar to the target. However, one masked-prime paradigm has produced counter-intuitive negative compatibility effects (NCE), such that performance costs occur when prime and target are similar. This NCE has been interpreted as an index of an automatic self-inhibition mechanism that suppresses the partial motor activation caused by the prime. However, several alternative explanations for the NCE have been proposed and supported by new evidence. As a framework for discussion, I divide the original theory into five potentially separable issues and briefly examine each with regard to alternative theories and current evidence. These issues are: 1) whether the NCE is caused by motor inhibition or perceptual interactions; 2) whether inhibition is self-triggered or stimulus-triggered; 3) whether prime visibility plays a causal role; 4) whether there is a threshold for triggering inhibition; 5) whether inhibition is automatic. Lastly, I briefly consider why NCEs have not been reported in other priming paradigms, and what the neural substrate for any automatic motor inhibition might be.

Keywords: object updating, active mask, automatic, subliminal

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This paper reviews recent theoretical and experimental work supporting the idea that brightness is computed in a series of neural stages involving edge integration and contrast gain control. It is proposed here that metacontrast and paracontrast masking occur as byproducts of the dynamical properties of these neural mechanisms. The brightness computation model assumes, more specifically, that early visual neurons in the retina, and cortical areas V1 and V2, encode local edge signals whose magnitudes are proportional to the logarithms of the luminance ratios at luminance edges within the retinal image. These local edge signals give rise to secondary neural lightness and darkness spatial induction signals, which are summed at a later stage of cortical processing to produce a neural representation of surface color, or achromatic color, in the case of the chromatically neutral stimuli considered here. Prior to the spatial summation of these edge-based induction signals, the weights assigned to local edge contrast are adjusted by cortical gain mechanisms involving both lateral interactions between neural edge detectors and top-down attentional control. We have previously constructed and computer-simulated a neural model of achromatic color perception based on these principles and have shown that our model gives a good quantitative account of the results of several brightness matching experiments. Adding to this model the realistic dynamical assumptions that 1) the neurons that encode local contrast exhibit transient firing rate enhancement at the onset of an edge, and 2) that the effects of contrast gain control take time to spread between edges, results in a dynamic model of brightness computation that predicts the existence Broca-Sulzer transient brightness enhancement of the target, Type B metacontrast masking, and a form of paracontrast

masking in which the target brightness is enhanced when the mask precedes the target in time.

Keywords: edge integration, brightness, lightness, achromatic color, brightness induction, masking, metacontrast, paracontrast, type B masking

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Concepts of visual consciousness and their measurement



pdf version

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**ABSTRACT**

Although visual consciousness can be manipulated easily (e.g., by visual masking), it is unresolved whether it can be assessed accurately with behavioral measures such as discrimination ability and self-report. Older theories of visual consciousness postulated a sensory threshold and distinguished between subjective and objective thresholds. In contrast, newer theories distinguish among three aspects: phenomenal, access, and reflexive consciousness. This review shows that discrimination ability and self-report differ in their sensitivity to these aspects. Therefore, both need to be assessed in the study of visual consciousness.

Keywords: consciousness, awareness, phenomenology, objective, subjective, blindsight

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Metzger's Challenge. "Laws of seeing" by Wolfgang Metzger BOOK REVIEW



pdf version

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