

Research Seminars in General Psychology and Cognitive Neuroscience
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„General Psychology and Cognitive Neuroscience“

(Prof. Dr. Stefan R. Schweinberger)

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Event Schedule

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29.10.2007	Stefan R. Schweinberger, Jena	Initial meeting

Markus Neumann

Jena

Attentional influences on early repetition effects in ERPs

It is a matter of considerable debate whether attention to initial stimulus presentations is required for repetition-related neural modulations to occur (e.g., Henson et al., 2007, NeuroImage). Recently, event-related potential (ERP) evidence for long-term repetition effects of unattended famous faces has been reported (Neumann et al., 2007, NeuroReport). This

finding is in line with the assumption that faces are particularly hard to ignore and tend to capture attention. The present study investigated influences of attention to prime face stimuli on repetition effects in ERPs. We manipulated attention to first presentations (S1) of task-irrelevant famous faces according to the perceptual load theory (Lavie, 1995, *Journal of Experimental Psychology – Human Perception and Performance*). Participants attended to letter strings superimposed on face images, and identified target letters “X” vs. “N” in letter strings consisting of either 6 different (high load, e.g. “HXZWMK”) or 6 identical letters (low load, e.g. “NNNNNN”). Letter identification was followed (SOA=2000ms) by presentations (S2) of a) identical repetitions of S1 faces, b) new famous faces, or c) butterflies. Participants responded to infrequent butterfly images (~12%) by button press. Our behavioural results showed that S1 load was manipulated successfully (higher accuracies and shorter reaction times for low vs. high load conditions). ERPs to S2 faces, however, revealed comparable repetition effects from 220 ms (N250r) at occipito-temporal regions irrespective of whether S1 face presentation occurred under low or high load conditions. This finding provides further electrophysiological evidence for processing of task-irrelevant faces, even under high perceptual load which usually prevents distractor processing.

Henning Holle

Max-Planck Institute for Human Cognitive and Brain Sciences, Leipzig

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The comprehension of co-speech iconic gestures: Electrophysiological, behavioral and neuroimaging studies

I will present experiments investigating the comprehension of co-speech iconic gestures using behavioral techniques, event-related potentials (ERPs) and functional magnetic resonance imaging (fMRI). Three general questions were addressed: (1) Do iconic gestures convey additional information to the listener? (2) If so, what is the earliest point in time at which the meaning of gesture is accessible? (3) What brain areas are involved in the interaction of gesture and speech during comprehension? In general, the impact of gesture on language comprehension was tested by means of a disambiguation paradigm, where spoken lexically ambiguous sentences were accompanied either by disambiguating gestures or meaningless grooming movements.

The ERP results suggest that listeners use the additional information provided by iconic gestures to disambiguate speech. In addition, these experiments provided evidence that the integration of gesture and speech during comprehension is not entirely automatic, but also modulated by contextual factors such as the amount of observed meaningful hand movements. Using a gating paradigm, Experiment 4 determined the earliest point in time at which gesture starts to exert its disambiguating influence. The disambiguation points of many gestures were found to be remarkably early, with almost two thirds of all gestures enabling a meaning selection before participants had seen the segment considered to be the most meaningful, i.e., the stroke phase. Finally, in the fMRI Experiment, it was found that the processing of co-speech gestures elicited activation in cortical regions previously associated with action comprehension and audiovisual integration.

In the general discussion, a model was proposed on the basis of the existing data. It is suggested that comprehending a co-speech iconic gesture is a two-step process, where gesture first elicits activation of the corresponding non-verbal representations, followed by an interaction between verbal and non-verbal information at the conceptual level.

Holger Wiese

Jena

Semantic priming in person recognition

It has been controversial whether representations for people are stored in associative networks based on co-occurrence, or in terms of more abstract semantic categories. In the present study, participants performed fame decisions to unfamiliar or famous target faces (Experiment 1) or names (Experiment 2), which could be preceded either by highly associated celebrity names, by names from the same occupational category, or which were unprimed. Reaction times (RTs) and event-related potentials (ERPs) were recorded. RTs yielded significant priming effects for both associated and same category conditions. ERPs to targets in the associated condition were significantly more positive than ERPs in all other conditions over centro-parietal areas ~400-600 ms (N400 priming effect). By contrast, an earlier and more posterior effect was found for categorical priming. These findings held for both cross- (Experiment 1) and within-domain conditions (Experiment 2). Our results (i) demonstrate behavioural and ERP evidence for categorical priming in person recognition, consistent with the assumption that shared semantic information units can mediate semantic priming, and (ii) suggest that associative and categorical priming are based on at least partially different mechanisms.

Jürgen M. Kaufmann

University of Jena

Are spatial caricatures special? An ERP study.

It has been suggested that caricatures are particularly incisive representations of familiar faces which can be recognized better than original portraits. We report two experiments in which participants performed speeded familiarity tasks and provided best-likeness ratings of photorealistic spatial caricatures and anti-caricatures (up to a distortion level of 30%) in comparison to veridical pictures of famous faces (Experiment 1) and personally familiar faces (Experiment 2). In Experiment 2, event-related potentials (ERPs) were recorded in addition to behavioural data. In both experiments there was no evidence for faster or more accurate recognition of caricatures. Furthermore, caricatures of famous and personally familiar faces at an exaggeration level of 30% were rated less representative than veridical pictures and anti-caricatures. In Experiment 2, ERPs for personally familiar faces were largely unaffected by spatial caricaturing. In contrast, clear effects were observed for unfamiliar faces, for which caricaturing elicited increased amplitudes of N170 and N250. Whereas N170 effects were

limited to the first half of the experiment, differences in N250 amplitudes became prominent in the second half of the experiment. After three stimulus repetitions, N250 for caricatured unfamiliar faces was larger than for veridicals and anti-caricatures of unfamiliar faces and approached N250 for familiar faces. These results imply that spatial information is of less importance for the recognition of highly familiar faces. In contrast, for unfamiliar faces spatial caricaturing may increase a face's distinctiveness and thereby enhance face learning.

Antje Holländer

Leipzig

Hemispheric Asymmetries in the Attentional Blink

Antje Holländer, Jeff P. Hamm, Michael C. Corballis The *attentional blink* (AB) refers to a decrement in detecting the occurrence of a probe item if it closely follows a previous target item in a stream of stimuli in rapid serial visual presentation (RSVP). In a series of experiments the question of hemispheric asymmetries in the AB was investigated. Therefore, two RSVP streams were presented in parallel, one in each visual field. When targets and probes were both presented in the right visual field (RVF), the typical AB pattern was obtained, sparing probes in the first post-target location ("lag 1 sparing"). However, the AB was greatly attenuated when both target and probe were in the left visual field (LVF). When target and probe were in different spatial locations, there was a strong decrement in detecting the probe in the first post-target position – again more marked in the RVF. Cross-stream decrements may reflect the transient effects of shifting attention, while the AB itself appeared to be largely restricted to within-stream sequences, and to processing by the left cerebral hemisphere. The results of a further behavioural study show, that the functional cerebral asymmetry of the AB is modulated by gonadal steroid hormones during the menstrual cycle in women. Women were tested with a double RSVP task during the low steroid menses and the high steroid midluteal phase. An AB was obtained bilaterally in the midluteal phase, while during the menses the probe detection deficit was evident only in the RVF. High levels of estradiol and progesterone in the midluteal phase appeared to reduce functional asymmetries due to a selective enhancement of the AB in the right hemisphere. Furthermore, event-related potentials (ERPs) were recorded to examine the temporal course of the AB. Probe-related ERPs were compared between control and experimental condition when the probe was presented in the blink period (post-target position 2-4) and in the no-blink period (post-target position 6-8). The finding of Vogel, Luck, & Shapiro (1998) was replicated which is that the AB and the P3 elicited by the target component are related.

Stefan R. Schweinberger

Jena

High-level auditory adaptation

Visual after-effects following adaptation to simple stimulus attributes (e.g. motion, colour) have been studied for literally hundreds of years. A striking discovery in the last few years has been that adaptation, a mechanism by which specific neural responses decrease after prolonged stimulation, is also of central importance for human perception of complex visual stimuli, and particularly faces. However, adaptation in high-level auditory perception has not been demonstrated before. Utilizing a novel technique of voice morphing, we show (Exp. 1) that adaptation to the gender of voices elicits strong auditory after-effects, such that adaptation to male voices causes subsequent voices to be perceived as more female (and vice versa). At least one minute after adaptation, these auditory adaptation effects in perception of voice gender were still significant, albeit reduced in magnitude. By contrast, crossmodal adaptation effects were completely absent, both when prototypical male or female first names were used as adaptors (Exp. 2), and when adaptors were silent videos of articulating male or female speakers (Exp. 3). Our findings exclude an explanation of the effect in terms of postperceptual adaptation to gender concepts, and suggest instead that adaptation to voice quality may routinely influence voice perception. This demonstration of a role of adaptation in calibrating properties of high-level representations for auditory stimuli suggests that adaptation is not confined to vision, but is a ubiquitous mechanism in the perception of social information from faces and voices.

Adrian P. Simpson

University of Jena

Accounting for phonetic differences between male and female voices

The voice is one of the most important ways in which a listener identifies and a speaker defines gender. Although many of the phonetic differences between the male and female voice are well-known, eg. pitch, formant frequencies, voice quality, it is less clear what the source of many of these differences is, i.e. whether they are biophysical inevitabilities or learned behaviours. In this talk I shall examine gender-specific differences in sound quality and sound duration which are still begging adequate explanations.

Thomas Klos

Zentrum für Neurologie und neurologische Rehabilitation (ZNR), Erlangen

Verbesserung von visuospatialem Neglect durch Prismenadaptation

Rossetti et al. (1998) zeigten eine Verbesserung von unilateralem linksseitigen Neglect durch Prismenadaptation. Der Effekt wurde an 8 Patienten über 2 Stunden nachgewiesen. Die vorliegende Studie versuchte eine Replikation an einer klinischen Stichprobe von 20 Patienten mit Erweiterung der Nachuntersuchung auf 5 Stunden. Analog zu Rossetti et al. wurden 10

Patienten an eine Verschiebung des visuellen Gesichtsfeldes um 10° nach rechts mittels Prismenbrille durch Zeigerversuche adaptiert. Als Kontrolle wurden 10 Patienten mit einer Brille ohne Prismen behandelt. Nach der einmaligen Adaptation über wenige Minuten zeigte die Experimentalgruppe in 6 von 7 Neglecttests nach 2 und nach 5 Stunden signifikant bessere Leistungen. Darüber hinaus werden erste Ergebnisse einer Therapiestudie berichtet. Mit 13 Patienten wurde Prismenadaptation als Therapie über 4 Wochen durchgeführt. Aufgrund der geringen Anforderungen an die Patienten hat diese Methode hohe klinische Relevanz für alle Phasen der Rehabilitation.

Christiane Schwier

University of Jena

Rational imitation in 12-month-old infants in a social playing context

When children imitate an adult's action they can, in some circumstances, reveal their understanding of the intentional structure of that action. Most famously, Meltzoff (1995) found that in a series of imitation tasks, 18-month-old infants reproduced not the exact bodily motions of an adult, but the result the adult intended to achieve— even though all infants saw was the adult trying and failing to achieve the result. This finding is most often interpreted as revealing that infants understand the goal of the adult's action. Moreover Gergely, Bekkering, and Király (2002) found that even infants aged 14 months show a selective, interpretative process when imitating a goal-directed action. They demonstrated that 14-month-old infants engage in "rational imitation". If an adult demonstrates a new way to execute a task to infants aged 14 months, the children will use this action to achieve the same goal only if they consider it to be the most rational alternative. To investigate the development and flexibility of this skill and to show if even younger infants have the ability of "rational imitation", we tested 12-month-olds on different but analogous tasks. For example in one task infants watched as an adult made a toy animal use a particular action to get to an endpoint. In 1 condition there was a barrier that prevented a more straightforward action and so gave the actor no choice but to use the demonstrated action. In the other condition there was no barrier, so the actor had a free choice to use the demonstrated action or not. Twelve-month-olds showed the same pattern of results as in Gergely and colleagues' study: They copied the particular action demonstrated more often when the adult freely chose to use the action than when she was forced to use it. This results demonstrated that infants as young as 12 months of age have some understanding of others' intentions and can engage in rational imitation. The early emergence and flexibility of infants' skills of rational understanding and imitation present a challenge to theories of early social-cognitive development that attempt to explain early competencies in a leaner, less cognitively rich manner.