

Department of Psychology

LICENTIATE DISSERTATIONS

2002

Anna-Carin Olsson

Process and representation in Multiple-Cue judgment

This thesis investigates the cognitive processes and representations underlying human judgment in a multiple-cue judgment task. Several recent models assume that people have several qualitatively distinct and competing levels of knowledge representations (Ashby, Alfonso-Reese, Turken, & Waldron, 1998; Erickson & Kruschke, 1998; Nosofsky, Palmeri, & McKinley, 1994; Sloman, 1996). The most successful cognitive models in categorization and multiple-cue judgment are, respectively, exemplar-based models and rule-based models. Study 1 investigated if the different theoretical conclusions in categorization and multiple-cue judgment derive from genuine differences in the processes, or are accidental to the different research methods. The results revealed large individual differences and a shift from exemplar memory to cue abstraction when the criterion is changed from a binary to a continuous variable, and especially for a probabilistic criterion. People appear to switch between qualitatively distinct processes in the two tasks. In Study 2, we expected learning in dyads to promote explicit rule-based thinking as a consequence of verbalization (social abstraction effect) and performance to improve due to the larger joint exemplar knowledge base (exemplar pooling effect). Study 2 suggests that dyads perform better, making more accurate judgments than participants working alone, but we failed to detect any difference in the representation of knowledge. When working in dyads, we can store more exemplars in memory together that leads to more efficient exploitation of memory and exemplar retrieval dominates the judgments. In contrast to earlier research, dyads surpassed the combined baseline level defined by the aggregated performance by members of the dyad working alone. Taken together, the results of these studies indicate that the differences that characterize typical categorization and multiple-cue judgment tasks are conducive of qualitatively different cognitive processes.

2004

Petter Marklund

Marklund, P. (2004). Shared component processes in working memory and long-term memory: Insights from functional brain imaging. Department of Psychology, Umeå University, S-901 87 Umeå Sweden

Recent findings from functional neuroimaging studies have shown pronounced similarities in the functional brain activity patterns associated with tests of various cognitive functions. This thesis investigates shared component processes in working memory and declarative long-term memory. Study 1 showed a common pattern of increased activity in four anatomically distinct regions in prefrontal cortex during three tests each of working memory, episodic memory, and semantic memory. Such similarities may reflect shared demands on working-memory processes across all tests or increased demand on attentional mechanisms. Study 2 was designed to dissociate these possibilities by measuring sustained and transient brain activity during tests of working memory, long-term memory and sustained attention. The results provided support for the notion that one basis for overlapping activations is increased attentional demands, but some activity seems to reflect cognitive control related to mnemonic processes. Taken together, the results indicate that it is critical for taxonomies of cognitive functions to consider similarities in underlying cognitive and associated neurobiological component processes.

This thesis for the licentiate degree is based on the following studies:

Nyberg, L., Marklund, P., Persson, J., Cabeza, R., Forkstam, C., Petersson, K.-M., & Ingvar, M. (2003). Common prefrontal activations during working memory, episodic memory, and semantic memory. *Neuropsychologia*, *41*, 371-377.

Marklund, P., Fransson, P., Cabeza, R., Petersson, K.-M., Ingvar, M., & Nyberg, L. (2004). *Dissociating sustained and transient brain activity during tests of working memory, long-term memory and attention*. Department of Psychology, Umeå University.

Erik Domellöf

Domellöf, E. (2004). Stepping, placing, and head turning biases in newborn infants: A neurodevelopmental perspective. Department of Psychology, Umeå University, S-901 87, Umeå, Sweden.

In the present thesis the stepping, placing and head turning responses in healthy human fullterm newborns are investigated. The main focus is put on a study of these newborn responses in relation to functional asymmetries, while at the same time exploring and discussing different factors that possibly can affect the outcome of such studies. Study I aims to examine one such factor in relation to underlying mechanisms controlling leg movements in focusing on the effects of glucose on newborn stepping and placing responses. The results revealed that glucose, as well as an inactive state, resulted in less pronounced stepping responses and difficulties in eliciting them. There was also a tendency towards a similar finding for placing in that both glucose and an inactive state were associated with a less vigorous placing response, although this could not be proved significant. However, there was no effect of glucose on expressions of laterality in either of the responses studied. A theoretical debate in progress concerns whether different newborn functional asymmetries can be said representing a single neural system for lateralization or multiple sub-systems rooted in different neural mechanisms (Grattan, De Vos, Levy, & McClintock, 1992). In order to look closer at this issue in relation to newborn head- and leg preferences, Study II was designed to investigate the presence of side biases in newborn stepping and placing responses (lower-body), together with head turning preference (upper-body), and whether observed lateral biases of the upper- and lower body are congruent with each other. No evident lateral bias could be found for either response in terms of the first foot moved or direction of head turning. Furthermore, asymmetries in head turning did not correspond to asymmetries in leg movements, in support for multiple sub-systems rather than a single lateralized system. However, a lateral bias was found for onset latency in relation to the first foot moved in both stepping and placing. The findings are discussed in relation to underlying neural mechanisms for lateral biases in leg movements and the important role of a thorough methodology in investigating newborn responses.

This thesis for Licentiate Degree is based on the following studies:

Domellöf, E., Hopkins, B., & Rönnqvist, L. (2003). Glucose effects on stepping and placing responses in newborn infants. *European Journal of Pediatrics* 162 (7-8), 545-547.

Domellöf, E., Hopkins, B., & Rönnqvist, L. (manuscript). Upper- and lower-body functional asymmetries in the newborn: Do they have the same lateral biases?

Linus Holm

Holm, L. (2004). Gaze control in episodic memory. Department of Psychology, Umeå University, S-901 87, Sweden

The role of gaze control in episodic recognition was investigated in two studies. In Study 1, participants encoded human faces inverted or upright, with or without eye movements (Experiment 1) and under sorting or rating tasks (Experiment 2) respectively. At test, participants indicated their recollective experience with R(remember) responses (explicit recollection) or K(now) responses (familiarity based recognition). Experiment 1 showed that face inversion and occlusion of eye movements reduced levels of explicit recollection as measured by R responses. In Experiment 2, the relation between recollective experience and perceptual reinstatement was examined. Whereas the study instructions produced no differences in terms of eye movements, R responses were associated with a higher proportion of refixations than K responses.

In Study 2, perceptual consistency was investigated in two experiments. In Experiment 1, participants studied scenes under different concurrent tasks. Subsequently, their recognition memory was examined in a R / K test. Executive load produced parallel effects on eye movements and R responses. Furthermore, R responses were associated with a higher proportion of refixations than K responses. However, number of fixations was correlated with refixations. Experiment 2 corroborated these results and controlled for number of fixations.

Together, these studies suggest that visual episodic representations are supported by perceptual detail, and that explicit recollection is a function of encoding and retrieving those details. To this end, active gaze control is an important factor in visual recognition.

This thesis for the licentiate degree is based on the following studies:

Holm, L, & Mäntylä, T.(2004). *Gaze control in scene recognition: refixations reflect recollection.*

Manuscript submitted for publication.

Mäntylä, T, & Holm, L.(2004). *Gaze control and recollective experience in face recognition.*

Manuscript submitted for publication.

Johan Eriksson

Eriksson, J. (2004) Neuroimaging consciousness: What happens in the brain when we become aware of what we perceive? Department of Psychology, Umeå University, S-901 87 Umeå Sweden

Although consciousness has been studied since the beginning of the history of psychology, how the brain implements consciousness is seen as one of the last great mysteries. This thesis investigates neural correlates of consciousness by measuring brain activity while specific contents of consciousness are defined and maintained. Study 1 showed that distinct but similar brain regions are activated for the initial creation of a percept and for sustaining that percept over time. Specifically, frontal and parietal regions were activated during both temporal aspects of consciousness. Study 2 investigated the generality of this activation pattern for consciousness in different sensory modalities, and showed that frontal regions were commonly activated for visual and auditory awareness whereas posterior activity was modality specific. However, frontal and parietal regions were jointly activated for both modalities during sustained perception. These results indicate that frontal regions interact with posterior, sensory-specific regions to instantiate a conscious percept. The percept is then maintained by a more general network including frontal and parietal regions.

This thesis for the licentiate degree is based on the following studies:

Eriksson, J., Larsson, A., Riklund Åhlström, K., & Nyberg, L. (2004). Visual consciousness: Dissociating the neural correlates of perceptual transitions from sustained perception with fMRI. *Consciousness and Cognition*, 13, 61-72.

Eriksson, J., Larsson, A., Riklund Åhlström, K., & Nyberg, L. (2004). *Similar frontal and distinct posterior cortical regions mediate visual and auditory perceptual awareness*. Department of Psychology, Umeå University.

Linnéa Karlsson

Karlsson, L. (2004). Additive Integration of Information in Multiple-Cue judgment. Department of Psychology, Umeå University, S-901 87 Umeå, Sweden.

This thesis investigates adaptive shifts between different cognitive processes in multiple-cue judgment tasks. At least two qualitatively and quantitatively different cognitive strategies can be identified: one process in which abstraction and integration of cue-criterion relations form the basis for the judgment (Einhorn, Kleinmutz & Kleinmutz, 1979) and one which is based on similarity comparisons between a probe and similar exemplars stored in memory (Medin & Schaffer, 1978; Nosofsky, 1984; Nosofsky & Johanssen, 2000). Within the framework of a proposed model of judgment, Σ , these processes are regarded as complementary means to deal with a proposed capacity limitation of our cognitive architecture; in situations of unaided abstraction and integration of information we are forced to handle pieces of information in an additive and linear manner. Predictions by Σ concern which of the two processes that will dominate judgments in different judgment tasks. In a judgment task where the underlying combination rule is additive and linear we are able to abstract and integrate information on how cues relate to a criterion and produce judgments that are consistent with the combination rule. In a judgment task where the underlying combination rule is multiplicative we are not able to abstract and integrate this information, and we are therefore induced to use a strategy of exemplar memory. Two studies test these predictions. In Study 1 the results confirm that in an additive judgment task cue abstraction was induced, while exemplar memory was induced in a multiplicative task. These results were replicated in Study 2, where a more complex judgment task was used. The results reported in this thesis provide tentative support for the idea of an adaptive division of labor between cue abstraction and exemplar memory as a function of the task, an ability we are equipped with to cope with a cognitive architecture only allowing elaboration of information in an additive and linear manner.

This thesis for the licentiate degree is based on the following studies:

Juslin, P., Karlsson, L., & Olsson, H. (submitted). Additive Integration of Information in Multiple-Cue Judgment: A Division of Labor Hypothesis.

Karlsson, L., Juslin, P., & Olsson, H. (2004). Representational Shifts in a Multiple-Cue Judgment Task with Continuous Cues. In K. Forbus, D. Gentner, & T. Regier (Eds.) *Proceedings of the Twenty-Sixth Annual Conference of the Cognitive Science Society*. Mahwah, New Jersey: Cognitive Science Society (Lawrence Erlbaum Associates).

2005

Patrik Hansson

Hansson, P. (2005). Overconfidence and format dependence in subjective probability intervals: Naïve estimation and constrained sampling, Department of Psychology, Umeå University, S-901 87 Umeå, Sweden.

A particular field in research on judgment and decision making (JDM) is concerned with realism of confidence in one's knowledge. An interesting finding is the so-called *format dependence effect* which implies that assessment of the same probability distribution generates different conclusions about over- or underconfidence bias depending on the assessment format. In particular, expressing a belief about some unknown quantity in the form of a confidence interval is severely prone to overconfidence as compared to expressing the belief as an assessment of a probability. This thesis gives a tentative account of this finding in terms of a *Naïve Sampling Model* (NSM; Juslin, Winman, & Hansson, 2004), which assumes that people accurately describe their available information stored in memory but they are naïve in the sense that they treat sample properties as proper estimators of population properties. The NSM predicts that it should be possible to reduce the overconfidence in interval production by changing the response format into interval evaluation and to manipulate the degree of format dependence between interval production and interval evaluation. These predictions are verified in empirical experiments which contain both general knowledge tasks (Study 1) and laboratory learning tasks (Study 2). A bold hypothesis, that working memory is a constraining factor for sample size in judgment which suggests that experience per se does not eliminate overconfidence, is investigated and verified. The NSM predicts that the absolute error of the placement of the interval is a constant fraction of interval size, a prediction that is verified (Study 2). This thesis suggests that no cognitive processing bias (Tversky & Kahneman, 1974) over and above naivety is needed to understand and explain the overconfidence bias in interval production and hence the format dependence effect.

This thesis for the licentiate degree is based on the following studies:

Winman, A., Hansson, P., & Juslin, P. (2004). Subjective probability intervals: How to reduce overconfidence by interval evaluation. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 30, 1167-1175.

Hansson, P., Juslin, P., & Winman, A. *Sampling in confidence judgment: Constraints on sample size and biased input distributions*. Unpublished manuscript, Umeå University.

Jonas Olofsson

Olofsson, J. (2005). Gender differences in chemosensory function. Department of Psychology, Umeå University, S-901 87 Umeå, Sweden.

This thesis consists of two studies, in which gender differences in nasal chemosensory function are investigated. The first study assesses odor identification ability in a population-based sample, varying from 45 to 90 yrs, screened for cognitive impairment and severe olfactory dysfunction. Results show that women are generally better than men at identifying odors, but there is no significant interaction of gender by age. Although odor identification is influenced by semantic memory and cognitive speed, these cognitive factors are unlikely to cause the observed gender difference in odor identification. The second study investigates chemosensory perception in men and women by assessing event-related brain potentials, and perceptual ratings for an odorant, which varies in concentration and olfactory/irritating properties. The results display a generally larger cortical response in women than in men, beginning from about 350 ms after stimulus onset. Women report higher perceived intensity and unpleasantness at the highest stimulus concentration, and a steeper psychophysical function, than do men. The results indicate that stronger cortical responses of nasal chemosensory stimuli provide a neural basis for stronger supra-threshold perception in women than in men, which might enhance odor identification performance. The nature and causes of these gender-differences in nasal chemosensory function are discussed.

This thesis for the licenciate degree is based on the following studies:

Larsson, M., Nilsson, L-G., Olofsson, J.K., & Nordin, S. (2004). Demographic and cognitive predictors of odor identification: Evidence from a population-based study. *Chemical Senses*, 29, 547-554.

Olofsson, J.K., & Nordin, S. (2004). Gender differences in chemosensory perception and event-related potentials. *Chemical Senses*, 29, 629-637.

Kina Meurle-Hallberg

Meurle-Hallberg, K. (2005). Relationships between bodily characteristics and mental attitudes: Bodily examined and self assessed ratings of ill health. Department of Psychology, Umeå University, S-901 87, Umeå, Sweden.

The present thesis investigates the psychometric properties and clinical relevance of the Resource Oriented Body Examination and its capacity to provide a useful assessment tool in patients whose symptoms appear to contain associations between psychological and physical problems.

Our aims were to find out if an early version of the Resource Oriented Body Examination, ROBE I, could be reduced into a shorter version, labelled ROBE II. We also wanted to know if ROBE II would treat the variation of items in the different subscales in a way that provided for discrimination between groups of patients with psychosomatic, musculoskeletal and schizophrenic disorders compared to a group of non-patients. A total of 198 subjects were body examined with a ROBE I protocol. The sample data were entered into a separate factor analysis for each domain. Principal components with varimax rotations were used, and the first two factors for each domain were extracted. The original 254 variables were reduced to 144, constituting an instrument for body examination, ROBE II, with 10 subscales. All subscales showed satisfactory internal consistency. Within all but one of the domains the subscales showed acceptable intercorrelation. All subscales disclosed information of body patterns relevant for tracing psychosomatic symptoms in accordance with the Norwegian Psycho Motor Physiotherapy (NPMP). The subscales of ROBE II distinguished bodily characteristics of patients with psychosomatic, musculoskeletal and schizophrenic disorders.

Another research question in this study was: how do patients with stress-related behavior and somatoform disorders assess their symptoms and self-image compared to healthy individuals, and how are these assessments related to bodily resources, assessed with a physiotherapeutic body examination?

The test group (n=31) consisted of consecutive patients referred to a treatment center specializing in psychosomatic problems. Significant differences ($p < 0.01$) were found between the test and comparison groups (n=22) on all but two of the ten subscales of the Resource-Oriented Body Examination (ROBE II). This was also the case for all the subscales of The Symptom Checklist-90 (SCL-90) (comparison groups n=52), and for all but three of the eight clusters of the Structural Analysis of Social Behavior (SASB) (comparison groups n=52). For the patient group, the ROBE II subscale Increased respiratory control correlated significantly with the SCL-90 subscales that measures Anger-hostility, Phobic anxiety, Paranoid ideation, with the Personality Severity Index (PSI) and with the SASB clusters Daydreaming and self-neglect, Self-indictment and oppression with r 's between 0.38 and 0.50. Body examination with ROBE II might provide a useful assessment tool in patients whose stress-related problems appear to contain associations between psychological and physical problems.

This thesis for the licentiate degree is based on the following studies:

Meurle-Hallberg, K., Armelius, B. Å., & von Koch, L. (2004). Body patterns in patients with psychosomatic, musculoskeletal and schizophrenic disorders: psychometric properties and clinical relevance of Resource Oriented Body Examination (ROBE-II). *Advances in Physiotherapy*, 6, 130-142.

Roger Karlsson

Karlsson, R. (2005). Reflective-functioning during the process and in relation to outcome in cognitive-behavioral therapy, interpersonal psychotherapy and brief psychodynamic psychotherapy. Department of Psychology, Umeå University, S-901 87, Umeå, Sweden.

The objective of this work was to investigate reflective-functioning (RF) as a measure of process in two independent studies that included three types of brief psychotherapy. RF is defined as the ability to recognize the existence and nature of mental processes taking place in the self and in others (e.g., intentions, beliefs, desires, and wishes). Theorists have suggested the ability for RF is crucial for predicting social causality and low RF has been found related to mental disorders. It has recently been suggested in the literature that improved ability for RF might be an important component of successful psychotherapy outcome, especially with respect to achieving structural change. RF was in this work investigated during the process through discourse analysis of the patients' narratives of self-other interactions in the treatment sessions. The Psychotherapy Process Q-set (PQS) was implemented in order to isolate specific components of the process (process correlates) that identified high and low RF and to investigate the links between the process correlates and outcome. The first study investigated 29 cases of cognitive-behavioral therapy (CBT) and 35 cases of interpersonal psychotherapy (IPT) with an average treatment length of 16.2 sessions in a sample from the National Institute of Mental Health (NIMH) randomized clinical trial Treatment of Depression Collaborative Research Program (TDCRP). The sample in the first study consisted of 128 sessions in total, where one session from the early part (on average the 4th session) and one session in the later part of the treatment (on average the 12th session) were rated for RF. The second study investigated a sample of 30 cases of brief psychodynamic psychotherapy (BPDT) with an average treatment length of 15.8 sessions in a naturalistic design and obtained from the Mount Zion Psychotherapy Research Group. In total, the second study included 90 sessions of BPDT, and RF was assessed during the 1st, the 5th, and the 14th session of each treatment. The results from these two studies suggested that the patients' ability for RF, as measured through the discourse from therapy sessions, is stable (in CBT and BPDT) or decreased (IPT) during the treatments. Furthermore, the process correlates defining high RF had a relation with good outcome, and process correlates defining low RF had a relation with poor outcome. The process correlates identified during the PQS-analysis suggested that both high and low RF was linked with personality characteristics in the patients. For example, high RF was linked to patients' ability for introspection, expression of negative emotions, and commitment to treatment. Low RF was linked to patients' expression of passivity, defensiveness, and suspiciousness. This work supported theorists' suggestions that brief treatments are supportive in their nature and therefore do not promote structural changes (e.g., changes in RF). It is suggested that the ability for RF as assessed pre-treatment might be a useful predictor for success in brief psychotherapy and could therefore be used as a patient inclusion criteria for such treatments.

2006

Lena Öhman

Öhman, L. (2006). Perceived chronic stress, health and cognition. Department of Psychology, Umeå University, S-901 87 Umeå Sweden

The aim of this licentiate thesis was to examine consequences of chronic stress for stress-related diseases and to investigate the chronic stress – cognition relationship.

In the first study data covering ten years was used from the Betula Prospective Cohort Study (Nilsson et al., 1997). Based on the ratings on a stress scale, matched samples between 40 and 65 years of age were divided into a high and low stress group. The reported incidence of cardiovascular, diabetes, psychiatric, tumor, and musculoskeletal diseases was assessed five and ten years after a baseline assessment. The incidence of diseases five years after baseline assessment showed no differences between the groups. After ten years, there was a higher incidence of psychiatric diseases in the high stress group as well as a significant effect for tumors. These results indicated that moderately elevated stress levels may have an impact on psychiatric diseases, especially depression, and possibly also some tumor diseases, but it was concluded that prolonged moderate stress does not appear to be very harmful to health in general.

In the second study cognitive performance was studied in chronic stress outpatients and matched controls. A battery of cognitive tests assessing processing speed, attention, episodic-, semantic- and working memory was used. Performance decrements for the chronic stress patients were found in episodic memory, particularly in learning across repeated trials, and in tasks requiring divided attention under either encoding or retrieval of words. Performance differences were also seen in aspects of working memory, mental tempo, semantic access (letter fluency) and prospective memory. It was concluded that executive functioning may be suboptimal in chronic stress patients and that letter fluency and prospective memory tests can be useful as clinical tools when evaluating chronic stress states.

Taken together, the findings indicate that there is no clear association between moderately elevated chronic stress and increased incidence of stress related diseases, whereas certain cognitive functions such as executive functioning appear vulnerable to chronic stress.

This thesis for the licentiate degree is based on the following studies:

Öhman, L., Bergdahl, J., Nyberg, L., & Nilsson, L.-G. *Longitudinal analysis of the relation between moderate long-term stress and health.* (submitted)

Öhman, L., Nordin, S., Bergdahl, J., Slunga Birgander, L., & Stigsdotter Neely, A. *Cognitive function in outpatients with perceived chronic stress.* (submitted)