

# Workshop on Measuring Intuition and Expertise

Max Planck Institute for Research on Collective Goods, Bonn  
&  
Radboud University Nijmegen

## Schedule

*10:00 – 10:30 Welcome and Introduction*

*10:30 – 12:00 General Methods (60 min. plus 30 min. discussion)*

Huber: Active Information Search

Bröder: Outcome based Maximum-Likelihood classification of decision strategies

Glöckner: Multiple measure strategy classification: Outcomes, decision times and confidence

Witteman: Cognitive structure analysis

*12:00 – 12:15 Break*

*12:15 – 13:30 Specific Approaches to Testing Aspects of Intuition (45 min. plus 30 min. discussion)*

Ryf: Negative effects of deliberation – Just don't think too much

Hausmann: Tracking automatically processed cue information

Dijkstra: Affect as information or as a spotlight for information processing

*13:30 – 14:15 Lunch Break*

*14:15 – 15:15 Discussion of needs and possible ways of improvement*

*15:15 – 15:30 Break*

*15:30 – 18:00 Ideas for New Methods*

Plessner: Understanding intuitive decision making by improving it

Renkewitz: Measuring memory content by using methods from cognitive psychology

(Hochman &) Glöckner: Physiological measures

Further ideas

*18:00 – 18:15 Break*

*18:15 – 19:00 Wrap up Discussion*

The Workshop will take place on Friday, 16<sup>th</sup> of November 2007 at the Max Planck Institute for Research on Collective Goods.

## **Background**

The importance of understanding automatic/intuitive processes in decision making has been prominently highlighted in several influential publications (e.g., Kahneman & Frederick, 2002). Automatic processes seem to be particularly important for expert decision makers such as physicians, managers and judges. But they might also enable lay persons to come to good decisions rather quickly. One of the major challenges for exploring automatic/intuitive processes is that with the predominantly used methods in decision research we are often not able to capture automatic processes, and that these methods sometimes even hinder persons to use these processes (Glöckner & Betsch, under review). The aim of the workshop is to discuss the applicability of existing methodological approaches and to develop new ones.

## **Abstracts**

### **Active information search**

Odilo Huber, University of Fribourg

Active Information Search (AIS) is a process tracing paradigm designed to investigate risky decisions. The subject initially is presented a scarce description of the decision scenario. Subsequently she asks questions and receives matching answers from a standardized list developed in pre-experiments. Thus, except the frugal initial scenario information, information acquisition is controlled by the decision maker allowing both the measurement of information needs as well as information acquisition sequence with low reactivity. The paper presents different versions of AIS developed to investigate both experimental and real decisions illustrated with examples and discusses the advantages and limitations of the paradigm.

### **Outcome-based Maximum-Likelihood classification of decision strategies**

Arndt Bröder, University of Bonn

In choice tasks, different strategies often predict the same outcome which makes strategy diagnosis difficult for the researcher. The problem is increased when random errors in strategy application have to be assumed. Ad hoc goodness-of-fit indices like the percentage of correct predictions of a model cannot handle items for which some models do not make predictions (e.g. guessing). A simple Maximum-Likelihood model is introduced which, however, needs explicit assumptions about error distributions. It is discussed how well this method can be approximated by simple scoring rules.

## **Multiple measure strategy classification: Outcomes, decision times and confidence**

Andreas Glöckner, Max Planck Institute for Research on Collective Goods

One of the basic challenges for the identification of individuals' decision strategies is that choice predictions have a high degree of overlap and that simple models (e.g., lexicographic rule, equal weight rule) are complete sub-models of more complex ones (e.g., weighted additive rule). The problem becomes even more severe if we take into account decision strategies that are (partially) based on automatic processing and, thus, impede the application of many other methods for measuring decision behavior. According to the law of parsimony (Occam's Razor) the model that can explain the phenomena with the fewest assumptions should be preferred. Aside from comparing the number of assumptions of models, it is possible to extend the number of dependent variables that should be explained by the models. Following this idea, I will present a method of individual strategy analysis based on outcomes, decision times and confidence that allows for identifying several deliberate and intuitive decision strategies by extending the outcome-based maximum-likelihood classification method by Bröder and Schiffer (2003).

## **Cognitive structure analysis**

Cilia Witteman, Radboud University Nijmegen

One way to find out how the expert thinks, is to just ask them. Realising that there are two levels at which people think: their knowledge structures and the content of those structures, the elicitation of their thinking should be targeted to these two levels. This is what is proposed in Cognitive Structure Analysis. The researcher details in advance what the different knowledge structures would look like, that is: decides on the discriminators of the different structures. For example a semantic network would be inferred when a taxonomy is given, with is-a relations. To find the knowledge structures and their content, experts are subjected to structured interviews about how they proceed in their domain. These interviews also contain domain-specific problems which the experts are asked to solve, while thinking aloud. Using this method, we were able to conclude that expert underwriters mainly use frame representations (and not Bayesian networks, as was assumed in decision support systems developed for their use).

This method may be used to determine whether people deliberate or use their intuition, by having speed and for example number of inferences and extent of explanations as discriminators when establishing how the problems are solved. It is a rather old-fashioned and time-consuming method, in the process-tracing tradition, yet it may give interesting direct information about the process, rather than only indirect (such as through e.g. implicit association tests) and only about the outcome.

## **Just don't think too much – unconscious information integration in a complex decision task**

Stefan Ryf & Hannes Bitto, University of Zurich

Numerous studies have shown that for complex decision tasks, decisions can be better if conscious deliberation is inhibited through a distraction task (e.g. Dijksterhuis, 2004; Dijksterhuis & van Olden, 2006). In contrast to these studies in which the difficulty of the decision task was based in the large amount of information that had to be considered, we investigated whether unconscious information processing can also be useful for decision problems where the complexity lies in the manner of information integration.

Thirty-six participants (18 women and 18 men) choose 30 times between two lotteries in three processing conditions: (1) they had to decide immediately, (2) they could deliberate their decision for maximal 45 seconds, and (3) they were distracted between the presentation of the lotteries and the decision (Two-Back-Task). To make the right choice (i.e. to choose the lottery with the higher winning expectation), three levels of winning probabilities and profits for each lottery had to be compared in a non-trivial way.

An ANOVA with the two factors gender und processing condition revealed a significant main effect for the kind of processing and a significant interaction. While women did significantly better in the distractor condition (65% correct decisions) than in the other conditions, men showed the best performance in the deliberate condition (69% correct), mainly because they had a high success rate for lottery pairs with a lower difficulty level (large difference in winning expectations and lower complexity).

A hint for a possible explanation for this difference is given by the significantly higher preference for intuition of the female participants ('Preference for Intuition and Deliberation' questionnaire; Betsch, 2004). At least the results for the women indicate that unconscious information processing can be functional for decision problems in which information has to be integrated in a complex manner.

## **Automatically processed cue information: Open questions of methodology, quality, quantity and integration within choice and decision tasks**

Daniel Hausmann, University of Zurich

Considering an object through a subject can never be neutral: Associations from an object perceived or recalled in memory are released in our brain automatically and form evaluations or attributes (cues) that stand readily for the further information processing. The associations (recall of the cues), evaluations (recall of the cue information) and further processing (for example comparisons concerning the discrimination of information and/or integration) are mainly supposed to be unconscious, which does not mean that parts of the mentioned processes are not potentially consciousness-capable.

A first main question aims at fathoming the dimensionality (quality and quantity) of such associative-evaluative cues. We postulate at least three dimensional classes: a “familiarity cue” (including Recognition), a “sympathy cue” (including emotional evaluation), and a “morality cue” (including sacred or protected values) (the later one was not evaluated within this investigation). A simple first experiment was conducted in which participants had to select three times 10 names (out of a list of 100), either for the purpose to build a (political) list of candidates or a tourist group. All 100 names have been rated for familiarity and sympathy before or after the choice task. Results show the independence of the two cues as well as the dominance of familiarity over sympathy.

The second main question affects the application of the postulated cues in a decision task. When choosing between two options, one of them probably shows stronger current preference to the subject, particularly the object with a larger familiarity and/or sympathy. In situations where ones desire to make a correct decision is relatively low (for example because it is not really important), we would expect that the option with the stronger preference is chosen without any search for external cue information (for example evidence based information). Therefore, a second experiment examined which of two objects (stocks of known and unknown companies) were immediately picked up into a fictitious portfolio (without any further information) and which pairs were put back (with the outlook for an additional information search after the first screening phase). As a result those objects are picked up rather immediate (spontaneous) into the portfolio, that show higher values either on the (rated) familiarity or on both dimensions (familiarity and sympathy).

Several questions about the adequacy of the used methodology (names, ratings, choice, and decision task) and possible alternatives are discussed critically. Two other questions should be answered: First, whether there are further classes of associative-evaluative cues and second, how such cues are weighted and/or used (sequential processing versus integration)?

## **Affect as information or as a spotlight for information processing**

Koen Dijkstra, Radboud University Nijmegen

Recent research indicates that emotions profoundly affect judgment and decision making. Decisions are not exclusively based on rational trade-offs between pros and cons, but often on affective reactions. Risks, for example, are perceived lower with positive feeling and higher when one feels negative towards the option (Alhakami & Slovic, 1994).

The main theoretical conception of how emotional reactions affect judgment and decision making focuses on the informational role of affective reactions (Loewenstein, Weber, Hsee & Welch, 2001; Schwartz & Clore, 2003; Peters, Lipkus & Diefenbach, 2006). Thus, the feeling that is experienced when considering each option, is taken as information.

However, other functionalities could be possible as well. For example, an affective reaction could function as a spotlight, directing the decision maker to relevant information. As such, the function would be to reduce computational load by reducing the amount of information to be processed.

I will explore these two hypotheses by asking participants to judge to probability of guilt of a defendant within a criminal case. Participants are given a picture of the defendant and nine witness statements (prosecuting, defending and neutral) to base their judgment. However, the picture of the defendant is evaluative conditioned (positive, negative or neutral) at the start of the experiment.

After the judgment task a filler task is administered, followed by a recognition task to assess accessibility of the witness statements. Finally, evaluative conditioning of the pictures is checked by an affective priming task and an evaluation task.

An effect of evaluative conditioning on the judgment task, but not on the recognition task, can be interpreted as evidence for the “affect as information” hypotheses. When however an effect is found on both tasks, the effect on the judgment task can solely be the result of the spotlight effect. An effect of evaluative conditioning on the recognition task can be interpreted as evidence for the “affect as information” hypotheses.

## **Understanding football referees' intuitive decision making by improving it**

Henning Plessner<sup>1</sup>, Geoffrey Schweizer<sup>2</sup>, Ralf Brand<sup>2</sup>

<sup>1</sup>University of Heidelberg

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In a football match, referees are expected to make their decisions in a rather intuitive manner, i.e. within a few seconds. About a quarter of these decisions are about fouls and misconduct. The possible responses of a referee who identified a foul vary from indirect free kick, direct free kick, to penalty kick in combination with a warning, a yellow card, or a red card (sending off). All of these sanctions have clearly an impact on the course of a game. Based on empirical observations, it has been estimated that on average about 20% of referees' decisions about foul and misconduct are wrong. Therefore, officials are strongly interested in measures that help them to improve decision accuracy. We developed an online-video training for football referees (SET) that aims at optimizing their decision-making skills. It is based on the assumption that most foul decisions can be considered as a perceptual-categorization task in which the referee has to categorize a set of features into two discrete classes (foul/ no-foul). Due to the dynamic nature of tackling situations in football, these features share a probabilistic rather than a deterministic relationship with the decision criteria. Therefore, learning to make accurate decisions requires repeated exposure to probabilistic information with corresponding feedback. SET provides such a multiple-cue learning environment for football referees. In our presentation we will discuss how SET can be used not only for improving referees' decision accuracy but also as a tool for analyzing and understanding the cognitive processes that underlie referees' intuitive decision-making.

## **How to assess the usage of cue information in memory-based decisions?**

Frank Renkewitz, University of Erfurt

It is a well-known problem in behavioural decision research that individuals' decision strategies can not be identified unambiguously based solely on choice patterns. Particularly in the case of decisions which have to be made from information stored in long term memory, this poses the methodological challenge to trace the underlying cognitive processes. Several additional measures have been used to differentiate between distinct process models. Most notably response times have recently been shown to provide evidence that aids in inferring decision strategies (Bröder & Gaissmayer, in press, Bergert & Nosofsky, in press, Glöckner, 2006). However, different process models yield not only diverging predictions concerning the time necessary to arrive at a decision but also concerning the cue information that is retrieved from or activated in memory. Surprisingly, up to now there seem to be no attempts to measure this aspect of the decision process. I will present methods that have been developed in other research areas to assess memory content in complex cognitive processes and that might also be applicable in the context of decision tasks. Among these methods is a variant of a probe reaction task that was successfully used to detect activated information in abductive (diagnostic) reasoning and sentence comprehension (e.g. Baumann et al., 2007). Another approach is based on the link between the retrieval of information and eye movements to the location where that information was presented (Richardson & Spivey, 2000). Potential problems with the application of these methods to decision processes will be discussed.

## **Physiological measures in identifying decision strategies**

Andreas Glöckner<sup>1</sup> and Guy Hochman<sup>2</sup>

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The affect heuristic (Slovic et al., 2002) claims that individuals (sometimes) decide based on automatic affective responses to options (affective tags) only. Such affective responses can be considered a special kind of “intuition” that can physiologically be tracked by different methods. Measuring the Peripheral Arterial Tone (PAT) at the fingertip is one of these methods. Such a method could be used to inform researchers about initial choice tendencies; more importantly, behavioral deviations could be identified that indicate deliberate corrections of initial (intuitive) tendencies. Based on the Parallel Constraint Satisfaction rule (Glöckner & Betsch, in press JJDM) it can be predicted that adding inconsistent (cognitive) cue information influences decision making even if affective tags are available. Such information should lead to an increased divergence of choices because of an increased likelihood for deliberate actions that are used to correct initial tendencies. We suggest that a combination of a modified version of the Iowa Gambling Task, probabilistic cues and measurements of PAT might be used to differentiate between intuitive and deliberate parts of decision making processes.

## List of Participants

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