

Max Planck Research Group Intuitive Experts

Research Summary

Background and Research Framework

The work of the Intuitive Experts group has progressed along three lines of research: 1) model development and testing, 2) methodological developments, 3) application to legal issues, economic decision making, and public goods provision. Important developments from the last two years are summarized in the following.

Model development and testing

In the beginning of the group, core parts of the theoretical work have been devoted to develop an integrated interactive-activation model for intuitive and deliberate decision making, the parallel constraint satisfaction (PCS) model (Betsch & Glöckner, 2010; Glöckner & Betsch, 2008). According to the PCS model, individuals make decisions by automatically constructing coherent interpretations based on the information provided to them. Initial tendencies for a certain interpretation are accentuated, whereas contradicting information is devalued. The decision maker becomes aware of the resulting (coherent) mental representations of the decision task, without being aware of the underlying automatic processes. Additionally, deliberate construction processes efficiently interact with these automatic construction processes to improve decision making. They can be used to generate new information, to restructure the mental representation, and to consider alternatives.

In the last two years of the funding period we have solved three weaknesses of the PCS model concerning specification and flexibility. First, we have included a free parameter in the model that now allows to capture interindividual variability concerning sensitivity to probabilistic cues (Glöckner & Betsch, 2012; Glöckner, Hilbig, & Jekel, in preparation). Including this sensitivity parameter enhanced the model's capabilities to cross-predict behaviour on an individual level. Second, we have developed a probabilistic version of PCS that has the advantage over the previous deterministic implementation to explicate reasonable assumptions concerning errors (Glöckner, Heinen, Johnson, & Raab, 2012). The third extension concerns the inclusion of a learning rule in PCS so that the theory now also models learning over time and goes beyond the previously used static perspective (Jekel, Glöckner, & Bröder, in preparation).

An evolutionary plausible model of human cognition should on average lead to good choices. In a comprehensive simulation study we show that PCS fulfils this criterion. PCS allows approximating the rational solution to probabilistic inference problems very well and better than prominent competing cognitive models of decision making (Jekel, Glöckner, Fiedler, & Bröder, 2012). This lends further support for the PCS model. Along a different line of research, we continued to directly test how well PCS can account for decisions in probabilistic inference tasks. Testing a critical property of serial integration models, we show that decision time not necessarily depends on the amount of information available for the decision. In contrast, in line with the predictions of PCS, in some situations providing more

comprehensive information leads to quicker decisions than providing less (Glöckner & Betsch, 2012). In further empirical work, limiting conditions for the PCS as model for decision making were identified. Specifically, it was shown that the prevalence of PCS usage reduces with increasing costs for information search in some presentation formats (Söllner, Bröder, & Hilbig, 2013).

Aside from improving PCS, the focus has been broadened to develop and test also alternative models based on evidence accumulation approaches (Ashby, Dickert, & Glöckner, 2012; Glöckner, Fiedler, Hochman, Ayal, & Hilbig, 2012). The Biased Evidence Accumulation Model (Ashby et al., 2012), for example, assumes that choices can be predicted as linear accumulation of affective responses to each outcome fixated with deviations from rationality being due to attention biases.

Methodological Developments and Debates

During the funding period researcher in psychology have become increasingly interested in issues of methodology and there have been various lively methodological debates. Members of the group have been involved in two core debates.

The first debate concerns weaknesses of currently used methods and the development of improved, new methods. As a part of this debate, Andreas Glöckner and Benjamin Hilbig edited a special issue on *Methodology in Judgement and Decision Making research*, which collected recent controversies and perspectives (Glöckner & Hilbig, 2011). Therein, we, among other things, developed a method to select tasks that allow to efficiently test and compare all kinds of models based on Euclidian Diagnostic Task Selection (Jekel, Fiedler, & Glöckner, 2011). Taken a somewhat different approach, Benjamin Hilbig established and applied multinomial process-tree models in various papers for investigating the usage of decision strategies (Hilbig, Erdfelder, & Pohl, 2011, 2012; Pohl, Erdfelder, Hilbig, Liebke, & Stahlberg, 2013) and negativity biases in judgments of truth (Hilbig, 2012a, 2012b). Furthermore, our work on using eye-tracking to investigate decision processes in a more fine-grained and none-invasive manner (Ashby et al., 2012; Fiedler & Glöckner, 2012; Fiedler, Glöckner, Nicklisch, & Dickert, 2013; Glöckner, Fiedler, et al., 2012; Rubaltelli, Dickert, & Slovic, 2012) has increased interest in the method and inspired constructive debates. Nathan Ashby is currently editing a special issue on eye-tracking methods and applications that aims to collect recent perspectives.

The second somewhat different debate concerns issues of scientific misconduct and possibilities to counter them. Susann Fiedler has been particularly involved in this debate. In a comprehensive online survey, she and her co-workers found that people indeed use questionable research practices to a surprisingly high degree (Fuchs, Jenny, & Fiedler, 2012). Furthermore, Susann Fiedler was engaged in recent large-scale projects on testing and improving replicability of findings (Alexander et al., 2012; Asendorpf et al., 2013a, 2013b). Finally, in a recent paper (Glöckner, Fiedler, Fiedler, Engel, & ... in preparation) we analyse scientific misconduct from a public good perspective and develop suggestions to counter them.

Application to Legal Issues, Economic Decision Making, and Public Goods Provision

Legal Judgments

Traditionally, PCS models have been developed for and most strongly applied to legal judgments. In two investigations of legal judgments, we show that individuals reevaluate evidence in the decision process (i.e., coherence effects) as predicted by PCS. While the underlying intuitive processes do not undermine the effects of varying standard of proof instructions, they reduce individuals' sensitivity to changes in the probabilities of guilt, if the general constellation of facts (the story) remains constant (Glöckner & Engel, 2013). Taking roles in the judicial process (prosecution vs. defense) leads to coherence effects that individuals are not able to correct for even if there are motivated to do so (Engel & Glöckner, 2013). In his submitted habilitation thesis "Evidence evaluation and standard of proof: rationality and intuition", Mark Schweizer provides a comprehensive legal and psychological discussion of PCS approaches as a descriptive model for evidence evaluations and contrasts them with normative Bayesian networks. Mark Schweizer also shows empirically that the application of Bayesian networks can reduce some of the negative side-effects of intuitive, coherence-based decision making by counteracting coherence effects and preserving the epistemic uncertainty inherent in weak cases (Schweizer, in press).

Along a different line of research we investigated the development of legal expertise and effects of legal expertise on judgments. In an interdisciplinary paper (Glöckner, Towfigh, & Traxler, 2013) we analyse more than 70,000 grades from test exams conducted by law students at the University of Münster for the three areas-of-law (public, civil, and criminal law). The results indicate that there are both area-of-law-specific and area-of-law-unspecific learning effects caused by taking test exams that involve case-solving practice. While good initial performers profit more from area-of-law-specific training, the poor initial performer profit more from area-of-law-unspecific exam practice. In a second paper we demonstrate differences concerning how persons with advanced legal training (i.e., experts) and lay persons make legal judgments (Dickert, Herbig, Glöckner, Gansen, & Portack, 2012). We confirm that legal training increased judgment accuracy and confidence in the judgment. More importantly, we found that for individuals without legal training providing more information increases emotional reactions to legal cases. For individual with legal training however, adding the same pieces of information leads to less emotional reactions. This interaction seems to be caused by fundamental differences in the way people construct their mental representations of the cases. While experts construct mental representation using abstract legal terms, lay persons rely stronger on exemplars and similarity to known cases.

Risky Choice

In four papers we investigated process models for risky choice. In a first paper we show that Cumulative Prospect Theory is well able to cross-predict individuals' choices whereas heuristics perform much worse and are barely better than chance level (Glöckner & Pachur, 2012). Given that Cumulative Prospect Theory remains at an "as-if" status and does not describe cognitive processes, there is a need for developing and testing more complex

process models for risky choice. In a comprehensive eye-tracking paper we investigated predictions derived from various kinds of models (Fiedler & Glöckner, 2012). Results indicate that individuals take into account all pieces of information and still make decisions very quickly. Information search varies systematically with properties of the task. In line with the predictions of evidence accumulation models and PCS, attention to outcomes increases with their probability. Furthermore, within each decision trial persons increasingly focus on the later on chosen option. This so called *gaze-cascade effect* can hardly be explained by any existing model but is in line with the prediction of PCS. A second eye-tracking study (Glöckner, Fiedler, et al., 2012) investigated risky choice processes in decisions from description (i.e., probability information of outcomes is explicitly provided) as compared to decision from experience (i.e., probabilities of outcomes have to be learned from experience). The results indicate remarkable differences between the presentation formats concerning information search and arousal implying that different kinds of process models seem to be necessary to account for decision making under the two conditions. In a third eye-tracking paper we investigated persons' valuations of risky prospects against the backdrop of evidence accumulation models (Ashby et al., 2012). We identified that there are systematic biases in attention dependent on the perspective (i.e., being a buyer vs. a seller of a good) and that these attention biases mediate endowment effects.

Cooperation and Public Goods

We extended fine-grained analyses of cognitive processes that are based on eye-tracking to decision tasks with consequences for others. Specifically, we investigated the cognitive processes in strategic decisions (i.e., one-shot public good, repeated public good) and simple interdependent decisions (i.e., money allocation tasks) (Fiedler et al., 2013). Individuals show gradual instead of qualitative differences in information search patterns providing support for single-strategy models based on automatic processes such as evidence accumulation models and PCS. The results speak against the standard assumption that individuals rely on qualitatively distinct simple strategies that differ between persons.

In much of his recent work Benjamin Hilbig investigated the influences of personality factors on cooperation in social dilemmas and he particularly investigated person x situation interactions (Hilbig, Zettler, & Heydasch, 2012; Hilbig, Zettler, Leist, & Heydasch, 2013; Hilbig, Zettler, Moshagen, & Heydasch, 2013; Zettler, Hilbig, & Heydasch, 2013). Overall this work a) highlights that honesty-humility, a broad personality trait that is missing in the standard Big 5 models for personality, is crucial for predicting strategic and interdependent decision making, and it b) supports a strong interactionist perspective in that behavior is shaped by an interplay between persons' honesty-humility and situational cues.

Further support for such an interactionist perspective comes from a paper on repeated prisoners' dilemma games. Specifically, we found that there is an interaction of situational factors and persons' risk aversion in predicting cooperation (Glöckner & Hilbig, 2012). Persons who are more (vs. less) risk-averse cooperate more in cooperation-friendly environments (i.e., high cooperation index). The effect, however, reverses in cooperation-unfriendly environments. This indicates that risk aversion goes along with following the

“usually expected” behavior (i.e., the norm), whereas risk seekers accept the risk to violate norms. Hence, risk is perceived relative to the structure of the environment.

Concluding Remarks

We hope that the research of the Intuitive Experts group has contributed to the cumulative development of knowledge concerning decision making in legal, and economic domains as well as in social dilemmas. We furthermore hope that the work has contributed to the overall goal of the institute to improve our understanding of public goods and the efficient design of legal institutions. Many new ideas concerning models, methodology and application have been developed. We would be delighted if some of the ideas are followed up, if they would provide inspirations for further work and if they were devised to further independent, critical testing. We thank the Max Planck Society for providing this extraordinary opportunity to realize our research agenda. Finally, we are particularly grateful to the directors Christoph Engel and Martin Hellwig and to all scientific and administrative members of the institute for their fantastic support and for providing such a friendly, constructive and inspiring environment for doing research.

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