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To all participants in regular paper sessions – Please note the time limits:

- Speaker: max. 25 minutes
- 5 minutes for general discussion

Chairpersons are kindly requested to follow and if necessary to rigorously enforce the time limits.

PROGRAMME SCHEDULE

Monday 20th August, 08.45 – 09.00, *Opening of the Conference*

Mon, 09.00 – 10.00

Plenary session (Building A, Auditorium A)

Keynote address:

Elke U. Weber: *'How do I choose thee? Let me count my ways'*

A functional analysis of different modes of decision making

Chair: Joop van der Pligt

Mon, 10.00 – 10.30

Coffee / Tea

Mon, 10.30 – 12.00

Paper sessions

Theory – Auditorium A

Chair: Robin Hogarth

10.30 Erik Angner: *The theory of indecision: Levi's account of preference reversals*

11.00 Igor Douven: *The rationality of further deliberation*

11.30 John Fox: *Arguments about beliefs and actions: Decision making in the real world*

Frequencies – Auditorium C

Chair: Clare Harries

10.30 Ulrich Hoffrage: *Information needs representation: The power of natural frequencies*

11.00 Peter Sedlmeier: *When the distinction between frequencies and probabilities does not matter*

11.30 Gaëlle Villejoubert: *Bayesian probability judgments: Are means really justified by current ends?*

Games – Lecture Room D

Chair: David Budescu

10.30 Susanne Abele: *Social information processing in strategic decision making: Why timing matters*

11.00 Peter Ayton: *Subjective patterns of randomness and choice*

11.30 Dirk Smeesters: *Priming might and morality in give-some games*

Time – Lecture Room E

Chair: Laurie Hendrickx

10.30 Gretchen Chapman: *Temporal discounting in Romania and the USA: A cross-cultural study*

11.00 Sietske Nicolaij: *The influence of temporal distance of negative consequences on the evaluation of environmental risks*

11.30 Gerrit Antonides: *Subjective time preference and willingness to pay for energy-saving durable goods*

Mon, 12.00 – 13.30

Lunch in main hall of Building E

Mon, 13.30 – 15.00

Paper sessions

Risk – Auditorium A

Chair: Tadeusz Tyszka

13.30 Renate Schubert: *How to predict gender differences in choice under risk: A case for the use of Decision Models?*

14.00 Zur Shapira: *Aspiration levels and risk taking by government bond traders*

14.30 Joanna Sokolowska: *Risk perception and acceptance*

Medical D M – Auditorium C

Chair: Nigel Harvey

13.30 Tim Rakow: *What is the best way to predict the outcome of heart surgery in children?*

14.00 Anne Stiggelbout: *Individualising risk: the impact on patient decision making*

14.30 Myriam Welkenhuysen: *Familial occurrence of breast cancer outweighs the perceived influence of genetic factors in decreasing optimism about the breast cancer risk*

Utility – Lecture Room D

Chair: Gideon Keren

13.30 Han Bleichrodt: *Probability weighting in choice under risk: An empirical test*

14.00 Ayse Onculer: *An intertemporal model of rank-dependent expected utility*

14.30 Peter Wakker: *Scale convergence of utility*

Consumer D M – Lecture Room E

Chair: Vera Hoorens

13.30 Ole Boe: *Does the use of decision heuristic influence impulse buying?*

14.00 Fergus Bolger: *Current mood and future economic expectations: Implications for the use of consumer attitude surveys in economic forecasting*

14.30 Tommy Gärling: *The Euro illusion: Not an illusion but a fact*

Mon, 15.00 – 15.30

Coffee / Tea

Mon, 15.30 – 17.30

Symposium

Symp. 1 – Rationality – Auditorium A

Convenors: Mandeep Dhani, Clare Harries

Discussants: Ulrich Hoffrage, Larry Fiddick

David Lagnado: *Judgment in hierarchical learning: Conflicting adaptations to the statistical environment*

Neil Bearden: *Ecological constraints on the development of social conventions*

Peter Juslin: *Rules and exemplars in human judgment*

Barbara Fasolo: *The effect of interattribute correlations on decision strategies are attribute-based or option-based*

Symp. 2 – Experts – Auditorium C

Convenors: David Weiss, James Shanteau

Discussants: Ola Svenson, Alexander Wearing

Ylva Skånér: *How do GPs use clinical information in their judgment of heart failure*

James Shanteau: *How to evaluate expert performance?*

Catherine Dacremont: *How to assess food experts? Application to texture profile*

David Weiss: *A CWS perspective on the food assessors*

Mon, 15.30 – 18.00

Paper sessions

Heuristics – Lecture Room D

Chair: Rob Ranyard

15.30 Eduard Brandstätter: *A heuristic account of the probability weighting function*

16.00 Noel Brewer: *Judgment, choice and the anchoring bias: Two examples of simultaneous assimilation and contrast*

16.30 Judith Covey: *Do incentives make anchoring effects disappear?*

17.00 Noortje Jansen: *Legal decision making: Framing and order of evidence as a function of response mode*

Decision Process – Lecture Room E

Chair: Ola Svenson

15.30 Michaela Wänke: *How comparison processes influence further*

16.00 Janet Schwartz: *Decoy effects on choice: A process tracing analysis*

16.30 Patricia Lindemann: *The impact of domain knowledge and common vs. unique features on multiattribute choice*

17.00 John Maule: *An experimental investigation of cognitive inertia showing why decision-makers fail to update their mental representation of evolving strategic decision problems*

Tuesday 21st August,

Tue, 09.00 – 10.00

Plenary session (Building A, Auditorium A)

Keynote address:

Carsten de Dreu: *Judgment and decision making in negotiation: A motivated information processing perspective*

Chair: Renate Schubert

Tue, 10.00 – 10.30

Coffee / Tea

Tue, 10.30 – 12.00

Paper sessions

Risk – Auditorium A

Chair: Thomas Langer

10.30 Gisela Böhm: *Causal structure and time perspective as determinants of environmental risk evaluation*

11.00 Claudia Gonzales: *The reflection effect revisited: Understanding risk attitudes with a stochastic choice model*

11.30 Cecile Janssens: *“It might happen or not”: Patients’ perceptions of prognostic risk in multiple sclerosis*

Probability – Auditorium C

Chair: Peter Ayton

10.30 Mandeep Dhami: *Interpersonal similarity in uses of linguistic probabilities: One’s person’s “dead ass” is another’s “good chance”*

11.00 Karl Havor Teigen: *Verbal probabilities: A question of framing?*

11.30 C. Witteman: *A verbal-numerical probability scale*

Control – Lecture Room D

Chair: Joanna Sokolowska

10.30 Vera Hoorens: *Comparative optimism: A matter of neglecting other people’s personal control?*

11.00 Oswald Huber: *The effect of different cues for controllability in risky decision tasks*

11.30 Dan Ariely: *Self-rationing time: Procrastination, deadlines, and performance*

Image theory – Lecture Room E

Chair: Terry Connolly

10.30 Lehman Benson III: *Magnitude versus all or none violation in image theory’s compatibility test*

11.00 Roger Cook: *Influences on the acceptance of decision aids in organisations*

11.30 Daniel Mertens: *Image theory’s violation threshold*

Tue, 12.00 – 13.30

Lunch in main hall of Building E

Tue, 12.00 – 14.30

Poster session (next to Auditorium A)

Tue, 14.30 – 15.30

Paper sessions

Probability – Auditorium A

Chair: Ulrich Hoffrage

14.30 Ilan Fischer: *The truth hides in the eye of the beholder: Accuracy measures for criterion lacking subjective probability judgments*

15.00 Craig Fox: *Partition dependence in judgment under uncertainty*

Theory – Auditorium C

Chair: Maya Bar-Hillel

14.30 Ralph Hertwig: *More is not always better: The benefits of cognitive limits*

15.00 Robin Hogarth: *Educating intuition: A model, principles, and some proposals*

Risk – Lecture Room D

Chair: Oswald Huber

14.30 Tadeusz Tyszka: *Propensity towards risk: One or many?*

15.00 Tomasz Zaleskiewicz: *Risk taking behavior: Does personality matter after all*

Social – Lecture Room E

Chair: Gisela Böhm

14.30 Carl Martin Allwood: *Increased realism in eyewitness confidence judgments: The effect of dyadic collaboration*

15.00 Paul Jones: *False consensus in the context of multiple reference groups and the role of perceived social proximity*

Tue, 15.30 – 16.00

Coffee / Tea

Tue, 16.00 – 17.30

Paper sessions

Theory – Auditorium A

Chair: Ralph Hertwig

16.00 Michael Schulte-Mecklenbeck: *Framing decisions: Hypothetical and real?*

13.30 Yuval Rottenstreich: *Money, kisses and electric shocks: On the effective psychology of risk*

17.00 Kazuhisa Takemura: *Focus on the outcome determines risk attitude: Contingent focus model for decision framing*

(SE) Utility – Auditorium C

Chair: Peter Wakker

16.00 Peep Stalmeier: *Chained minus standard utilities equals anchoring, and few respondents adjust*

16.30 Susanne Haberstroh: *The interdependence of probability and utility in decision making*

17.00 Carmelia di Mauro: *Reaction to uncertainty and market mechanisms: Experimental evidence*

Risk – Lecture Room D

Chair: Mandeep Dhami

16.00 Thomas Langer: *The influence of feedback frequency on risk taking: How general is the phenomenon?*

16.30 Nick Pidgeon: *Constructed preferences for health and safety control: The curious case of rail vs. road safety*

17.00 George Wright: *Differences in expert and lay judgments of risk: myth or reality?*

Theory – Lecture Room E

Chair: Dan Zakay

16.00 Gideon Keren: *Acceptability of randomization procedures as tie-breakers of indeterminacy*

16.30 Maja Bar-Hillel: *Are professional test makers “rational”? A critical look from a cognitive and game-theoretic viewpoint*

17.00 Thane Pittman: *Avoidance of regret and procrastination: Escalating costs and inaction inertia*

Tue, 17.30 –

EAEDM Business Meeting in Auditorium A

Wednesday 22nd August,

Wed, 09.00 – 10.00

Plenary session (Building A, Auditorium A)

Keynote address:

Nigel Harvey: *Experience, feedback and improvements in judgment performance*

Chair: Jeryl Mumpower

Wed, 10.00 – 10.30

Coffee / Tea

Wed, 10.30 – 12.00

Paper sessions

Auditorium A

Chair: Marcel Zeelenberg

10.30 Denis Hilton: *Counterfactual and causal judgments of intentional and physical causes in chains*

11.00 Lisa Ordóñez: *Passing the buck: Individuals, groups, and the strength of regret*

11.30 R.D. Sorkin: *Rational models of social conformity and social loafing*

Dynamic decision making – Auditorium C

Chair: José Kerstholt

10.30 Raanan Lipshitz: *Acquisition of proficiency in complex decision making: A knowledge-driven decision making approach*

11.00 Cade Massey & George Woe (presenter): *Detecting regime shifts?*

11.30 G. Meij: *Behavioral entrapment in dynamic task environments*

Time – Lecture Room D

Chair: Gretchen Chapman

10.30 Daniel Read: *Is time discounting hyperbolic or subadditive?*

11.00 Ilana Ritov: *Temporal perspective in evaluation of decision outcome*

11.30 Dan Zakay: *The dynamic change of decisions' determinants as a function of the distance in time from the decision's implementation*

Affect – Lecture Room E

Chair: Karl H. Teigen

10.30 Niklas Karlsson: *Escalation with transparent information*

11.00 Daniel Västfjäll: *Preference for regret, disappointment, elation, and surprise related to appraisal patterns and core affects*

11.30 Irwin Levin: *Framing life's experiences: Individual differences in judging pleasant and unpleasant events*

Wed, 12.00 – 13.30

Lunch in main hall of Building E

Wed, 13.30 – 14.45

de Finetti Prize Winner Presentations (Auditorium A)

Chair: Pieter Koele

Wed, 14.45 – 15.15

Coffee / Tea

Wed, 15.15 – 17.15

*Symposium***Symp. 3 – Emotion – Auditorium A**

Convenor and discussant: Wilco van Dijk

Orit Tykocinski: *Anticipated regret and the accumulation of losses: Inaction inertia in the stock market*

Marcel Zeelenberg: *Anticipated regret and lottery participation*

Terry Connolly: *Regret and cognition: Cognitive mediation in decision-related regret*

Karl Halvor Teigen: *Probabilities and surprises: Different ways of telling what you (did not) expect*

Symp. 4 – Risk perception – Auditorium C

Convenors: Daniëlle Timmermans, Myriam Welkenhuysen

Discussant: Shoshana Shiloh

Sandra van Dijk: *Genetic counseling, perceived risk and the intention for prophylactic mastectomy*

Daniëlle Timmermans: *Perceived risk and the intention to have a prenatal screening test*

Myriam Welkenhuysen: *Does risk perception influence the intention regarding predictive testing for hereditary breast cancer among women in the general population?*

Ilan Yaniv: *To know or not to know? A preference for uncertainty in genetic testing*

Wed, 15.15 – 17.15

*Paper sessions***Advising – Lecture Room D**

Chair: Helmut Jungermann

15.15 David Budescu: *Aggregation of probability judgments from asymmetric source*

15.45 Katrin Fischer: *Expert's advice and client's information processing in the context of medical decision making*

16.15 Alyssa Mitchell: *Deciding to give advice: The correlates and consequences of unsolicited advice*

16.45 Jack Soll: *Incorporating another person's judgment: How, and how well, do we use advice?*

Decision Process – Lecture Room E

Chair: Lisa Ordonez

15.15 Rob Ranyard: *Stated probabilities and background information in decision under risk and uncertainty: A think aloud study*

15.45 Kiyoko Saito: *A process model of decision making*

16.15 Clare Harries: *Distinction of cue effects in additive and configural rules*

16.45 Ola Svenson: *Decision makers' characterizations of important decisions*

Wed, 18.30

Departure of boat to Shipyard 't Kromhout for Conference Dinner

The boat is leaving from the Nieuwe Prinsengracht, on the corner of Roetersstraat, opposite the entrance of Building E

Abstracts of Presentations of the Keynote Speakers

Monday 20th August 09.00 – 10.00

Elke U. Weber “*How do I choose thee? Let me count the ways*” *A functional analysis of different modes of decision making*

Tuesday 21st August 09.00 – 10.00

Carsten de Dreu *Judgment and decision making in negotiation: A motivated information processing perspective*

Wednesday 22nd August 09.00 – 10.00

Nigel Harvey

Experience, feedback and improvements in judgment performance

Keynote Speakers

Elke U. Weber (Columbia University)

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*“How do I choose thee? Let me count the ways”
A functional analysis of different modes of decision making*

Recent work in decision making has expanded the notion of how people make decisions. Many researchers now look beyond the consequentialist rational choice or cognitive information integration models traditionally studied by economists, psychologists, operation researchers, and philosophers. In addition to evidence for decision-making as a weighing of outcomes and probabilities and the (albeit implicit and imperfect) calculating of costs and benefits, researchers are finding that decision makers often act in ways that cannot be described in terms of such calculation (Beach & Mitchell, 1990; Gigerenzer, Todd, & Group, 1999; Hammond, 1996; Klein, 1998; Yates & Lee, 1996). In some cases, alternative decision-making modes are even designed to prevent cost-benefit calculations (March, 1994; Prelec & Hershstein, 1991). Yates and Lee (1996) coined the term *decision modes* to describe qualitatively different strategies for arriving at a decision.

This new plurality of views on the ways that people make decisions asks for a systematic examination of the range of decision modes that people use and of their functional significance. The programmatic “adaptive decision maker” framework of Payne, Bettman, and Johnson (1993) provided such an account for the large number of decision algorithms that fall under the category of calculation-based decision making, showing how required effort and necessary accuracy determine a decision maker’s choice between more comprehensive and compensatory algorithms and less effortful shortcuts. Our research extends this framework in two ways. (1) We consider a broader set of (qualitatively different) decision modes as the strategies and processes at people’s disposal. (2) We examine a broader set of characteristics of both the decision problem and the decision maker as predictors of implicit selection of decision mode and thus consider a broader set of dimensions that people are trying to optimize when making a decision using a particular mode. Predicting decision mode selection provides us with a broader descriptive understanding of human motivation, decision making, and action. It also is of practical interest as the selection of decision mode can influence the decision outcome.

Our proposed taxonomy of the modes people use to arrive at a decision includes three classes of modes, in particular calculation-based, recognition-based, and affect-based decision making. It characterizes each of these modes in terms of their attentional focus, primary cognitive and affective processes, necessary mental representations, and potential functional significance for self-regulation, social interactions, and material effectiveness.

The *calculation-based* class of decision modes includes prescriptive models such as expected or multi-attribute utility (von Winterfeldt & Edwards, 1986) and descriptive models such as prospect theory (Kahneman & Tversky, 1979) or a wide range of noncompensatory riskless-choice models (see Payne, Bettman, & Johnson, 1993, for a list).

When using *recognition-based* decision modes, the decision maker recognizes the situation as a member of a category for which a judgment or action has already been stored (Simon, 1990). Once the situation has been classified, an if-then rule is activated which dictates the behavior or choice. Many component processes of Beach and Mitchell’s (1987, 1990) image theory are examples of recognition-based decision making. Klein (1998) and Gigerenzer and Goldstein (1996) have recently demonstrated the advantages of simple memory-based decision modes that involve recognition and categorization. An example of recognition-based decision making is the case-based decision making of experts for whom a presenting problem evokes similar situations in the past (Chase & Simon, 1973), the actions taken, and their consequences (Weber, Bockenholt, Hilton, & Wallace, 1993). If this reminding is

unconscious, episodic memory may provide a basis for the “intuitive” decision making of the expert (Klein, 1998). Another example of recognition-based decision making are situations for which people learn that cost-benefit-based or affect-based decision modes result in “bad” outcomes, i.e., in outcomes that they will ultimately regret but will initially choose due to insufficient self control (Prelec & Herrnstein, 1991). If people learn to recognize these situations, they can assure themselves a better decision outcome by following simple if–then rules (e.g., “if offered some illegal drug, just say no”). Rule-based decision making also operates for routinized decisions (e.g., the “decision” to stop at a red traffic light), where procedural memory directs behavior in much the same way that it directs overlearned motor tasks (Ronis, Yates, Kirscht, 1989). Recognition-based decision making also includes the role-based decision making described by March (1994). In many situations, calculation-based decisions based on personal preferences lead to socially suboptimal outcomes. To guard against such outcomes, groups have evolved rules and expectations of socially-desirable behavior. Parents who calculate costs and benefit when deciding on whether to provide for their children would be frowned upon (and potentially jailed), and doctors are bound by their Hippocratic oath to assist in a roadside accident, regardless of personal inconvenience. Particular social roles are associated with rules and expectations, and situations that prime a particular social identity will also prime those behavioral norms (March, 1994). People are motivated to engage in role-based decision making because it affirms their social identities, thus strengthening their self identity.

When making a decision using an *affect-based* decision mode, people base their decisions on their immediate and holistic affective reaction to the choice alternatives (Damasio, 1993; Epstein, 1994; Hsee & Kunreuther, 1998; Loewenstein, Weber, Hsee, & Welch, 2001) rather than on a more carefully and rationally constructed evaluation as in calculation-based modes. Wright (1975) has studied affect-based decision making in the arena of consumer choice, calling it affect referral.

In this talk, I present the results of two studies of decision mode selection. Study 1 examines the choice of decision mode of a sample of 40 Columbia University students for twelve decisions from a range of content domains (e.g., financial decisions, consumer choices, romantic decisions). Participants indicated how likely they *would* use each of a set of qualitatively different modes to make each decision, to what extent they thought that they *should* use each mode, and how likely they thought other students would use each mode. They also rated each decision situation on a range of dimensions that included need for assessment, need for action, need for decision justification to oneself or to others, and such variables as perceived importance and emotional content. A functional analysis of the relative advantages of different decision modes (e.g., recognition-based and affect-based modes allow for faster decisions than calculation-based modes) provides a basis for predicting situational and individual differences in the use of decision modes (e.g., calculation-based modes will be used more for decisions in content domains that require more assessment and less action; role-based decision making will be used more for by individuals who feel the need to justify a decision to others). These data also allow us to examine respondents’ use of multiple modes and the pattern of co-occurrences of modes.

Study 2 examines differences in decision mode usage between cultures by studying the description of decisions in 20th century American and Chinese novels. Evidence about the differential importance placed in on self- vs. other-oriented motivations in these two cultures results in predictions about differential frequency of use of decision modes in the two cultures. For each culture, we identified 7 to 10 classic 20th century novels, nominated as such by literature professors in each country. We also identified a similar number of best-selling novels published over the last 20 years. For each novel, a set of blind raters identified the major decisions made by characters in the novel. They then characterized each decision along a set of dimensions (e.g., content domain, importance) and answered a set of questions about the way the character went about making each decision, including the decision mode(s) employed.

Preliminary analyses of the results of both studies show support for many of our hypotheses, but also suggest some modifications to our initial decision mode taxonomy. Details will be presented at the meeting. Current research on decision modes has primarily a descriptive focus, i.e., is interested in documenting the full range of ways in which people go about making decisions. However it also has a range of prescriptive implications. To the extent that research documents the adaptiveness of the selective use of different decision modes, it will argue against the current almost exclusive prescriptive advocacy of calculation-based modes of decision making. Instead, prescriptive arguments may be made for using different (or multiple) decision modes contingent on individual and situational circumstances. As a consequence, a new generation of decision aids may need to be developed that

will help people make better decisions using a range of decision modes. To develop such decision aids, it will be imperative to have a good process-level account of each mode and its motivations and triggers. Such an account is needed to help people in the selection of optimal decision modes for particular problems and in the successful execution of the crucial processes in each mode.

Notes:

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Judgment and Decision Making in Negotiation: A Motivated Information Processing Perspective

Whether in close personal relationships, the workplace, or in international interaction, differences of interest are often settled by efforts to negotiate agreements about what each shall give and take, leave or perform. Negotiation serves as an alternative to forceful domination by one side and obliging capitulation, and thus serves as a foundation of social structures and relationships. Negotiated agreement, however, often is difficult to achieve: the competitive need to do well personally often does not mix well with the co-operative need to overcome differences of interest. It is not uncommon to find that negotiators reach outcomes that are sub-optimal by normative standards.

A major underlying cause of the difficulties of negotiation is the negotiators' inclination to base judgments and behaviours on faulty beliefs and inappropriate sources of information. For example, negotiators have been found to rely inappropriately on the representational format of the negotiation outcomes, stereotypic information about other parties, and momentarily accessible anchor values. However, the recent emphasis by negotiation scholars on cognition in negotiation belies the importance of motivational processes. An underlying premise of our work is that a strict reliance on a purely cognitive approach to negotiator judgment and behaviour offers an incomplete story. I will present recent work from our laboratories, and from others, that detail the interaction of motivational and cognitive processes in negotiation. This research suggests a motivated information-processing perspective on negotiation, which has implications for our understanding of judgment and decision making within as well as outside the immediate confines of negotiation and social interaction.

A Motivated Information-Processing Model of Negotiation

Negotiators process relevant and available information to perform. A negotiator acquires information from interactions with the world. The *attention* phase of information processing consists of the perception of information. The *encoding* process involves the structure, evaluation, interpretation, and transformation of the information into a representation, which is *stored* and accessed later through *retrieval* processes. Encoding, storage and retrieval processes influence the response in terms of judgment or decision.

The emerging view of negotiators as information processors extends methodological and theoretical developments in cognitive psychology. However, the processing of information in interpersonal settings such as negotiation involves activities that occur *within* as well as *among* the minds of negotiators. Thus, individual information processing is integrated with communication, reflecting group level information processing. Moreover, negotiators may differ in the information they possess, the ideas that are most accessible, and in their preferences for certain decision alternatives. An important aspect of negotiation is how opposing parties combine these various resources and preferences to come up with a mutually acceptable agreement. Through communication negotiators can reach a shared and accurate understanding of the task, resolve differences, and come up with a high quality solution.

Key to an effective combination of resources and preferences is that negotiators share their ideas, information, and preferences. This requires the *motivation* to both retrieve information from memory and to actually share it during discussion. Second, negotiators may process the ideas, information and preferences that become available during negotiation in more or less depth. The extent to which information is processed is contingent on the *motivation* to process the information that is entered into the debate. In sum, effective negotiation is dependent on (a) adequate sharing of information, and (b) in-depth processing of new information.

Until now, the literature on negotiators as information processors has fully ignored these motivational aspects of human information processing and its consequences for negotiation. This omission is remarkable because various theories concerned with interpersonal and small-group processes accord quite an important role to motivation. Dual Process Models recognise that information processing is influenced by the motivation to (a) ensure the coherent and favourable

evaluation of the self, and (b) ensure satisfactory relations with others, along with (c) understanding the entity or issue featured in the influence appeals. Interdependence Theory distinguishes between selfish motivation to defend, value and promote one's own (tangible and intangible) interests and points of view, and pro-social motivation to defend, value and promote (tangible and intangible) interests of others and their points of view.

Integrating these two lines of reasoning and research, information processing and subsequent judgment and decision making in negotiation may be understood in terms of two classes of motivation. The first class of motivational forces is social and concerned with the outcome distributions negotiators aim for. This *social motivation* is argued to drive at the *kind* of information negotiators attend to, encode and retrieve. The second class of motivational forces is non-social and deals with understanding the task and the issues involved. This *epistemic motivation* is argued to drive at the *degree* to which new information is sought and available information is attended to, encoded and retrieved. Thus, the processing of information is influenced by the interaction between social motivation driving what negotiators encode and retrieve and epistemic motivation driving the degree to which the "what" is encoded and retrieved. Likewise, the quality of agreement depends on social motivation driving the extent to which negotiators value inclusiveness (e.g., consensus instead of majority coalition or win-lose agreements) and on epistemic motivation driving the extent to which negotiators "satisfice" and accept middle-of-the-road compromises or continue searching for maximizing joint outcomes and finding solutions that meet (most of) the negotiators' aspirations (cf., "satisficing" versus "optimizing").

I will review evidence from our own laboratories, and of others, to answer the following basic questions: (1) what are the origins of social and epistemic motivation (De Dreu, Weingart & Kwon, 2000b), (2) are these motivational forces intertwined or independent from one another (De Dreu, Koole, & Oldersma, 1999; De Dreu, Koole, & Steinel, 2000a), (3) how does social and epistemic motivation alone and in interaction influence information processing in negotiation (De Dreu & Boles, 1998; De Dreu et al., 1999; De Dreu & Van Kleef, 2001), and (4) how does social and epistemic motivation alone and in interaction influence the quality of negotiated agreement (De Dreu, 2001; De Dreu et al., 2000a; 2000b).

Key Studies to be Reviewed

- De Dreu, C.K.W. (2001). *Time pressure and motivated closing of the mind in negotiation*. Unpublished manuscript, University of Amsterdam.
- De Dreu, C.K.W., & Boles, T. (1998). Share and share alike or Winner take all? The influence of social value orientation upon choice and recall of negotiation heuristics. *Organizational Behaviour and Human Decision Processes*, 76, 253-276.
- De Dreu, C.K.W., Koole, S., & Oldersma, F.L. (1999). The freezing and seizing of negotiator inferences: Need for cognitive closure moderates the use of heuristics in negotiation. *Personality and Social Psychology Bulletin*, 25, 348-362.
- De Dreu, C.K.W., Koole, S., & Steinel, W. (2000a). Unfixing the fixed-pie: Toward a motivated information-processing model of integrative negotiation. *Journal of Personality and Social Psychology*, 79, 975-987.
- De Dreu, C.K.W., & Van Kleef, G.A. (2001). *Motivated information search in negotiation: Power, impression formation, and the self-fulfilling prophecy*. Unpublished manuscript, University of Amsterdam.
- De Dreu, C.K.W., Weingart, L.R., & Kwon, S. (2000b). Influence of social motives on integrative negotiation: A meta-analytical review and test of two theories. *Journal of Personality and Social Psychology*, 78, 889-905.

Notes:

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Experience, feedback and improvements in judgment performance

Multiple-cue probability learning (MCPL) has been and continues to be one of the most intensively studied judgment paradigms. People are required to make judgments of the values of some criterion (e.g., the weights of various people) on the basis of information about the values of various cues (e.g., the ages, heights, and incomes of these people) that are related to the criterion in some way. One of the most striking findings from experiments of this type is that outcome feedback provided after each judgment to inform participants of the true value of the criterion improves judgment only when there are relatively few cues and when these cues are linearly related to the criterion. Even then, the process appears to be very slow. This is surprising given that feedback rapidly induces learning in motor skills that are, according to some authorities, not intrinsically different from cognitive skills.

Findings from MCPL tasks contrast with those from other types of judgment. For example, feedback can rapidly improve forecasting from noise-free time series. What is the crucial difference between these two types of task? It may be that outcome feedback is ineffective with probabilistic inference tasks but effective with deterministic ones (Brehmer, 1980). Alternatively, outcome feedback may be ineffective in MCPL tasks because it does not directly provide people with information about how they have misapprehended the relations between each of the cues and the criterion (Todd & Hammond, 1965).

I shall argue that work on advice combination favours the second explanation. In these experiments, a number of advisors provide estimates (i.e., cues) for the value of the criterion (e.g., number of sales of some consumer product). Cues are probabilistically related to the criterion but, because they are on the same scale as the criterion, outcome feedback directly provides participants with information about whether their reliance on particular cues has been inappropriate. Even with four cues, outcome feedback produces rapid learning in this situation. Furthermore, a direct comparison between the two tasks, in which the formal relationship between the cues and criterion was the same, confirmed that learning is much faster in advice combination than in MCPL.

Interestingly, however, this comparison revealed an unexpected finding. Performance was very much better in the advice combination task than in the MCPL task on the very first trial before any outcome feedback had been provided. This suggests that participants' mental models of the task were more useful when they had to combine sales advice from four different sources (chief stock controller, research and development officer, product manager, sales manager) than when they had to forecast sales on the basis of four pieces of information (current share price, size of competitor's promotion campaign, number of sales outlets, cost of product). For example, they may have regarded it as unlikely that all advisers are biased in the same direction and therefore (correctly) selected a value within the range of those provided by their advisers. In contrast, their mental model of the MCPL task was unlikely to have constrained their judgments in this way.

In certain tasks (e.g., where a degree of perceptual learning occurs), mere repeated exposure to the cues relevant to performance may produce performance improvements even in the absence of outcome feedback. However, it is not always easy for researchers to determine *a priori* whether a given task falls into this category. Presumably, it is also difficult for participants to make this decision. Sometimes their mental models of the task will lead them to expect performance to improve in the absence of outcome feedback when, in fact, it does not do so. On other occasions, they will lead them to expect performance to remain stable in the absence of feedback when, in fact, it improves.

As an example of the first of these possibilities, I shall outline an experiment in which people's performance on a motor task was tested in the absence of feedback. After each trial, they rated their confidence in success. Prior to the testing session, half the participants had practised the task with feedback (active learning) whereas the other half had just observed someone proficient at the task performing it (passive learning). Results showed that during the testing session there was no change in performance and no difference between the two groups. However, confidence ratings

demonstrated that participants expected their performance to improve over the testing session; furthermore, confidence in success was higher after active than after passive learning. It appears that participants' mental models of their task had led them to expect that prior learning would be more effective when active than passive and that learning would continue during the feedback-free testing session. Both these expectations were unwarranted.

As an example of the opposite phenomenon, I shall describe some experiments in which people saw a target move part way across a screen, selected a means for intercepting it, and then estimated the probability of successful interception. When feedback was given, they saw whether or not interception occurred; when it was not given, they did not see this. In both cases, they were initially overconfident in their success. With feedback, they soon became well calibrated. However, even without feedback there was a significant reduction in the Brier Score. Although a (non-significant) reduction in scatter may have contributed to this, it arose primarily because overconfidence disappeared. This occurred because confidence in successful interception remained constant over the session whereas the probability of correct interception increased. In this case, it appears that participants' mental models of their task led them to expect that no learning would occur without feedback. Again, however, their expectation was unwarranted. People appear to use task instructions to categorize their experimental tasks as those in which learning will or will not occur; sometimes these categorizations are erroneous. Presumably, in order to achieve these categorizations, they must relate what they are being asked to do in the laboratory to tasks that they have performed previously inside or outside the laboratory.

Research into dynamic decision making casts further light on the role of feedback, mental models and the interrelation between them in determining levels of task performance. I shall outline experiments in which people had to control the output of a unidimensional non-linear system (a logistic map) by altering the system parameter. Participants role-played psychiatrists treating patients with affective disorders by giving them drugs (that changed the system parameter). When they had to move the system state from one point attractor (depression or mania) to another (corresponding to a stable healthy mood), they learnt their task only slowly: although the distance between these two point attractors provided them with an appropriate cue, the transient responses of the system produced by their control actions meant that it was difficult to use outcome feedback to determine the appropriate cue-criterion relation. When they had to move the system state from a periodic attractor (oscillating manic-depression) to a point attractor (corresponding to a stable healthy mood), learning was even slower. The size of the oscillations provided an appropriate cue but participants had great difficulty recognizing or using this fact: the problems were the same as before but exacerbated because of the decreased saliency of the cue. Finally, when participants had to move the system from a chaotic state (unpredictable manic-depression) to a point attractor (corresponding to a stable healthy mood), hours of practice still produced no learning: the signal provided no cue to the size of the relevant control action and so outcome feedback was uninformative.

Interestingly, experimenters with inside knowledge of how the system works (gained from study rather than feedback) have little trouble in controlling the system: they know that a succession of small control responses that minimize transient responses are useful for moving between point attractors whereas an initial large response is needed to escape the chaotic region of the state space. Experience of the task with outcome feedback is not sufficient to guarantee development of a mental model that will improve performance. However, if appropriate extra-laboratory information is recognised as relevant, a mental model that allows identification and use of information provided by the task can be developed and produce performance improvements.

In summary, I suggest that changes in judgment performance often depend on a mechanism that minimizes the difference between feedback and a goal state. As Todd & Hammond (1965) point out, the effectiveness of this mechanism depends crucially on how easy it is to transform this difference into corrective action. However, changes in performance also depend on mental models that produce expectations (feedforward) and that provide cognitive interpretations of the meaning of feedback (thereby suggesting an appropriate corrective action). These models vary in appropriateness. They derive not just from experience with the task inside the laboratory (Serman, 1994) but also from attempts to relate the laboratory task to previous experience and knowledge obtained inside and outside the laboratory.

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Notes:

Symposium Abstracts

Symposium 1. Ecological Rationality in Learning and Decision Mechanisms

Egon Brunswik (1952) introduced the idea of a Darwinian style adaptation of cognitive processes to the environments in which they function. This idea has been successfully applied to multiple-cue probability learning and the formulation of decision mechanisms. Consequently, the notion that people are ecologically, rather than axiomatically, rational, has become popular. This symposium includes researchers who study the adaptive nature of cognitive processes, namely learning mechanisms in categorical and social environments, and decision strategies in categorical and choice situations. The papers also demonstrate the methods by which ecological rationality may be investigated. The discussants will evaluate and integrate this research.

Convenors

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Discussants

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Larry Fiddick (Max Planck Project Group, Bonn, Germany)

Contributions

1. David A. Lagnado & David R. Shanks (Department of Psychology, University College London, UK)

Judgment in hierarchical learning: Conflicting adaptations to the statistical environment

Research in an associative learning paradigm suggests that after exposure to a structured learning environment people give judgments more closely related to predictiveness than to normative probability. This is because their learning mechanisms are attuned to statistical contingencies in their environment, and they use these learned associations as a basis for subsequent probability judgments. Using a medical diagnosis task, we introduced a simple hierarchical structure into this paradigm, setting up a conflict between predictiveness and coherence. Under a probability format participants tended to violate coherence and make ratings in line with predictiveness, and under a frequency format they were more normative. These results are difficult to explain within a unitary model of inference, whether associative or frequency-based.

2. Neil Bearden (Department of Psychology, University of Maryland, College Park, USA)

Ecological constraints on the development of social conventions

An assumption underlying evolutionary game theory is that each organism in a population interacts with every other with equal probability. However, this assumption is not met in a natural ecology where organisms are more likely to interact with others closer to them. Experiments investigated geographically constrained, boundedly rational, simple learning organisms that use cues (i.e., past interactions) and a Q-learning mechanism in order to coordinate their behaviors. Through local coordination, complex self-organizing behavior emerges at the global level, demonstrating that a large

number of locally rational but globally inefficient conventions can develop under realistic ecological constraints. These observations are not predicted by standard evolutionary game theory, which makes some ecologically implausible assumptions.

3. Peter Juslin (Department of Psychology, Umeå University, Sweden)

Rules and exemplars in human judgment

Recent theories of categorization postulate that people simultaneously acquire representations at multiple levels, which compete to control specific responses. When interacting with an environment people acquire knowledge of exemplars and abstract rule-based knowledge of cue-criterion relations (i.e., cue validities). I contrast these systems in terms of their speed and frugality. The exemplar system attains flexibility by storing large amounts of knowledge and postponing all computation until the time of judgment (i.e., a lazy algorithm), whereas the rule-based system compiles knowledge into special-purpose abstractions, thus requiring extensive precomputed knowledge to attain flexibility. I review data from our experiments that aim to ascertain which environments promote either system and what consequences this has for the properties of the judgments.

4. Barbara Fasolo, Gary H. McClelland & Katharine Lange (Department of Psychology, University of Colorado, Boulder, USA)

The effect of interattribute correlations on decision strategies are attribute-based or option-based

In choices among different options, the relationship between the attributes that describe these options determines how we search for information and make a decision. Using a web-based information display board, we found that decision makers responded to positive inter-attribute correlations by using simple attribute-based information search and decision strategies, and to negative inter-attribute correlations by adopting more effortful option-based strategies. Thus, when trade-offs between negatively correlated attributes need to be made, decision makers overcome the inherent difficulty and adopt effortful option-based strategies rather than more frugal attribute-based ones. This reinforces an optimistic view of decision makers able to flexibly adapt search and decision strategies according to the structure of their decision environment.

Notes:

Symposium 2. Did the Experts Judge Expertly?

In the absence of an accuracy standard, it is difficult to determine whether an expert judge is in fact performing expertly. The Cochran/Weiss/Shanteau (CWS) approach argues that expertise requires two capabilities: to discriminate among the stimuli in the domain, and to be consistent in judging the same stimulus. Estimates of these components generate an index of expert performance. This approach has been successful in reanalysis of studies of expert auditors, livestock judges, and personnel selectors. Here, judgments by Swedish physicians and French tasters are analyzed traditionally and using the CWS approach. The data both support and challenge the new methodology.

Convenors

David J. Weiss (California State University, Los Angeles) & **James Shanteau** (Kansas State University)

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Discussants

Ola Svenson (University of Stockholm)
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Contributions

1. Ylva Skånér, L-E Strender, and J. Bring (Department of Clinical Neuroscience and Family Medicine, Sweden)

How Do GPs Use Clinical Information in their Judgments of Heart Failure?

Forty-five case vignettes based on actual patients from two health centres in Stockholm, were presented to each of 27 GPs. For each case vignette, the GPs judged the probability of heart failure. Five of the vignettes were duplicates. The GPs' utilization of clinical information in their judgment strategies was measured by the regression coefficients in a multiple regression equation with the probability assessments as dependent and the clinical criteria as independent variables. We found considerable variation among the GPs' assessments of the probability for heart failure. The judgmental strategies differed among the doctors, with the most important variables for most of the doctors being lung and heart X-ray and a history of myocardial infarction.

2. James Shanteau (Department of Psychology, Kansas State University)

How to Evaluate Expert Performance

The term "expert" is a linguistic, rather than a psychological concept. Because there are no operational definitions to tell us who is (and who is not) an expert, analyses of expertise often lead to divergent conclusions. Some researchers claim that most experts are little better than novices, while others have reported high levels of expert performance that far exceeds what novices are capable of doing. I will review three previous approaches to identifying experts -- external validation, formal certification, and peer nomination. Unfortunately, these approaches have often proved inadequate because they fail to reflect the unique characteristics of expert behavior. I will then describe a novel approach to evaluating experts based on a quantitative assessment of their performance. The approach is based on a recently developed measure of expertise called CWS. This measure combines discrimination ability and judgment consistency into a single index. This approach will be illustrated using data from the study of medical decision making conducted by Drs. Skaner, Strender, and Bring (1998). The CWS index provided new insights into the source of previously unexplained individual differences.

3. Catherine Dacremont and Dominique Valentin (Groupe Evaluation Sensorielle, ENSBANA, Université de Bourgogne, France)

How to assess food experts? Application to texture profile

Descriptive analysis is widely used to describe perceptions of food products during consumption. Usually, a small group of assessors is trained to quantify the intensity of relevant attributes. During training, they should reach consensus on the meaning of each attribute and memorize the range of stimulus intensities. Assessors should be discriminating at the individual level and homogeneous at the group level. The analysis is challenging because the nature and the magnitude of the differences between products are not known a priori. The performance of 8 assessors trained to describe the texture of food products was examined. The texture of 56 food products (biscuits, raw vegetables...) was described through judgments of 12 attributes. Some assessors were more effective than others as they achieved systematically higher F-values. ANOVAs on the group data showed relatively good agreement among assessors on the meaning of each attribute. The use of F-values as an index of performance expertise will be discussed.

4. David J. Weiss (Department of Psychology, California State University, USA)

A CWS Perspective on the Food Assessors

The tasting data allow exploration of theoretical challenges inherent in the CWS approach to assessment of expertise. We have always argued that CWS provides necessary but not sufficient criteria; the exposure of the methodology to real data brings home the limitations. The “threshold effect” occurs when a judge responds “0” to a large number of the stimuli. The consequent inflation of the CWS score is illustrated with artificial data. One of the tasters reported zero crunchiness for 99 of the 112 foods. These answers cannot be called wrong, but they hardly seem to constitute evidence of judgmental skill. This extreme consistency generated a CWS value that was much larger than that of any other judge, so blind use of our index leads to a dubious conclusion. The “catch” refers to a judge demonstrating discrimination and consistency, but attending to an incorrect aspect of the stimuli. According to the CWS index, such a judge is an expert, although the judgments are not valid. For most of the tasters, the judgments of crispness, crackle, and crunchiness were positively correlated. This result may mean that the judges could not attend strictly to the specified attribute, or that associations were inherent in the foods.

Notes:

Symposium 3. Emotions and decision making

Research in judgment and decision making has increasingly begun to consider the importance of emotions. The purpose of this symposium is to present new empirical research on the role of emotions and affect on judgment and choice. Presentations will discuss the effects of anticipated regret on producing inaction inertia, the effects of anticipating regret on lottery participation, the cognitive mediation in experienced regret and the effects of outcome probabilities and outcome valence on the experience of surprise. Wilco van Dijk will introduce the topic of emotions and decision making and discuss the validity and implications of the presented findings.

Convenor and discussant

Wilco W. van Dijk (Vrije Universiteit Amsterdam)

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Contributions

1. **Orit Tykocinski** (Ben Gurion University), **Thane Pittman** (Gettysburg College) & **Israel**

Anticipated regret and the accumulation of losses: Inaction inertia in the stock market

Models of the costs of action may sometimes focus on economic costs and neglect psychological ones. But for an investor who has missed an opportunity to sell a stock for a modest gain, the action of subsequently selling it for a loss entails both economic and psychological costs. Whereas economically one might be wise to sell to avoid future losses, this action is also likely to trigger the psychological cost of regret for having failed to act sooner. In the domain of positive outcomes, anticipated regret was implicated in producing inaction inertia. Having missed an opportunity for a substantial gain we are less likely to take similar opportunities that, although objectively still attractive, offer less positive outcomes. We assess the role of anticipated regret in producing inaction inertia in the domain of negative outcomes using a stock market computer game. Participants who missed an initial opportunity to sell their stock for a moderate gain and now faced a large loss were less likely to sell their stock compared to participants who faced the same large loss but who had no previous opportunity to sell. These results suggest that inaction inertia phenomena can be expected to affect investment behavior.

2. **Marcel Zeelenberg** (Tilburg University) & **Rik Pieters** (Tilburg University)

Anticipated regret and lottery participation

The Dutch postal code lottery owes its name to the process by which the winner is selected: namely by randomly drawn postal codes. There are a variety of prizes to be won in this lottery. For example, for the Street Prize a postal code is drawn and everyone who bought a ticket and has this postal code receives a prize. Would you buy a ticket or not? Before answering this question you might want to consider the following situation: Imagine that your postal code has been selected, but you did not buy a ticket. However, your neighbour, with whom you share your postal code, did buy a ticket and won. How would you feel? Probably you would kick yourself and feel intense regret. If you consider the possibility of regret before making your decision whether or not to play in the postal code lottery, it might prompt you to buy a ticket because buying a ticket protects you against the possibility of severe regret. We report on a study with real lottery players as participants. Consistent with our predictions we found that anticipated regret is a strong predictor of future participation in the postal code lottery.

3. Terry Connolly (University of Arizona) & **Jochen Reb** (University of Arizona)*Regret and cognition: Cognitive mediation in decision-related regret*

Regret theory assumes that all individuals understand a given decision problem in the same way, and make similar imputations of regret, disappointment, self-blame and so on when outcomes are poor. In an experiment, we provided participants (N=166) with alternative framings of identical decision problems and asked them to predict their decision-related emotions. We used three choice scenarios which had previously shown action/inaction effects on regret. Participants assessed eleven possible emotions before or after evaluating alternative arguments for each scenario. We found that regret is strongly mediated by exposure to these brief arguments, suggesting that a subject's spontaneous framing of a decision may be readily modified by considering alternative framings. Different framings lead to different regret predictions, and thus to different decisions. Regret is thus not simply a product of whether or not a protagonist takes action in a particular setting. It is also significantly shaped by whether or not such (in)action is seen as appropriate, given the participant's problem framing.

4. Karl Halvor Teigen (University of Tromsø) & **Gideon Keren** (Eindhoven University of Technology)*Probabilities and surprises: Different ways of telling what you (did not) expect*

Outcome expectations can be expressed prospectively in terms of probability estimates, and retrospectively in terms of surprise. Surprise ratings and probability estimates differ, however, in important ways. Surprise ratings appear to be affected by outcome valence in addition to outcome probability; they appear to be determined by relative, rather than absolute probabilities; and by previous rather than by predicted outcomes. These discrepancies are consistent with a contrast interpretation of surprise, according to which the surprise of an event is determined by its conflict with a dominant belief or an experientially based expectancy rather than by its estimated low probability. Thus expectations about alternative outcomes are equally decisive for rated surprise than are expectations regarding the outcome that actually occurred.

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Symposium 4. Risk perception and genetic testing: how important is an accurate understanding of personal risks for making informed decisions?

The primary underlying intent of genetic counselling appears to focus on information dissemination to ensure individuals to make informed decisions about participating in testing, screening and prevention. Providing information about the risks is considered an important component of genetic counselling. However, earlier research has shown that people find it difficult to get an adequate perception of their personal risk. This symposium deals with the question: How important is an accurate risk perception for making informed decisions regarding genetic screening or testing, and how does risk perception affect people's behavior? Which other factors are important?

Convenors

Danielle Timmermans (Department of Social Medicine, Institute for Research in Extramural Medicine, Vrije Universiteit Amsterdam)

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Discussant

Shoshana Shiloh (Department of Psychology, Tel Aviv University, Israel)

Contributions

1. Sandra van Dijk, Wilma Otten, Moniek Zoetewij & Danielle Timmermans (Departments of Medical Decision Making and Clinical Genetics, Leiden University; Medical Center & Department of Social Medicine, Vrije Universiteit Amsterdam)

Genetic counselling, perceived risk and the intention for prophylactic mastectomy

The topic of prophylactic mastectomy is controversial. Despite the lack of definitive evidence of efficacy, and the possible medical and psychosocial drawbacks, a preventive operation to remove breast tissue is often requested by women with a high risk to develop breast cancer (again). In the presentation we will describe prospective data on whether genetic counselling influenced breast cancer worry and perceived risk, and subsequent intention for prophylactic mastectomy. Furthermore, we present data on the effect of different measures of perceived risk (e.g. numerical, relative, verbal risk, and the perceived risk of being a gen carrier). Data collection started in November 1998 and until now, 156 respondents completed a questionnaire before and after a consult with a clinical geneticist. The strongest predictors for the intention were precounselling levels of worry and perceived risk. The additional effects varied depending on which measure of perceived risk was considered. During the presentation, we will discuss the effect of providing objective risk information, and the different effects of measures of perceived risk.

2. DRM Timmermans, GJM Bosboom, JMG van Vugt (EMGO-Institute, Social Medicine, Vrije Universiteit Amsterdam; Department of Obstetrics and Gynaecology, University Hospital Vrije Universiteit Amsterdam)

Perceived risk and the intention to have a prenatal screening test

The aim was to investigate what factors can predict women's intention to accept the offer of prenatal screening. A questionnaire was sent out to 659 women. All women received a leaflet with information about a prenatal screening test. We asked them if they would have the screening test when offered, what they thought their chances of having a child with Down Syndrome or with Neural Tube defects

are, and their general attitude towards prenatal screening. Response rate was 60%. Most women (53%) stated that they would (probably) have a screening test when offered. Surprisingly, no statistically correlation was found between estimated chances on Down's syndrome or Neural Tube defects and the intention to have a screening test. There is a statistically significant correlation between women's opinion on the offer of prenatal screening to all pregnant women and their intention to have the screening test ($r = .6$). Regression analysis of these factors with 'intention to screen' as dependent variable resulted in a $R^2 = .5$. Women's intention to screen is determined mainly by their attitude. There is no relation at all with perceived risk.

3. M. Welkenhuysen, G. Evers-Kiebooms, M. Decruyenaere, E. Claes, L. Denayer (Psychosocial Genetics Unit, Center for Human Genetics, Leuven, Belgium)

Does risk perception influence the intention regarding predictive testing for hereditary breast cancer among women in the general population?

The risk perception concerning breast cancer (BC) and hereditary breast cancer (HBC) and intentions regarding predictive testing for HBC were investigated among 471 Flemish women (19-65 years old) who received an informative text on HBC, its genetic transmission and on the predictive test. Two questionnaires were completed: one before and one after reading the text. The response rate was 70%. About 20% reported that BC occurred in the family. The numerical and qualitative assessment of both the personal BC risk (before reading the text) and HBC risk (after reading the text) in this group were higher than in the group without BC in the family. Surprisingly, while 75% of the latter group would ask for a predictive test in case breast cancer would occur in relatives, a negative intention was reported by two thirds of the women with BC in the family. Regression analyses on the total sample show that none of the risk perception measures predicted the intention regarding the predictive test. Instead, the intention was determined by the perceived importance of the benefits of a predictive test, the attitude toward the development of such a test, the number of children and the occurrence of BC in the family.

4. Ilan Yaniv*, Debbie Benador*, Liat Pollack-Basis*, Michal Sagi** (*Department of Psychology, Hebrew University of Jerusalem; ** Department of Human Genetics, Hadassah Hebrew University Hospital, Jerusalem)

To know or not to know? A preference for uncertainty in genetic testing

Research on population at-risk for incurable diseases such as Huntington disease has shown only limited willingness to undergo predictive testing. Our research investigated the conditions under which people in the general population (not at risk) would wish to receive personal genetic information about themselves regarding the likelihood that they will develop in the future certain hypothetical diseases whose description was varied systematically in the various studies. We report several studies. The first one ($n=120$) tested intentions to undergo predictive testing as a function of three factors in the description of the disease: the base rate of the disease, diagnosticity of the test, and possibility of treatment. In the absence of treatment less than half the respondents chose to know. Among the three factors in the description of the disease only treatment had a significant effect on the choice to know. In the second study ($n=225$) we varied type of treatment and scenario (whether or not the test had already been done) as factors. We also administered to each respondent the following four personality scales: need for cognition (Cacioppo & Petty, 1982), desirability of control (Burger & Cooper, 1979), optimism (Scheier & Carver, 1985) and Miller's (1989) MBSS on coping styles in anxiety-evoking situations. Respondents choices depended on type of treatment available and scenario. Furthermore, the need for cognition and Miller's monitoring style (MBSS) were found to be related to respondents' willingness to be tested. We discuss the factors affecting the choice to know or not to know, their practical implications and their significance for decision making theories.

Notes:

Abstracts of Individual Oral Presentations

The abstracts are alphabetically ordered by the last name of the first author. Unless otherwise indicated the first author is the presenter.

Susanne Abele & Herbert Bless (University of Mannheim)

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Social Information Processing in Strategic Decision Making: Why Timing Matters

In strategic decision situations (e.g. in games) the outcome of decisions depend on all decision-makers involved. Imagine you choose simultaneously with another player ('simultaneous'). Would that be different from knowing that your opponent chose before you, but still not knowing what s/he did ('pseudo-sequential'). Empirical evidence suggests that the two situations have different effects. E.g. in coordination games, risk-avoiding strategies were more likely in simultaneous rather than sequential situations. We hypothesize that this "timing-effect" is - at least partly - due to the cognitive activation of different concepts. More specifically, we assume that games with pseudo-sequential structures are more likely to activate concepts of social interaction, which in turn increase individuals' interpersonal trust and decrease individuals' risk-aversion in situations of interdependence. Games with simultaneous structures are more likely to activate concepts of games of chances that increase individuals' risk-aversion. In three experiments participants played a coordination game either simultaneously or pseudo-sequentially. Additionally we manipulated thinking time (experiment 1), activation of concepts like social interactions (experiment 2) and competitiveness of the context of the situation (experiment 3). All results clearly support our hypothesis that different cognitive processes mediate the timing-effect. We relate our empirical findings to game-theory and social-cognition research.

Notes:

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Increased realism in eyewitness confidence judgments: The effect of dyadic collaboration

This study investigated to what extent pair collaboration influenced the realism in eyewitness confidence. A condition where participants directly collaborated in pairs was compared with a condition where the pair members first performed the task individually. The condition where individual performance preceded pair collaboration showed better calibration compared with the condition where no individual work took place. Furthermore, within the condition where individual work preceded pair collaboration, better calibration was found in the pair phase compared with the individual phase. The eyewitnesses in this condition also made more realistic judgments of the total number of event memory questions answered correctly. Theoretical implications of the results are discussed.

Notes:

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The Theory of Indecision: Levi's account of preference reversals

Isaac Levi has argued that his theory of decision -- which was developed primarily as a normative theory -- can account for a number of anomalous experimental results, including the Allais paradox, the Ellsberg paradox, and preference reversals. Levi defends a generalization of Bayesian decision theory in which probabilities and utilities may be indeterminate, and where agents may resort to security considerations when expected utility calculations fail. By claiming that this theory accommodates the behavior patterns exhibited in a range of decision situations, Levi wants to rescue the notion that experimental subjects make rational choices on the basis of their beliefs and preferences. While Levi's treatment of the Allais and Ellsberg paradoxes has been discussed in the literature, his account of reversals has received little attention. In the present paper I attempt to assess Levi's account, and argue that it ultimately fails; available evidence is compatible with no more than about half of recorded reversals. This result does not, however, conclusively falsify the claim that Levi's theory is descriptively adequate. To conclude, I discuss other ways in which Levi's theory may be shown compatible with the experimental evidence.

Notes:

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Subjective Time Preference and Willingness to Pay for an Energy-Saving Durable Good

Different shapes of individual subjective time preference functions were compared using real measures of willingness to accept future outcomes in an experiment. The two-parameter hyperbolic discount function described the data better than three alternative discount functions. Also, the two-parameter hyperbolic function explained the common difference effect better than the other discount functions. Discount functions were also estimated from survey data of Dutch households who reported their willingness for postponing positive and negative amounts. Future positive amounts were discounted more than future negative amounts and smaller amounts were discounted more than larger amounts. Furthermore, younger people discounted more than older people did. Finally, discount functions were used in explaining consumers' willingness to pay for an energy-saving durable good. In this case, the two-parameter discount model could not be estimated and the one-parameter models did not significantly fit the data.

Notes:

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Self-Rationing Time: Procrastination, Deadlines, and Performance

Procrastination is all too familiar to many people. Yet, people also sometimes try to control their procrastination by setting deadlines for themselves. We empirically examine how sophisticated people are in dealing with their own procrastination behavior in effortful tasks, in which the cost of procrastination is likely performance deterioration. Do people self-impose meaningful (i.e., costly) deadlines to overcome procrastination in these tasks? Moreover, are self-imposed costly deadlines as effective in improving task performance as externally imposed costly deadlines? That is, is self-control as effective as external sanctioning? Two field studies and a (real) choice experiment show that people recognize their self-control problems because they self-impose deadlines on their behavior that are costly to miss. But these self-imposed deadlines are not as effective as externally imposed deadlines in improving task performance. That is, people are sophisticated (see ODonogue & Rabin 1999) enough to recognize their own procrastination tendencies, but if left to their own devices they solve this self-control problem only partially. We discuss the implications of our findings in light of the emerging empirical evidence on self-control (Wertenbroch 1998).

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Subjective Patterns of Randomness and Choice

Rubinstein, Tversky and Heller (1997) found that subjects playing a competitive game, where they had to hide treasure in a 1x4 array, attempted to be unpredictable, but failed, by preferring the same non-salient locations as seekers attempting to find the treasure. In co-ordination games, where subjects are asked to find each other, they succeed by picking salient locations. We extended their design to test whether these tendencies would result in hit rates above chance when subjects distribute three marks in a 5x5 grid. It does; asking subjects to avoid or find other subjects, distribute their marks randomly, in an aesthetically pleasing manner, or just place marks anywhere elicits very similar responses. In two-dimensional games, hidiers' responses are less predictable than seekers in competitive games and more predictable in co-ordination games. Our analysis of Rubinstein et al's competitive games replicates this finding, though we did not find it in other one-dimensional games. Experience can help; although seekers who earlier attempted hiding are not better than seekers with no hiding experience, hidiers who earlier sought get better at hiding. Experience of randomising helps hidiers and seekers more than experience of the opposite role. We consider explanations for, and implications of, these findings.

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Are professional test makers "rational"? A critical look from a cognitive and game-theoretic viewpoint.

Outside of psychology, experiments showing failures and biases of respondents in tasks involving judgment, decision making, or strategic reasoning, are often dismissed as being due to the artificiality of the experimental situation, and the absence of proper incentives for "rational" behavior. This paper offers a case study of "irrationality" in a real-life, high-stakes, situation, that of so-called educational measurement. The ETS (Educational Testing Service) develops and administers the SAT (Scholastic Aptitude Test), which is one of the most widely used tests for precollege screening. Several important features of this test -- most notably, its scoring rule and its answer-key policy -- are based on assumptions which are erroneous and naive about the test takers, and reflect erroneous and naive reasoning on the part of the test makers (many of whom have PhDs in statistics, economics, psychology, education, etc., so they should have known better...). Answer keys exhibit "local representativeness", while scoring rules simply reveal inconsistent reasoning.

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Magnitude versus All or None Violation in Image Theory's Compatibility Test

Seidl and Traub (1998) proposed a version of image theory's compatibility test that treats violations as magnitudes of incompatibility (continuous) rather than as "all-or-none" (discrete) (Beach, 1990). The present work empirically examined these two ways of treating violations. Subjects screened job options after having been told that they recently had become a parent and would, therefore, prefer as little job-related travel as possible. The amount of required travel was varied across groups (number of weeks). Results showed that low levels of required travel were generally not regarded as violations, but high levels were, and all higher levels counted roughly the same in the decision to reject the job. That is, the relationship between rejection and weeks of travel was a step function rather than a continuous function, supporting the all-or-none hypothesis. Additional experiments suggest that for moderate degrees of violation, subjects treat violations as all-or-none rather than continuous, but that an extreme violation (36 weeks of travel) is treated as a 'killer,' leading to almost unanimous rejection of that alternative. Moreover, whether a discrepancy will or will not be regarded as a violation appears to depend upon how many other violations an alternative exhibits.

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Probability Weighting in Choice under Risk: An Empirical Test

This paper reports a violation of rank-dependent utility with inverse S-shaped probability weighting for binary gambles. The paper starts with a violation of expected utility theory: one-stage gambles elicit systematically different utilities than theoretically equivalent two-stage gambles. This systematic disparity does not disappear, but becomes more pronounced after correction for inverse S-shaped probability weighting. The data are also inconsistent with configural weight theory and Machina's fanning out hypothesis. Possible explanations for the data are loss aversion and anchoring and insufficient adjustment.

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Does the Use of Decision Heuristics Influence Impulse Buying?

In the present study a survey was performed in order to investigate if the use of heuristics in decision-making has an influence on the impulse buying tendency. Another aim of the study was to see if there were any age differences with regard to the use of heuristics and the impulse buying tendency. The study was conducted with students from Göteborg University and Karlstad University in Sweden (n = 69), with different educational backgrounds. Participants filled out a booklet of questions divided in two parts. One part measured impulse buying tendencies, and the second part measured the use of heuristics in decision-making. One hypothesis was that impulse buyers would use heuristics to a higher degree than planned buyers. It was also hypothesized that young participants would be more impulsive buyers because they use heuristics more than older participants. The results gave no support to the hypothesis that impulse buyers would use heuristics to a higher degree than planned buyers. Support for the second hypothesis was received as 20-24 year old high achievers on the heuristics test were found to be significantly more impulsive buyers than low achievers in the same age group.

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Causal Structure and Time Perspective as Determinants of Environmental Risk Evaluation

Two determinants of environmental risk evaluation are investigated: the causal structure of the risk and the time perspective of potential harmful consequences. Three types of causal structure are distinguished: (a) anthropogenic risks that endanger only nature, (b) naturally caused risks with potential harmful consequences for humans, and (c) anthropogenic risks that may harm humans. Time perspective refers to when potential consequences are expected to occur. It is assumed that a risk's perceived causal structure determines the intensity of ethical evaluation whereas time perspective of consequences affects perceived risk. Both evaluative aspects are assumed to elicit specific emotions and behavioral preferences. Two hundred and seventy participants took part in an experiment where scenario information about environmental risks was provided. The scenarios differed with respect to causal structure and time perspective. For each scenario, subjects evaluated the event's morality, perceived risk, the intensity of specific emotions, and their preference for prospective actions. Factor analyses yielded three types of emotion (ethical, loss-based, and helplessness) and four types of behavioral tendencies (help, aggression, escape, and indirect / political action). Causal structure turned out to be more influential than time perspective. The implications for the decision process and the mediating role of emotions will be discussed.

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Current mood and future economic expectations: Implications for the use of consumer attitude surveys in economic forecasting.

The index of consumer sentiment (ICS) is widely accepted as a leading indicator of discretionary spending. However, the ICS displays strong seasonality suggesting that variables like the weather and current events influence the ICS. Our hypothesis is that both current mood and economic expectations affect optimism as expressed in the ICS, however, since future purchases are only affected by economic expectations, the predictive utility of the ICS is not as high as it could be.

We test the first part of our hypothesis by performing regression analyses on ICS data collected over the last 22 years from the US and the Netherlands. Based on Maslow's Hierarchy of Needs we composed a questionnaire to measure perception of news events. From the responses to this questionnaire of samples of US and Netherlands citizens we then constructed an index of the impact of non-economic events on mood. This news index and weather variables were then used as predictors of the ICS. The second part of our hypothesis is tested on a holdout sample by examining forecasting accuracy of the ICS for discretionary spending with and without the news index and weather partialled out. The theoretical and practical implications of our findings are discussed.

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The Lure of Choice

This paper investigates illusory choice (options that should never be chosen) and its effects on sequential decision making where early decisions influence what future opportunities are available. Six studies report two stage sequences with lottery games and decisions embedded in context-rich scenarios. Our key research question is whether the lure of choice is responsible for changes in subjective preferences that increase the market share of an option associated with illusory choice. Results suggest that the lure of choice is robust. Participants were drawn to behavioural paths that appeared to offer greater choice and were more likely to choose an option paired with a lure than when no choice was offered. The effect cannot be attributed to contrast effects, where the lure makes the target option look better, nor are people inappropriately summing all the possible outcomes of a choice set. We also show that the effect is not a variant of the asymmetrically dominated effect. The lure of choice has important behavioural implications and is discussed with relation to the desire to keep options open by delaying commitment to a single decision. Humans, like other animals, appear to favour choice over no choice, even when the choice is illusory.

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A Heuristic Account of the Probability Weighting Function

This presentation sheds new light on the shape of cumulative prospect theory's weighting function (see Tversky & Kahneman, 1992). A closer inspection of the literature reveals that much research within decision theory is based on one format. In this standard format both probabilities and monetary outcomes are expressed by numbers. However, people are usually much more trained to operate with numbers representing money than with numbers representing probabilities (e.g. $p = .2$). Accordingly, the standard format is assumed to make monetary outcomes relatively more salient than probabilities. Experiment 1 shows that outcome salience, as fostered by the standard format, can explain the usual shape of the probability weighting function. Experiment 2, in contrast, reveals the opposite pattern. Probability salience can dampen and even reverse the shape of the weighting function. Results (1) highlight the importance of the format used and (2) suggest simple cognitive heuristics to account for the weighting function.

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Judgment, Choice and the Anchoring Bias: Two Examples of Simultaneous Assimilation and Contrast

The anchoring bias is robust in altering judgments but few demonstrations exist of irrelevant anchors biasing choice. In the first study, 167 Iowa physicians reviewed the case of a hypothetical patient with symptoms suggestive of pulmonary embolism, a medical problem that can cause sudden death if not quickly and properly treated. First, physicians stated whether the likelihood of embolism was greater or less than a randomly assigned number. Next, they stated the chance of pulmonary embolism and the treatment options they would pursue. As predicted, physicians in the low anchor group estimated the likelihood of embolism lower than the high anchor group (24% vs. 53%, $p < .0001$). Unexpectedly, low anchors increased treatments such as hospitalization and prescribing anticoagulants (p 's $< .05$).

The second study used a similar design as the first and replicated its results with a sample of 112 HIV-positive patients. After reading a vignette that suggested that they had exposed a sexual partner to HIV, those receiving the low anchor simultaneously gave lower estimates of the likelihood of HIV infection, and suggested more aggressive measures (p 's $< .05$). The apparently simultaneous assimilation and contrast effects are interpreted using the framework of the Contrast and Assimilation Prediction Rule (Brewer & Chapman, 1999).

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Aggregation of probability judgments from asymmetric source

We investigate the case of a Decision-Maker (DM) who obtains probabilistic forecasts regarding the occurrence of a target event from J distinct, asymmetric advisors. Asymmetry is induced by manipulating (1) amount of information (number of diagnostic cues) available to each advisor, and (2) quality (accuracy) of advisors' previous forecasts. Empirical results from two experiments indicate that the DM's final estimate can be described as a weighted average of advisor forecasts, where the weights are equally sensitive to both sources of asymmetry. This work extends the model derived by Budescu and Rantilla (2000) for the DMs confidence in the aggregate to accommodate advisor asymmetry. As in the symmetric case, the DM's confidence in the weighted average of the forecasts is a function of the number of judges, the total number of cues, the (inferred) inter-judge correlation, and the level of inter-judge overlap in information. The extended model predicts that aggregate confidence increases as a function of asymmetry among judges. Empirical results support the main (ordinal) predictions of the model, including the predicted effect of inter-judge asymmetry.

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Temporal discounting in Romania and the USA: A cross-cultural study

Temporal discounting is the extent to which future outcomes are valued relative to immediate ones. Subjective temporal discounting might vary cross-culturally because of cultural values or political experience. 100 Romanians and 100 Americans (age ranging from teens to 80s) read four types of temporal discounting scenarios resulting from a 2 X 2 design. Scenarios described personal (e.g., restaurant meal) or public policy (e.g., pollution clean-up) situations with gain (e.g., win a lottery) or loss (e.g., pay a debt) outcomes. In each scenario, respondents made a series of choices between a smaller, sooner outcome and a larger, later outcome, revealing an indifference point. In the personal scenarios, Romanians and Americans showed equivalent discounting, while in the public policy scenarios, Romanians discounted future outcomes more steeply than Americans. Both personal and public scenarios showed a sign effect: Gain outcomes were discounted more steeply than loss outcomes. Romanian participants showed a striking sign effect that was more extreme than that for the Americans, indicating that, whereas Americans wish both to expedite gains and delay losses, Romanians have an extreme tendency to expedite gains but also a desire to get losses over with early.

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Influences on the acceptance of decision aids in organisations

This study extends the currently limited research into what might influence whether a decision maker will use or accept a particular form of decision aid. Most of the current work has concentrated on decision support for personal choice or has taken a basically technological approach to the issue. This research concentrated on personal and organisational issues and the nature of the problem to see if it was possible to devise a model which might capture the main influences. The basic model, which was then empirically tested, made considerable use of Image Theory.

The organisational focus, the need to compare the views of multiple actors as well as the exploratory nature of the study all led to an adoption of a qualitative style of study more common in social cognition than cognitive studies of decision making. In particular the methodology relied significantly on an adaptation of Personal Construct Theory.

The main findings were that intra-organisational agreement with the value of the aid was an important influence on acceptance but that this was tempered by the nature of the problem and the extent to which the organisation was constrained by external influences.

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Do incentives make anchoring effects disappear?

The reported experiments explored the role of incentives in the mediation of anchoring effects across a range of estimation tasks. By manipulating the incentives provided for accurate judgement it was possible to determine the extent to which anchoring effects would disappear when a participant is economically motivated. The results showed that economic motivation was insufficient to remove anchoring effects and that other factors, such as the perceived informativeness of the anchor value provided, were also important mediators. Our findings will be discussed in the context of the likely causes of the discrepancies between single referendum dichotomous choice and open-ended willingness to pay questions used in contingent valuation surveys for public goods.

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Interpersonal similarity in uses of linguistic probabilities: One person's "dead ass" is another's "good chance"

It is well known that individuals vary widely in their use and numerical interpretations of linguistic probability phrases. Not known is whether the entries in any two persons' distinct lexicons map onto each other. An answer to that question is of both theoretical and practical interest, but requires an empirical measure of inter-personal similarity of phrases. We define an empirical measure of similarity, s_{ij} , between phrase i and phrase j , or between use of the same phrase in contexts i and j , as $s_{ij}=1-d_{ij}$, where d_{ij} is the maximum difference between the cumulative distributions of the (subjective or objective) probabilities of events to which phrases i and j are assigned, or to which the phrase is assigned in context i and j . The measure applies whether the same or different people use the 2 phrases. Participants selected and rank ordered their own probability phrases, assigned the phrases to 300 events and encoded their membership functions under the condition of aleatory uncertainty, and did the same for events under epistemic uncertainty. Separately in the latter case, they also assigned numerical probabilities to those events. Within-individual phrase similarities were not significantly different from 1 across types of uncertainty. Membership functions displayed very small, but significant differences. Moreover, the similarity measure proved very useful in equating phrases between individuals.

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The Rationality of Further Deliberation

This paper offers a new account of rational agency. It is motivated by the failure of the currently dominant Bayesian decision theory to explain why sometimes further deliberation rather than resolute choice is rationally mandated. Central to the new theory is the notion of value of further deliberation. A function is defined that assigns to any act considered in a decision-making situation a number corresponding to the value of deliberating further about what else might be open to the agent other than choosing that act right away. The theory formulated by means of this function is developed in some detail. It will be seen to be in agreement with standard decision theory on points on which the latter is intuitively right, but the new theory will also be seen to give us the correct verdict in cases in which standard decision theory conspicuously fails to do so.

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The truth hides in the eye of the beholder: Accuracy measures for criterion lacking subjective probability judgements

Accuracy measures of subjective probabilities calculate the correspondence between probability judgements and the proportion of correct predictions. However, many real-life situations lack the necessary criterion information because it is either covert or impossible to detect. Since traditional calibration measures are not applicable in such situations, our alternative approach replaces the missing information with subjective judgements elicited from pre-defined reference groups. We modify the traditional Calibration measure, and replace it with Normative Calibration. Experiment 1 compares the traditional measure with the proposed one. Experiment 2 utilizes the new approach to assess integrity of job applicants.

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Expert's advice and client's information processing in the context of medical decision making

Most decisions in medical contexts are characterized by an imbalance of expertise between client and physician. Often, clients neither understand the complex medical domain nor do they know procedures for making rational choices. On the other side, the expert knows the domain well, he knows procedures for making rational choices, and he also knows common aims and values of his clients. In these situations, clients often ask for an advice from the expert. In two studies we tested whether an advice influences information seeking and the storage of information. Indeed, getting an advice changes information seeking: It becomes selective and more option-oriented confirming the expert's recommendation. Without an advice search for information is more attribute-oriented and less selective. Furthermore, when an advice was given people recall more information about the recommended option than about the non-recommended alternatives. However, study II shows that these differences in recall are not due to a selective storage of information but to selective encoding. Obviously, getting an advice mostly influences early stages of the decision process, namely searching and encoding information. But it does not necessarily cause a selective storage of information. Thus, getting an advice means sometimes knowing the alternatives a bit less well - not because of a selective storage but because of a selective seeking of information.

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Partition dependence in judgment under uncertainty

I argue that judgment under ignorance typically entails an intuitive application of the "principle of insufficient reason" in which people exhibit maximum entropy of belief across elementary events into which the sample space is subjectively partitioned. For instance, if five unfamiliar horses are entered in a race, a person will typically assign equal belief in the proposition that each horse will win, assigning an "ignorance prior" probability of $1/5$ to each horse. This scheme yields coherent probabilities if the sample space partition is held constant. However, subjective partitions are an inherently ad hoc construction that may shift with the attention of the decision maker. For instance, a person may judge the probability that the Jakarta stock index (JSX) closes above 1,000 to be .5 (assigning equal belief to the events "below 1,000" and "above 1,000") but may likewise judge the probability that the JSX closes above 5,000 or even 50,000 to be .5. I hypothesize that judgment under uncertainty typically reflects a compromise between the "ignorance prior" and the balance of evidence recruited via heuristics and other methods. In my presentation I will (a) document the phenomenon of "partition dependence" in a variety of contexts; (b) document factors that influence the subjective partition adopted by decision makers; and (c) document factors that affect the relative weighting of the balance of support versus the ignorance prior.

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Arguments about beliefs and actions: Decision making in the real world

Studies of human reasoning and decision making suggest that qualitative reasoning plays an important role in the management of uncertainty. Experiments with computer-based decision aids show that qualitative argumentation techniques can yield improvements in decision making that are as great as those offered by quantitative methods. The appeal of argumentation is that it directly exploits the kind of knowledge and common sense that people bring to problem solving and decision making. In this paper I set out a formal theory of argumentation, its relationship with orthodox methods reasoning under uncertainty and outline a number of successful applications.

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The Euro Illusion: Not an Illusion but a Fact

In a telephone survey of Swedish households, a set of questions was asked concerning the average prices of selected products and services in countries that are members of the monetary union. For respondents in an experimental group the prices were expressed in Euro, for respondents in a control group the prices were expressed in Swedish Crowns. In both groups respondents rated on five-point scales how expensive compared to Sweden (which is not a member of the monetary union) they experienced the prices as well as how large they perceived the last 10 years price increases due to the average inflation. Despite that respondents were told the exchange rate, the prices were as expected rated as more expensive when expressed in Swedish Crowns (0.12 Euro) than when expressed in Euro. Also as expected, the price increases were rated to be larger in Swedish Crowns than in Euro. Replicating the money illusion, higher prices were rated to have increased more than lower prices although the percentage increase (the average inflation) was the same. In a follow-up study undergraduates were found to reverse their preference for more attractive and expensive products/services when prices were expressed in smaller than in larger money units.

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The Reflection Effect Revisited: Understanding Risk attitudes with a Stochastic Choice Model

Kahneman & Tversky's (1979) reflection effect was investigated using a stochastic model of choice proposed by Gonzalez-Vallejo (2000). The PD model assumes that subjects make trade-offs using a normalized attribute difference variable (d). d is subjectively compared to a person's decision threshold (δ). δ measures how sensitive a person is to attribute differences. The model has been successfully applied to over 9 data sets of choice propensities (including published data). PD can account for the reflection effect as a function of d and as a function of δ . PD can also account for the 'reverse' effect (risk-seeking in gains and risk-aversion in losses-Schneider and Lopes, 1986), which prospect theory is unable to handle. Subjects made choices in gains and loss contexts. d predicted the choice propensities at the individual and aggregate levels (90% of variance accounted for). Using individuals' estimated deltas, we found a mean change in δ from gains to losses in the direction predicted by prospect-theory. At the individual level, however, only 9% of subjects consistently reflected in the standard way. PD predicted 84% of the subjects' reflection patterns with a maximum of one error. Implications for understanding risk attitudes are discussed.

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The interdependence of probability and utility in decision making

Expected-utility models treat utility and probability as independent concepts. Some decision theories deviate from this assumption, but they do not explain under which conditions utility and probability should influence each other. We present a model, which predicts an effect of utility on frequency and probability judgments. This effect is assumed to be moderated by the presentation format of the probability information: No interdependence is expected when utility and probability information is presented in an aggregated format (such as in the lottery paradigm). However, when judgments concerning the probability of outcomes are based on the sequential observation of events in the environment, they are influenced by the utility of outcomes. In two experiments we show under which conditions frequency and probability judgments are influenced by the size of outcomes and how this interdependence affects decisions between lotteries. When participants are presented with information about outcomes and probabilities of two lotteries in an aggregated format (lottery paradigm), they usually choose the less risky alternative. However, when they have to infer the probability information from sequential draws of the lotteries, they prefer the riskier alternative. This difference is due to the overestimation of the probability of high monetary outcomes compared to low outcomes.

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Distinction of cue effects in additive and configural rules

After exposure to numerous examples people behave as if they have learned complex implicit rules. In this experiment, we examined people's ability to generalise about the effect of one variable in a rule, whilst another is held constant. Participants were given feedback as they forecast sales figures. After an initial promotion-less period, sales for different times and different promotion sizes were presented. Participants either continued to see previous examples, or each was displayed one at a time. Either additive or configural rules combined the effects of time and promotion size on sales figures. We expected that participants exposed to configural rules would be misled by the display of the effect of time during no promotions when estimating the effect of time during a fixed promotion. In fact, judgements of the effect of time with a fixed promotion were good in all conditions, and the interaction between time and promotion was well captured in the configural conditions, as measured by the mean and range of sales figures. We discuss the results in relation to strategies of extrapolation from exemplars and rule learning.

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More is not always better: The benefits of cognitive limits

The premise that information-processing capacity is limited is usually accompanied by another ubiquitous assumption, namely, that these limitations pose a liability. They constrain our cognitive potential, this assumption holds, barring us from performing feats such as quickly computing the square roots of large numbers in our heads. Even more sinister, though, these cognitive limits are also suspected of being the culprit behind lapses of reasoning. The goal of this presentation is to challenge the obligatory link between cognitive limitations and human irrationality. While not doubting that limits can exact a price, their exclusively negative status is questioned. Specifically, the thesis is put forth that limitations in processing capacity can actually enable rather than disable important adaptive functions. Secondly, it is argued that decision-making strategies that take limitations into account need not be less accurate than strategies with little regard for those limitations. Finally, the assumption is challenged that simple decision-making strategies have evolved in response to the cognitive limitations of the human mind. The reverse causality is suggested and the thesis is submitted that capacity constraints may in fact be a by-product of the evolution of simple strategies.

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Counterfactual and Causal Judgments of Intentional and Physical Causes in Chains

In this study we investigate selection of causes from chains of events that we call unfolding causal chains, which are characterised by the seemingly predictable and inevitable production of an end-result through a chain of intervening events, given the occurrence of a triggering event. We find, as predicted by legal analyses of the attribution process, that people are more likely to select distal causes as explanations of accidents if they involve human actions (e.g. an act of sabotage) rather than natural events (e.g. heavy storms). We then test four statistical models to explain these causal preferences: two based on covariation analysis, and two others based on sufficiency analysis. Our results indicate that causal preferences are more strongly correlated with perceived sufficiency than perceived covariation, and that the two kinds of sufficiency we studied (non-conditionalised and conditionalised sufficiency) contributed independent variance to the prediction of causal preferences. However, further analyses suggested that our measures of perceived sufficiency did not completely explain the tendency to prefer intentional explanations, suggesting that intentions are not preferred as explanations simply because they are more "sufficient in the circumstances".

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Information Needs Representation: The Power of Natural Frequencies

Several studies have reported that physicians have great difficulties in estimating the positive predictive value of a diagnostic test, that is, the probability of a disease being present given a positive test. We argue that the problem lies not only in physicians' lack of statistical training, but in the way numerical information is presented in such studies and in the medical literature, including textbooks. External representation is part of the reasoning process. In this paper, I review a series of studies with lay people, advanced medical students, physicians, and AIDS counsellors to see whether experts would profit from natural frequency representations as much as lay people do. When information was presented in natural frequencies rather than probabilities, Bayesian reasoning improved in experts about as much as it did in students. In addition, I review some studies that evaluated how this approach can be used for teaching, and address some recent misunderstandings of what natural frequencies are, and why they facilitate reasoning.

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Educating intuition: A model, principles, and some proposals

Intuition has not been treated consistently within the J/DM literature. The work reported here is based on an extensive review of the psychological literature and asks three critical questions: (1) What is intuition, and what role does it play in human information processing? (2) When is intuition functional and dysfunctional? (3) Can people educate their intuitions, and if so, how? It is argued that people have two systems for processing information, one tacit, and the other deliberate. The former refers to all processes that occur tacitly or automatically (i.e., without use of conscious attention). Outcomes of the latter are effortful; they require deliberation and attention. Intuitions are generated by the tacit system. The "quality" of intuition depends critically on the conditions under which it has been acquired - as a product of tacit learning and the automation of deliberately learned responses. The nature of the learning environment is the key factor in determining the "quality" of intuition. Is the structure of the learning environment kind (enabling veridical learning) or wicked (leading to invalid learning)? Evidence indicates that people are capable of adapting their ways of reasoning provided these are compatible with schemata they already possess (see, e.g., Nisbett et al.). The program for educating intuition that emerges from the present work is based on seven principles: (1) Select your environments; (2) Seek feedback; (3) Impose "circuit breakers;" (4) Acknowledge emotions; (5) Explore connections; (6) Accept conflict in choice; (7) Make scientific method "intuitive." In turn, these principles lead to several concrete proposals.

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Comparative optimism: A matter of neglecting other people's personal control?

According to the cognitive egocentrism explanation of comparative optimism, the latter phenomenon occurs because people onesidedly consider their own desirable instrumental behaviors when estimating their relative chances of experiencing positive and negative events as compared to those of others. However, attempts to influence the occurrence of comparative optimism based on this hypothesis have generally failed. Therefore, the alternative hypothesis was formulated that people evaluate their personal control over controllable events relatively adequately. However, they fail to consider the mere fact that other people have personal control over the risks occurring in their lives as well as they do. To test this control neglect hypothesis, a series of experiments was designed in which participants gave likelihood estimates for themselves and the average peer. Attention to the average other's personal control over the positive and negative events under study was manipulated by manipulating the occurrence of a control rating task before the likelihood estimation task. Eliciting control ratings for the average other reduced comparative optimism while eliciting control ratings for oneself did not affect it, thus supporting the control neglect hypothesis. The implications for the nature and the explanation of the phenomenon of comparative optimism will be discussed.

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The effect of different cues for controllability in risky decision tasks

In several experiments decision makers were found to search actively for possibilities to control the risk connected with an otherwise attractive alternative. The present study investigates the effects of three different types of cues for controllability in quasi-naturalistic decisions. Information cues informed subjects that they could receive further information about the relevant risky aspects of an alternative. Information-plus-suggestion cues let subjects know that they could get further information, and, in addition, were allowed to make active suggestions for reducing the risk. Control cues informed the subject about the existence of concrete control actions to reduce the risk. We hypothesize that all three types of cues induce a feeling of enhanced controllability for those alternatives that allow subjects to perform certain control actions. This should result in an increased rate of choice also of alternatives with information cues. As additional dependent variables we measured estimated controllability and probability. Furthermore, we measured the subject's generalized control beliefs. 48 subjects were run. The results confirmed the main hypotheses: There was an effect of the three types of information cues on subjects' decisions. In addition, information-plus-suggestion cues and control cues resulted in a higher degree of estimated controllability.

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Legal decision making: framing and order of evidence as a function of response mode

In the present study we elaborated on Pennington and Hastie's (1992) work, comparing the anchoring-and-adjustment-model and a story-model for participants' assessment of guilt in criminal cases. They concluded that anchoring-and-adjustment models could best describe judgments when participants were required to process evidence step-by-step (SbS), whereas a story model could best describe the judgments when participants were required to provide global judgments at the end of a sequence (EoS). In addition to varying the response mode (EoS and SbS), we also investigated the effects of framing in the present study, that is, information concerning the personality of the suspect. The frame was stated in a positive or negative way and could be presented either before or after the witness statements. The results indicated an overall order effect for both response modes. Furthermore, participants corrected for their assessment of guilt when a positive frame was presented after they had read the statements of the witnesses, but only in the SbS response mode. In all, the results only partially confirm the suggested model by Pennington and Hastie. An alternative model explaining the present data will be discussed.

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"It Might Happen or Not": Patients' Perceptions of Prognostic Risk in Multiple Sclerosis

Little is known of how patients convert uncertain prognostic information into expectations about future health. We have studied expectations regarding wheelchair-dependency in patients with multiple sclerosis (MS; n=76), a chronic neurological disease with a variable and unpredictable course. Patients were asked their perceived 10-year risks of wheelchair-dependency. Responses were given on VASs, anchored at definitely not (0) and definitely (100), and explained in subsequent interviews. Neurologists rated functional limitations. 88% of patients were ambulatory, mean age was 37.6 years and mean time since diagnosis 8.2 months. Average perception of risk was 40.6% (SD 25.9). 28 patients (37%) perceived the risk to be 50%. Perceived risks were significantly correlated with functional limitations and this correlation increased when excluding 50%-responders. The latter had functional limitations comparable to patients with lower perceived risks. Interview data confirmed that patients often explained their VAS-scores by referring to their functional limitations. Furthermore, 50%-responders significantly more often stressed their uncertainty regarding the outcome and reasoned: "it might happen or not". Our data show that one-third of the patients overestimate their risks by giving a 50%-response, most likely reflecting their uncertainty about the future.

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False consensus in the context of multiple reference groups and the role of perceived social proximity.

The objective was to examine how the false consensus effect (FCE) is affected by group membership status, the nature of the reference group being judged and the perceived social proximity to that reference group. In-groups were hypothesised to attract higher FCEs than out-groups and that perceived social proximity with a group underlied this relationship. The study involved three groups of participants: psychology students, economics lecturers and technical personnel. The participants of each group indicated their own position on both ability and opinion items and then estimated the percentage of people who agreed/disagreed with them for each reference group. Participants' perceived social proximity with each reference group was also measured. Each group perceived the other two as being equivalent relative out-groups. The hypothesised relationship of higher FCEs with in-groups only applied to the student group. However, further analyses provided evidence that the effect of group membership status on FCE is in some cases mediated by the perceived social proximity with the reference group. Finally higher FCEs were associated with opinions than with abilities although group membership status was found to moderate this relationship. Thus the processes underlying the FCE should take into account group membership status and reference group.

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Escalation with transparent information

A common example of irrational decision making is the tendency to escalate commitment in response to previous investments of money, effort, or time. Two experiments were conducted in which undergraduates responded to fictitious investment problems. In Experiment 1 escalation was demonstrated for conditions with transparent information when it is not assumed to occur, that is, when investment alternatives are salient and estimates of future returns are explicit. However, neither escalation nor marginal decision making or the rate-of-return hypothesis could explain the observed effects of sunk costs on decisions. In Experiment 2 it was found that anticipated emotions were more important for choices when these were made in line with sunk costs than when made in line with net returns. The results suggest that in investment decisions with transparent information, the effect of sunk costs may primarily be an effect on how people will feel about alternatives (anticipated emotions) and not on the monetary utility of alternatives.

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Acceptability of Randomization Procedures as Tie-breakers of Indeterminacy

Rational choice theory prescribes the use of a randomization device (e.g., a coin) whenever a decision-maker is indifferent or her preferences are indeterminate. The use of lotteries under such conditions reflects an intentional choice to make a choice by a non-intentional mechanism. People, however, are often unwilling to use a random device for making decisions, especially when the consequences are highly important. When deciding whether to save the life of one person or the other, most people are reluctant to use a coin even when there are no rational considerations to favor one person over the other. Several experiments will be described that were designed to answer two questions: 1. When is the use of a coin suitable for a tiebreak, and under what conditions is it perceived as unacceptable. 2. To what extent is acceptability determined by the nature of the random device employed. Implications for daily decisions (e.g., medical decisions) will be briefly discussed.

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The Influence of Feedback Frequency on Risk Taking: How general is the Phenomenon?

Gneezy and Potters (1997) present experimental evidence for the impact of feedback frequency on individual risk taking behavior in repeated investment decisions. They find an increased willingness to invest into a risky asset if less frequent feedback about the outcome of previous investments is provided. The observed decision pattern is explained by "myopic loss aversion" (Benartzi and Thaler, 1995), a combination of mental accounting and loss aversion. In this paper, we argue that the findings of Gneezy and Potters on the relationship between feedback frequency and risk taking are not as general as they might seem. We provide theoretical arguments and experimental evidence to demonstrate that the reported phenomenon is not robust to changes in the risk profiles of the given investment options.

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The impact of domain knowledge and common vs. unique features on multiattribute choice

Previous research has shown that alignable (common) features are more influential than nonalignable (unique) features for decision makers evaluating multiattribute choice alternatives. The decision maker's ability to incorporate nonalignable features in an evaluation of the alternatives is hypothesized to depend on the sophistication of the decision maker's mental representation of the choice alternatives. Thus, low knowledge individuals should rely more on alignable features than high knowledge individuals. Results demonstrate that alignable information dominates choice processing for all individuals, but more strongly for the low knowledge group. Alignability influences decision making at many levels including information selection, information weighting, information evaluation, strategy selection and final choice outcomes.

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Acquisition of proficiency in complex decision making: A knowledge-driven decision making approach.

Knowledge-driven decision making assumes that real world decisions are driven by action arguments of the general form "Do A because R subject to C in order to achieve G," where A, R, C, and G stand for Action, Reasons, Conditions and Goals that express context related concrete substantive knowledge. The purpose of this study was to identify the substantive action arguments that drive decision making and to track how these arguments change as decision makers improve their proficiency in a complex dynamic decision making task. Seven undergraduate students participated in the study. Each student played four rounds in Winmoro, a computer-driven simulation specifically designed for the study of complex dynamic decision making (Victor & Brehmer, n.d.). Analysis of subjects' behavior (which was automatically logged by the simulator) revealed that (a) as subjects gained experience they tend to focus their attention and actions on specific substantive domains; (b) different decision strategies, expressible as action arguments, are systematically associated with high and low performance levels and, (c) high and low performing subjects differ in their ability to acquire effective substantive strategies. The implications of the study's findings and methodology for understanding and improving decisions are discussed.

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Framing Life's Experiences: Individual Differences in Judging Pleasant and Unpleasant Events

Subjects were asked at one time to recall a recent pleasurable activity and at another time to recall a recent unpleasant activity. For each activity they were told to suppose that they were at the exact midpoint of the activity. They were asked to express how they felt at that time, using bipolar scales such as half-way over/half-way to go, the best (worst) part is past/the best (worst) part is yet to come, looking forward/looking backward, satisfied/not satisfied, time is going fast/time is going slowly. Subjects (N=103) were more apt to see the pleasurable activity as compared to the unpleasant activity as being half-way over rather than half-way to go, as looking forward rather than looking backward, and as time going fast rather than slow. The "Big 5" Personality Inventory was used to assess individual differences. For pleasurable activities, subjects scoring high on Extroversion, high on Agreeableness, or low on Neuroticism were the most satisfied. For unpleasant activities, subjects scoring high on Neuroticism were more apt than others to see the worst part as yet to come, to be looking backward, and to see time as going slowly.

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Detecting Regime Shifts

Virtually all managers operate in a dynamic environment, with markets, competitors, and technology changing regularly. The ability to detect and respond to these changes is critical to a manager's success. We consider how responsive individuals are to these kinds of changes. Specifically, we investigate when individuals are more likely to over-react to change and when they are more likely to under-react to it. We develop a system neglect hypothesis for behavior in dynamic environments. The hypothesis suggests that responsiveness to change is insufficiently sensitive to the environmental system governing the change. Two studies, a probability estimation task and a prediction task, reveal a behavioral pattern consistent with our hypothesis: under-reaction is most common in unstable environments with precise signals and over-reaction is most common in stable environments with noisy signals. We present a statistical comparison of the Bayesian model with a parametric form of the system neglect model, and find strong support for the system neglect hypothesis.

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An experimental investigation of cognitive inertia showing why decision-makers fail to update their mental representation of evolving strategic decision problems

Cognitive inertia, the tendency for changes in actors' mental models to lag significantly behind important changes in the environment, has been used to explain major failures in strategic decision making. We report an experimental study of cognitive inertia in a complex strategic decision problem presented over three phases. Phase 1 involved a choice between two alternatives; phase 2 provided negative feedback indicating the chosen course of action was failing; phase 3 involved a further allocation of funds between the alternatives. Participants' mental representations were captured by hand drawn cognitive maps. Different groups of participants mapped at different points, allowing us to evaluate participants' mental representations across the different experimental phases. Our findings showed a high level of variability between the content of participants' maps but consistency in terms of their structure, with significantly more causal reasoning around the chosen than the rejected alternative. In addition, participants demonstrating inertia produced simpler maps with a different underlying structure. These differences were evident at the first phase suggesting that inertia depends upon how people initially conceptualise a decision problem rather than how they interpret negative feedback. The implications of these findings are considered along with a brief discussion of future work.

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Reaction to Uncertainty and Market Mechanisms: Experimental Evidence

Much of the evidence of violations of Subjective Expected Utility theory (SEU) comes from experiments on individual choice and judgement.

In this study, we address the issue whether, in market experiments, there is a tendency for anomalous behaviour to disappear or to be reduced as a consequence of market experience and feedback. We empirically test the validity of this assumption by running an auction market for the sale of both risky and uncertain prospects. We compare bidding behaviour and prices in market-like settings with valuations obtained from individual pricing tasks with and without financial incentive .

We conclude that, with the repetition of the market experience, there is a tendency for subjective expected utility to perform better. However, economists' general assumption that, in laboratory experiments, poor performance of SEU is due to the lack of financial incentives or to the lack of market-like settings is by no means supported by our data.

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Behavioral entrapment in dynamic task environments

People have a tendency to stick to an initial course of action, even in situations where it is rational to switch to an alternative course of action. This bias, often referred to as behavioral entrapment, is mostly explained in terms of investments, whether it is money, time or mental effort. However, even though all tasks required an adaptive reaction to an environmental change, this aspect has never been taken into account. In my studies I have therefore used a dynamic simulation of a four-layered ship in which subjects had to solve fires. The main goal of these experiments was to investigate several alternative explanations for people's reluctance to switch. The results of three experiments will be presented. The first two experiments demonstrated that attentional theories failed in providing an explanation: people continued with a course of action even when switch-costs were nil. The third experiment was conducted to investigate whether behavioral entrapment is determined by the degree of investment – as supported by Arkes and Blumer (1985) or by the degree of task completion - as recently suggested by Boehme and Paese (2000). A model will be presented discussing the contribution of each explaining factor.

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Image Theory's Violation Threshold

Image Theory posits two thresholds as part of pre-choice screening of decision alternatives. The first is the violation threshold, the point at which an individual feature of a decision option is so discrepant from the decision maker's standard for that feature that it must be regarded as a 'violation' of that standard. The second is the rejection threshold, the point at which the accumulated number of violations associated with a decision alternative that the decision maker rejects it as an option. Research has examined the rejection threshold extensively, but there has been little research on the violation threshold. Building upon an initial study by Benson, Mertens, and Beach (2000), this experiment further defines the violation threshold and the events that influence it.

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Deciding to give advice: The correlates and consequences of unsolicited advice

Decisions are frequently made by Judge Advisor Systems in which the Judge has available input from an Advisor prior to making final decisions. Past research and theory on JASs has emphasized the behavior of the Judge in soliciting and using advice. However, in many settings advice is unsolicited - the advising act is initiated by the Advisor. The present research is designed to examine the factors associated with the Advisor's decision to give advice and the impact of that advice on the Judge. Advisors monitored Judges via collaborative technology as the Judges made decisions and gave confidence assessments for each of several decision problems. The Advisor was able to intervene in the process for any of the problems by opening a videoconferencing link and speaking with the Judge. The Judge could not open the link; the decision to provide advice rested solely with the Advisor. After the link was closed, the Judge had the option of revising his or her initial decision and confidence assessment. We discuss the frequency and nature of Advisor interventions under varying conditions and describe the effects of unsolicited advice on Judges' decisions and confidence assessments.

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The influence of temporal distance of negative consequences on the evaluation of environmental risks

Environmental consequences of present behavior are often delayed, which may induce people to trivialize the associated risks. Research on intertemporal preference and choice has shown that people tend to devalue or discount delayed outcomes. Prior studies mainly addressed decisions concerning money, consumption goods or health. They revealed that individuals apply the same discount rate to different decisions within a specific domain (e.g., health, money), whereas discount rates across different domains are essentially unrelated. This 'domain independence' may be due to differences across domains in the psychological mechanisms underlying discounting, i.e., in the reasons for which people discount. The limited evidence on temporal discounting of environmental risks suggests that these are discounted differently compared to money and health issues. We experimentally investigated how temporal discounting affects risk judgments and behavior intentions regarding environmental issues, and which psychological mechanisms (or 'reasons') underlie discounting. Two hundred and seventy participants read a text about the greenhouse effect, in which the temporal distance, the magnitude and the certainty of possible consequences were systematically varied. They then filled out a questionnaire, measuring perceived risk, willingness to change relevant behaviors, and reasons for time preferences (among other factors). Main findings will be presented and discussed.

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An Intertemporal Model of Rank-Dependent Expected Utility

We examined the combined effect of delay and uncertainty in valuing future risky outcomes. Contrary to normative predictions, the experiments showed that preferences related to delay and risk discounting are not independent. The experimental results suggest that a new model of risky intertemporal choice is needed in order to capture the combined effect of delay and uncertainty in an analytical manner. The current study is an attempt to introduce such a model and to assess it empirically. The model we propose is an intertemporal extension of the rank-dependent expected utility (RDEU) model of Quiggin (1993).

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Passing the Buck: Individuals, Groups, and the Strength of Regret

Previous research examines effects of regret on individual decision making, but has not explored regret effects for group decisions. A diffusion of responsibility occurs when decisions are made in a group which implies feelings of less responsibility than if members made the decision alone. Because this decreases commitment to decisions, people should feel less regret about bad outcomes from a group decision than an individual decision. Therefore, regret effects found for individuals (e.g. more intense regret when bad outcomes result from decisions to act rather than not to act) should be reduced or eliminated for groups. We examine three regret effects to compare decisions made by individuals and groups in several outcome conditions. Results indicate that individuals envision themselves feeling more regret than groups. Regret effects at the group level were eliminated for omission bias, reduced for near miss, and were inconclusive for feedback.

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Constructed Preferences for Health and Safety Controls: The Curious Case of Rail vs. Road Safety

The paper reports a major study into public risk preferences in the UK. Fieldwork was conducted at the end of 1998, and replicated in 2000 in response to a major rail accident at Ladbroke Grove. The research programme attempts to investigate whether psychometric characteristics underlie public preferences for health and safety controls. In each study four risk contexts are compared by public respondents (n=118 and n=150 in the two surveys): road accidents, fires in the home, fires in public places, and railway accidents. Relative rank order preferences are reported, together with qualitative content analysis of respondent's reported reasons for their rankings. Of the four risk contexts, road accidents are a clear first preference for a majority of participants (contrary to current UK regulatory policy). The qualitative data indicates that people justify this because the activity kills most people in any one year, affects themselves and families, and is in part out of personal control. In the follow-up study, results indicate that the media and other impacts of the Ladbroke Grove disaster directly impacted rankings for railway risk. Theoretical and methodological issues (the degree of constructed preferences present) as well as policy implications are discussed.

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Avoidance of Regret and Procrastination: Escalating Costs and Inaction Inertia

Procrastination is often associated with the accumulation of both psychological and actual costs. Based on the inaction inertia model it was hypothesized that these costs may sometimes energize further avoidance of the task through the mediator of avoidance of anticipated regret, and that in these circumstances procrastination will tend to increase with increasing accumulated cost magnitude. Three studies were designed to test the role of accumulated costs arising from procrastination in continued task avoidance. Study 1 focused on psychological costs and demonstrated an increase in perceived task aversiveness over time. In study 2, the magnitude of actual procrastination costs was manipulated to test the hypothesis that greater accumulated losses are likely to increase procrastination. Consistent with this hypothesis it was found that the size of a bonus lost as a result of failure to meet an early deadline affected subsequent submission rates on the final due date. A final experiment, in another behavioral domain, found results consistent with the second study. We speculate that when a particular time of completion is seen as ideal, once that opportunity is missed or foregone subsequent opportunities increasingly suffer by comparison, instigating a process of continued task avoidance.

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What is the best way to predict the outcome of heart surgery in children?

Twenty-two paediatric cardiologists and heart surgeons from a specialist centre reviewed 40 surgical cases and estimated the likelihood of early mortality following surgery. Estimates of the probability of early mortality for each patient were also generated using logistic regression models taken from the published literature, or derived from analysis of the operations performed at the participating institution (local models). Probability estimates derived from published models failed to discriminate by outcome, and provided estimates that were, on average, too optimistic. The doctors' judgements were essentially unbiased (observed mortality 16.8%, mean judged likelihood of mortality 16.2%), but failed to successfully discriminate by patient outcome. The local models that used only one or two patient variables provided an appropriate method of identifying higher and lower risk patients. Analysis of the doctors' judgements indicates that they were generally responsive to a number of risk factors in the published literature. Risk assessment based on a small number of locally determined risk factors was the most robust method of stratifying risk. Doctors' judgements exhibited a clear evidence base, but most of the risk factors identified by research at other centres were not predictive of outcomes at their institution.

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Stated Probabilities and Background Information in Decision under Risk and Uncertainty: A Think Aloud Study

Choosing among lotteries with known, objective probabilities is conventionally described as decision under risk whereas choosing among sports gambles with unknown probabilities is described as decision under uncertainty. In the latter, stated probabilities, such as expert judges' opinions of the outcome of a soccer match, are subjective rather than objective. Two previous studies compared choice patterns for equivalent lottery and sports gambles. Displayed information was controlled across gamble type except for one item of background sports information, which soccer team was playing home or away. No differences were found with respect to the impact of stated probabilities across gamble type. However, with respect to team location, home win bets were chosen significantly more frequently than draw (tie) or away win gambles, compared to the equivalent lotteries. The present follow-up study employed the think aloud procedure to further investigate the role of stated probabilities and background information on the decision process. Decision strategies were broadly similar across gamble type and involved stated probabilities in a similar manner. However, in sports gambles, the introduction of team location information led to modifications in subjective probabilities and to some changes in decision strategy. Implications for cognitive theory and proposals for further research are discussed.

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Is Time Discounting Hyperbolic or Subadditive?

Subadditive time discounting means that discounting over a delay is greater when the delay is divided into subintervals than when it is left undivided. This may produce the most important result usually attributed to hyperbolic discounting: declining impatience, or the inverse relationship between the discount rate and the magnitude of the delay. Three choice experiments were conducted to test for subadditive discounting, and to determine whether it is sufficient to explain declining impatience. All three experiments showed strong evidence of subadditive discounting, but there was no evidence of declining impatience. I conclude by questioning whether hyperbolic discounting is a plausible account of time preference.

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Temporal perspective in evaluation of decision outcome

Different findings over the past decade suggest that the evaluation of outcomes may change over time. In particular, Gilovich and Medvec show that while in the short term actions are more regretted, in the long term people tend to regret their failures to act more than their actions. Variation in regrets over decisions taken at different times in the past, however, does not necessarily reflect a temporal change in the evaluation of a particular outcome. The present research proposes to investigate the role of time, by examining satisfaction with specific real choices made by participants at varied times in their past. In separate studies two decisions were evaluated: the retaking of an exam in introductory psychology class in order to improve one's grade point average, and the choice of the undergraduate major. The participants made those decisions between a few months to ten years prior to their participation in the study. The results suggest that the impact of forgone options on the evaluation of decision outcomes tend to grow stronger with time. Increased regret for omissions in the distant past can be viewed as a special case of this general effect.

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Money, Kisses and Electric Shocks: On the Affective Psychology of Risk

Prospect theory's S-shaped weighting function is often said to reflect the psychophysics of chance. We propose an affective rather than psychophysical deconstruction of the weighting function resting on two assumptions. First, preferences depend on the affective reactions associated with potential outcomes of a risky choice. Second, even controlling for their monetary values, some outcomes are relatively affect-rich and others relatively affect-poor. Although the psychophysical and affective approaches are complementary, the affective approach has one novel implication: weighting functions will be more S-shaped for lotteries involving affective-rich than affect-poor outcomes. That is, people will be more sensitive to departures from impossibility and certainty but less sensitive to intermediate probability variations for affect-rich outcomes. We corroborate this prediction by observing probability-outcome interactions: an affect-poor prize is preferred over an affect-rich prize under certainty, but the direction of preference reverses under low probability. We suggest that the assumption of probability-outcome independence, adopted by both expected utility and prospect theory, may hold across outcomes of different monetary values, but not different affective values.

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A process model of decision making

The aim of this research is to propose a new model of decision making. In Differentiation and Consolidation theory (Svenson, 1992, 1996), the decision making process is modelled as one in which a choice option is gradually differentiated from other alternatives. Our model also demonstrates differentiation, but the result of our experiments shows that the process of differentiating is completely different between an optimistic versus a pessimistic decision-maker, and between decision making under an advantaged versus a disadvantaged situation. This deviation in the differentiation process is facilitated through the repetition of reevaluating alternatives with time passing. This leads to the result that some decision-makers can easily differentiate one option while other decision-makers can not. They can not make up their minds. Diff Con theory describes the differentiation phenomena, but does not analyze the mechanism of differentiation. With our present research it is possible to explain the various differentiation processes and to more clearly demonstrate the psychological factor which influences the process. Also, the present model can clearly explain how the process of "hesitation" versus "make a rush conclusion" differs.

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How to Predict Gender Differences in Choice Under Risk: A Case for the Use of Decision Models?

Women are stereotyped as more risk averse than men. This has important implications: statistical discrimination against women. Given the potential for market discrimination and its suboptimality, it is necessary to establish the strength of empirical support for the stereotype. However, the overall picture is unclear: different empirical and experimental studies deliver evidence on a multitude of different and often unrelated aspects. The existing evidence cannot be used to test the gender stereotype or to make reliable predictions. However, predictions on gender differences in choice behavior would be necessary to assess ex-ante implications of policy measures in fields where risks are involved, such as the privatization of public pension systems.

Problems with the evidence arise because an explicit theoretical framework is lacking. We aim at integrating gender into decision models. We concentrate on five frequently used theories of decision making under risk. These theories have substantive differences in risk definition and in explanations how risk enters the decision process. We show how gender can be introduced into the different models and how the different models display distinct gender differences. Recommendations on when to use which decision model when dealing with gender differences in risky choice behavior will be given.

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Framing Decisions: Hypothetical and Real

The paper addresses the general issue whether the practice of investigating human decision making in hypothetical choice situations is at all warranted, or under what conditions. A particularly relevant factor that is likely to influence whether hypothetical decisions match real decisions is the importance of a decision's consequence. A review of the literature shows that the empirical studies on the real/hypothetical issue in experimental gambles tend to confound the reality of the payoffs with the size of the payoffs: Hypothetical payoffs tend to be large, and real payoffs tend to be small. We test whether real choices match hypothetical choices in the well known framing effect avoiding this confounding. We find that the framing effect does depend on payoff size but that hypothetical and real choices match closely for small as well as for large payoffs. Since the field lacks a general theory of when hypothetical decisions do match real decisions, the paper presents an outline for developing such a theory.

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Decoy Effects on Choice: A Process Tracing Analysis

Introducing new options (or decoys) to a choice set can influence existing preferences, resulting in decisions that violate normative principles of choice. In a series of experiments, we used computer-based process tracing to examine the effects of different types of decoys on choice behavior. In Experiment 1, participants showed two common choice biases, the attraction effect and the compromise effect when making decisions among everyday consumer products. Within-subjects comparisons revealed significant differences in patterns of information processing when biased responses were compared to unbiased responses. Information processing patterns also varied across different decoy conditions. Specifically, we found that a process measure that measured acquisitions of a targeted alternative fully mediated the attraction effect, but only partially mediated the compromise effect. Experiments 2 and 3 replicated and extended the findings of Experiment 1. Taken together, the results provided evidence that participants used trade-off avoiding heuristics to construct preferences, as postulated by Reason-Based Choice explanations of behavior (Shafir, Simonson, & Tversky, 1993).

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When the distinction between frequencies and probabilities does not matter

There is increasing evidence that a global distinction between frequency format and probability format is not very helpful when predicting the outcome of judgmental tasks that deal with uncertain information. The hypothesis examined in two experiments is that it is the kind of information at encoding and not the kind of judgment that matters. No difference was found between judgments of probability and judgments of frequency when events were serially encoded. This result is in accordance with the predictions of recently developed computational models such as MINERVA-DM (Dougherty et al., 1999) and PASS (Sedlmeier, 1999).

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Aspiration levels and risk taking by government bond traders

The management of risk is important in financial institutions. Investment houses dealing with volatile financial markets such as foreign exchange or government bonds may find it difficult to maintain "proper" levels of risk taking. Such firms encourage traders to take risks in trading but also promote risk aversion since they value reputation as careful and solid investors rather than risk takers. Government bond traders work in a very volatile and fast moving market. They are compensated by a base salary plus a bonus which relates to the profit and loss they create for the firm. Recent models of risk taking (Kahneman and Tversky, 1979; March and Shapira, 1992) suggest that risk taking is affected by reference points people use to evaluate risky prospects. Such targets can be set by "objective" grounds based on some economic considerations of profitability. However, often targets are set in a "comparative" sense, that is, by comparison to the performance of other similar firms. The above models suggest some alternative ways in which targets may affect risk taking. These predictions are tested on real purchase and sell decisions made by government bond traders. Implications for risk management are discussed.

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Priming might and morality in give-some games

This research examines if priming can directly activate social value orientations in settings of mixed-motive interdependence. Subjects were confronted with one of three unobtrusive priming conditions (prosocial, neutral, proself primes) and we measured their degree of cooperation in simultaneous one-trial give some games. Four experiments revealed that people automatically created expectations about the other players' behavior. Subjects confronted with prosocial primes expected significantly more cooperation from their opponent(s) than subjects confronted with proself primes. Subsequently, these automatically formed expectations were used to determine own cooperative behavior. Prosocials and proselves displayed the same lack of cooperative behavior when they were confronted with proself primes. However, prosocials and proselfs reacted very differently when confronted with prosocial primes. In this case, prosocials were cooperative whereas proselfs took advantage of the situation and defected. An interesting finding of our research is that the priming effect on behavior was mediated by automatically created expectations. This result questions a key hypothesis of automaticity research that motives directly activate social behavior. Implications to both the literature on social value orientations and on automaticity will be discussed.

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Risk Perception and Acceptance - One Process or Two?

One way to answer this question is to check whether some personal features and/or situational factors impact risk perception and acceptance in the same way. For example, those who claim that risk evaluation and risk acceptance are two independent processes, also assume that wealth level affects preferences but not perceived risk (e.g. Sarin & Weber, 1993; Brachinger & Weber, 1997). Another situational factor assumed to affect preferences is aspiration level (e.g. Lopes, 1987, 1990, 1996; March & Shapira, 1987, 1992). The impact of aspiration level on perceived risk and preferences was investigated in an experiment carried out with 100 university students. Subjects were presented with a description of offers for a joint venture - building a supermarket with a foreign investor. Subjects evaluated risk of different joint ventures described in terms of probabilities and amounts of profit and loss and declared whether they would accept these offers or not. Subjects differed due to experimentally set aspiration level. The preliminary results show the impact of aspiration level on preferences and not on risk evaluation.

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Incorporating another person's judgments: How, and how well, do we use advice?

This paper examines opinion revision for quantitative judgments. In our studies participants give initial judgments, see judgments of an advisor, and finally give revised judgments. Revised judgments are paid for accuracy. There are three basic findings. First, on average people put 70% of the weight on self. Second, people alternately assign high and low weight (often 100% and 0%) to their initial judgments. Third, averaging typically outperforms intuition. Our normative analysis suggests that intuition will outperform averaging when two conditions are met: (1) judges differ substantially in accuracy, and (2) judges can detect who is more accurate. Our participants used the alternating strategy across situations, and often would have done better with averaging. Averaging is unattractive partly because people misunderstand its benefits. People typically predict that averaging will perform at the level of the average judge, and fear that averaging might do worse than both judges. In fact, the average judge is a lower bound for the performance of averaging. When people do occasionally average, they see it as a compromise, not as a mathematically robust way to reduce error.

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Rational Models of Social Conformity and Social Loafing

Two well-known group decision-making phenomena are (1) social conformity, wherein group members tend to agree with the expressed views of the majority and (2) social loafing, wherein members tend to reduce their individual efforts at the group task. Both these phenomena seem to increase in magnitude with group size and occur even when group members are highly trained and receive monetary payoffs for accurate performance. We propose rational models of these phenomena and we describe the results of experiments testing the models. We show that a conforming strategy is usually optimal but produces much poorer performance than the rational strategy when there are biases in the group members' responses to the decision alternatives. The behavior of our human participants was consistent with the rational model. The rational model of social loafing is consistent with known results but harder to confirm experimentally. We discuss the results of some indirect techniques for evaluating the model.

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Chained minus standard utilities equals anchoring, and few respondents adjust

In medical decision making, classic utility assessment uses death and perfect health as endpoints. Chained utility assessment uses other health states as endpoints. It has been found that these two assessment procedures lead to different utilities. Purpose: To explain the discrepancies between chained and classic assessments. Methods: First, previous data are plotted in a uniform way to facilitate comparison. Second, from our own experiments using Time TradeOff and Conjoint Measurement data, we estimate how strongly respondents adjust their responses when endpoints are varied. Our samples included healthy volunteers from the general public, students, and women at high risk for breast cancer seeking genetic counseling. Results: Previous data exhibit the following pattern: when compared to standard utilities 1) chained utilities are smaller (larger) when the best (worst) anchor varies, 2) the discrepancies become smaller for utilities near 0 and 1. Our own data replicate this pattern. We obtained 741 data records from a total of 106 participants. When degenerate cases are omitted, more than 50% of responses show a complete lack of adjusting the response when the endpoints are varied. The latter finding explains the robust pattern of discrepancies.

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Individualising Risk: The Impact on Patient Decision Making

Decision models allow for the individualisation of risk and benefits of treatment. We assessed whether presenting individualised risks affects patient perceptions and evaluations of the process of decision making.

Methods: A Markov model was developed for the treatment of a-symptomatic abdominal aneurysm, allowing for individualisation of mortality and life-expectancy (for surgery, watchful waiting, and doing nothing). Patients randomly received either a general brochure, or a brochure with individualised risks. Following the consultation with their surgeon, patients filled out a questionnaire on reported behaviour during the consultation, involvement in decision making, decisional conflict, and satisfaction.

Results: Until date, 52 patients have been randomised to the experimental group, 48 to the control group. The individualised brochure was not perceived as more threatening. No effect of individualisation was seen on many of the process measures. A tendency existed for the experimental group to perceive more of a choice. In this group, the decision had more frequently been postponed. Remarkable was the larger discrepancy in this group between the preferred decision making role and the reported role.

Conclusions: A transformation of the decision making process seemed to occur, a finding that we already noted in a qualitative analysis of the data.

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Decision makers' characterizations of important decisions

The study aims at describing decisions as decision makers themselves represent them. Decision makers rated decisions on a set of characteristics, whose degree of applicability as descriptors of different decision problems were rated by the decision makers themselves. In the experiments characteristics related to classical decision theory (e.g., likelihood, outcome) were used along with a number of other characteristics to describe the different decisions. Because we were only interested in really important decisions, we asked our subjects to characterize their own representations of very important decisions that they had made themselves (e.g., to leave a partner). The results show how different decisions can be characterized on different dimensions (created by grouping the characteristics). The results of the study can be related to decision processes triggered by different decision problems.

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Focus on the Outcome Determines Risk Attitude: Contingent Focus Model for Decision Framing

Identical decision problems in form may yield different decisions, depending on the subjective decision framing as a function of how the situation is described. This is called the framing effect. The study applied the Contingent Focus Model (Takemura, 1994) as an explanation of the framing effect. The model assumes that a risk attitude depends on how to focus on the possible outcome, and how to focus on them is, in turn, contingent on situations of decision making. Based on these assumptions, it is hypothesized that risk aversion emerges when an outcome is interpreted as gain, risk seeking emerges when it is interpreted as loss, and neither risk aversion nor risk seeking occurs when the outcome involves both gain and loss. A verbal protocol analysis of the Asian disease problem (Tversky & Kahneman, 1981) confirmed this hypothesis ($n = 40$). The second hypothesis derived from the Contingent Focus Model is that emphasizing a possible outcome enlarges the tendency of risk seeking. To test this, we conducted 2 experiments ($n = 180$). The data confirmed not only the framing effect but also our second hypothesis.

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Verbal probabilities: A question of framing?

Verbal expressions of probabilities and uncertainties are of two kinds: Positive (“possible”, “probable”) and negative (“uncertain”, “doubtful”). Previous research has shown that this directionality of probability terms can create framing effects. In this paper we show that the choice of a probability term is also determined by the way the situation is framed. In the first study, this is achieved by linguistic quantifiers. If a doctor says, “some of the tests were positive, so it is that the patient has the disease”, most respondents will insert a positive probability term. If he says, “not all tests were positive”, the sentence will be completed with a negative term. In a second study, frames were established by complementary statistics, e.g. “4 of 10 students will be admitted” versus “6 of 10 students will not be admitted”. The first sentence suggests that a random student has “a chance” of being admitted, whereas the second suggests that it is “uncertain”. Choice of term will, in turn, give rise to expectations over and above the numeric probability associated with the phrase.

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Propensity towards risk: one or many?

The research on risk attitudes has rarely dealt with individual differences. The few studies that investigated this issue demonstrated mainly inconsistencies of different measures of risk attitudes. In the present research we investigate actual behaviors in risky situations in different domains – investments, gambling, insurance, medical checkups, etc. The purpose of the study was to determine whether risk attitudes are the same or different in different domains. A questionnaire about risky behaviors in several domains was administered to 826 people. The results of factor analyses revealed that four uncorrelated types of risk can be distinguished – associated with four values: health, money, prestige, security. Thus, we should speak of not one but many risk propensities. The distinction of four instead of one risk propensities was also supported by other findings of the study. For example, we compared those more vs. less active in investments and found that the more active were more risk prone in financial risk. Yet, at the same time they tended to be less risk prone in insurance behavior (security risk) than the other group.

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Preference for Regret, Disappointment, Elation, and Surprise Related to Appraisal Patterns and Core Affects

An experiment is reported in which 176 participants assigned to four groups were asked to recall emotion episodes of regret, disappointment, elation, and surprise, to rate the recalled emotions on the core-affect dimensions of valence and activation, to rate their preference for the recalled emotions, and to assess the recalled emotions on several appraisal dimensions. The results showed (1) that except for disappointment and regret, the core affect dimensions differentiated between the recalled emotions; (2) that the recalled emotions had unique appraisal patterns; and (3) that preference for the recalled emotions was related to valence and activation. The discussion focuses on the implications of the results for theories of decision making assuming that anticipated emotions play important roles for preference and choice.

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Bayesian Probability Judgements: Are means really justified by current ends?

Recent developments in research on posterior probability judgements suggest that participants can indeed produce normative answers, given appropriate formulation of the information presented and/or the question asked. Contrary to the prevailing view, it is argued that the ability to compute a Bayesian answer cannot, in itself, provide evidence for Bayesian reasoning (i.e. the ability to form Bayesian judgements using reason). A first experiment investigated whether participants providing accurate responses in a frequentistic setting would provide evidence of Bayesian reasoning in another task. Participants were asked (1) to make a posterior probability judgement and (2) to propose a strategy for judging a posterior probability in a similar setting without having to produce a numerical answer. The order of these two tasks was counterbalanced to control for an effect of the frequentistic judgement task on the elicitation of Bayesian reasoning. A second experiment tested the hypothesis that participants' reasoning is impaired by the numerical information provided. Probabilistic information was then either presented to participants, or elicited from them. Both judgements and reasoning strategies were expected to be more often Bayesian when the information was elicited, even when this information was not frequentistic.

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How comparison processes influence further judgments and choices

Most judgments and definitely all choices involve comparison processes. While the impact of comparison processes on comparative judgments and choices is well researched the impact of comparison processes on later evaluations of a target has remained relatively neglected. The present paper will first show how the direction of comparison between a target and a context stimulus influences the mental representation built of the target and consequently determines whether the target evaluation reflects contrast or assimilation regarding the context stimulus. Further studies demonstrate that prior comparison processes involving moderate targets and extreme context stimuli may influence target evaluations and preferences between targets in an opposite direction. When target A was presented with an extremely positive stimulus and target B with an extremely negative one, target A received more negative evaluations than target B. Nevertheless in direct preference ratings target A was preferred. The paper discusses the links between the research on comparison processes and research on assimilation and contrast in evaluative judgments. All stimuli involve consumer products.

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Scale Convergence of Utility

During the preceding century, the measurement of utility through self-reports was taboo. Especially economists were strict in the behavioral interpretation of utility. After the discovery of one behavioral anomaly after the other, there is again interest in alternative approaches. First attempts to measure utility through self-reports were not successful because different measurement methods gave different results, leading to an, in the speaker's opinion, fruitless distinction between risky and riskless utility. Only when Tversky and Kahneman developed cumulative prospect theory in 1992, did a useful risk theory become available that combines empirical realism with theoretical soundness. This paper uses cumulative prospect theory to analyse utility measurements. Four different methods are used. Three of these consider decisions under risk and can be framed within the traditional behavioral paradigm. The fourth method uses introspective strengths of preferences that are not behavioral and are neither related to risk. When analyzed by means of cumulative prospect theory, all methods give the same utilities. This finding suggests that psychological measurement methods by means of questionnaires can play a role in developing economic theory.

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Familial occurrence of breast cancer outweighs the perceived influence of genetic factors in decreasing optimism about the breast cancer risk

For most health problems, especially infrequent and preventable diseases, people believe that they are at less risk than comparable others. A community-based questionnaire study among 481 women (19-65 years old) shows that this optimistic bias - measured with a direct comparative risk perception measure on a 7-point scale - also occurred for a common disease, namely breast cancer. As expected, a stepwise regression analysis revealed that the absence/presence of breast cancer in the family was the most important predictor of the optimistic bias: while women without relatives with breast cancer (N=387) displayed a significant optimistic bias, the bias remained absent among women with breast cancer in the family (N=94). Contrary to our expectations, the interaction between the perceived influence of genetic factors and the absence/presence of breast cancer in the family did not predict optimism. Regression analyses in the two groups separately (women with versus without breast cancer in the family) showed considerable differences in the way the comparative risk perception was determined by control-related variables, the numerical estimation of the population risk for breast cancer, the number of children as well as the perceived influence of genetic factors. The practical implications of these findings will be discussed.

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Negative-based Prominence: The Role of Negative Features in Matching and Choice

Choice between two matched alternatives (i.e., two options made equally attractive using a matching procedure) often result in unequal choice shares. One of the alternatives is chosen more often because the more prominent dimension receives a greater weight in choice than in matching. Previous research related to this prominence effect (e.g., Tversky, Sattath and Slovic, 1988) has mainly focused on the causes and boundary conditions of the effect. This paper investigates the determinants of prominence and explores a negative-based prominence effect in which the negative attribute becomes the prominent one. Using a matching-choice procedure, we show that the negative dimension became the prominent one under two different cover stories, suggesting that the negative feature looms larger in choice than in matching. By lowering the values on the positive dimension and enhancing the values on the negative dimension, the prominence effect could be reversed. The paper distinguishes between two determinants of prominence: intrinsic prominence caused by 'natural' attribute importance and negative-based prominence caused by negative attribute values. Compared with a matching task, the results suggest that choice leads to enhanced sensitivity to negative features.

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A verbal-numerical probability scale

We will present a verbal-numerical scale for eliciting probability assessments, and report studies we undertook to test this scale. A (numerical) probability scale is the best-known direct method to elicit probability judgments: presenting a horizontal or vertical scale and asking judges to mark a position on it. The scale is easy to understand and use; its drawback is that it gives judges few anchors to go by. Two indirect methods that are often used are gambles and probability wheels. A probability assessment is inferred from judges' choice behaviour in a controlled situation, which supposedly gives more correct assessments. A major drawback of these indirect methods is that they are difficult to learn and very time-consuming in use. Research has shown that it does not really make much difference in the probability assessments which elicitation method is used. For reasons of efficiency and user-friendliness, a scale would seem best. But we think it may be improved upon, because people are not always very comfortable giving their judgements numerically. We therefore took the standard probability scale as a point of departure, and refined it to include verbal expressions of probability.

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Differences in expert and lay judgments of risk : myth or reality?

This paper evaluates the nine empirical studies that have been conducted on expert versus lay judgments of risk. Contrary to perceived wisdom, we find that there is little empirical evidence for the propositions: (1) that experts judge risk differently from members of the public, or (2) that experts are more veridical in their judgmental risk assessments. We document methodological weaknesses in the early research and then show that the results of more recent studies are confounded by social and demographic factors that have been found to correlate with judgments of risk. Using a task-analysis taxonomy first developed by Bolger and Wright (1994), we provide a template for the documentation of future studies of expert/lay differences/similarities that will facilitate analytic comparison.

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The Dynamic Change Of Decisions' Determinants as a Function of the Distance in Time from The Decision's Implementation.

The dynamic changes in the nature of determinants which influence a decision process was explored in two ecological studies. The main hypothesis was that whereas in the beginning of a decision process the dominant determinants reflect thinking about the decision in ideal, long-term considerations, when the implementation becomes closer in time the dominant determinants reflect thinking in terms of implementation feasibility and immediate-term considerations. In the studies, students facing real life vocational choices were interviewed in different points in time along the decision process as well as six months after the decision has to be implemented. The findings supported the main hypothesis. Furthermore, it was found that students who did not complete the decision process successfully (in the sense of reaching a decision, feeling good about it, implementing it and being satisfied with the implementation) also did not succeed in changing their perspective from emphasizing long-term considerations to emphasizing immediate-term ones. The findings are discussed in terms of its implications for understanding dynamic decision processes and for helping decision makers in achieving a successful implementation of their decisions.

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Risk taking behavior: Does personality matter after all?

The existence of the context-free, personality-driven differences in risk taking is a debated question in behavioral decision theory. It is argued here that the failure to find stable personality determinants of risky behavior has resulted from considering risk as a one-dimensional construct. The main idea of this paper was that personality matters in risk taking, but its influence on choice changes when different kinds of risk are considered. Two kinds of risk taking are distinguished: instrumental (oriented on reaching a goal and more rational in the sense of decision theory) and stimulating (more spontaneous and oriented on excitement seeking). The goal of the research was to test the hypotheses that the two kinds of risk taking are correlated with specific personality features and are differently related to various domain-specific (economic, recreational) risk attitudes. The research demonstrated that instrumental risk taking was related to the investment risk preference and was correlated with personality traits connected with orientation toward the future, the tendency to think rationally and functional impulsiveness. In contrast, stimulating risk taking was related to the preference for recreational behaviors and gambling and was correlated with paratelic orientation, arousal seeking, impulsiveness and strong need for excitement.

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Abstracts of Poster Presentations

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Faraway eyes: The impact of distant future outcomes on intertemporal choice

Research on time preferences involves decisions between immediate and near-future outcomes. Positive outcomes are usually preferred sooner rather than later, whereas negative outcomes are often preferred later. Gestalt psychologists have demonstrated that the meaning of old information can be changed in the light of new information. The present research examines whether this principle of reevaluating situations in the context of additional information, can be applied to time preferences. We investigate how information involving additional faraway-future outcomes affect time preferences for near-future outcomes. We argue that reevaluations of near-future outcomes depend on the sign of the faraway outcomes. We expect that people want to avoid faraway losses (Tversky & Kahneman, 1991), and re-evaluate the near-future outcomes such that gains are judged as less attractive and losses as more unattractive. As a consequence, people will prefer to delay these outcomes. On the other hand, the prospect of faraway gains results in more positive reevaluations of near-future outcomes. Gains will be seen as more attractive and losses as less unattractive, and as a consequence, people will prefer to speed up these outcomes. The predicted interaction between near- and distant-future outcomes was supported for monetary (Study 1), and health-related outcomes (Study 2).

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Preference Theory: A Cognitive-Affective Approach to Experience-Based Decision Making

I put forward a general model of decision making, called preference theory. The theory is designed to account for recurrent decisions in experienced individuals who can rely on decision routines. Preference theory consists of several propositions, which address knowledge representation, automatic and deliberate forms of information processing, and rules for information search and choice. It assumes that termination of a decision process is triggered by affective coherence and that the option evoking the most favourable affective reactions is most likely to be chosen. The theory is applied to explain and predict a variety of routine effects in decision making.

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More thinking - more framing effects? Framing effects as a function of increased processing capacity and increased processing motivation

The paper investigates cognitive processes underlying the impact of problem framing (gains vs. losses) on risk taking. It is argued that the impact of the frames rests on the requirement to enrich the

problem scenario with additional information (Bless, Betsch & Franzen, 1998). If framing effects are partly due to an enrichment, framing effects should increase with the amount of processing allocated to the task. In three studies participants worked on the classical Asian-disease-task. In addition to the framing, we manipulated context cues that either fostered or hindered enrichment of the task. In study 1 we measured individuals' decision latencies, in study 2 we experimentally manipulated processing time, and in study 3 we experimentally manipulated participants' processing motivation. Consistent across the three studies, framing effects were most pronounced when the context cue elicited enrichment processes and when participants thought about the problem extensively. Framing effects were reduced when the context cue hindered the enrichment or when participants were unable or unwilling to engage in extensive processing. The results are interpreted as additional evidence that framing effects are partly due to the enrichment of the problem scenario.

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Factors affecting website return rate and the decision to buy internet products

The present study investigated factors affecting the decisions to return to websites and to buy Internet products. Participants (n=47) were given two questionnaires. One questionnaire measured the degree to which they used heuristics in decision making. The other questionnaire measured how often they had used Internet and bought products from websites. Participants were categorized into either low-achievers or high-achievers, depending upon to which degree they used heuristics when making decisions. One hypothesis was that the number of steps involved in the Internet product buying process would have to be simplified if a decision would be made to return to that website to buy another product. A second hypothesis was that a website with a blue background colour would make it easier to make the decision to return to that website. A third hypothesis stated that high-achievers on the decision heuristics test would more frequently make decisions to buy products from the Internet as compared to low achievers. The results showed that the hypotheses received support as participants indicated that they preferred an easier process when buying Internet products, and that they preferred blue as website background colour. Finally, high-achievers were found to buy Internet products significantly more often than low-achievers.

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Some experiments on the endowment effect in consumer choice

In an experiment to test a dual-process model of consumer choice, we manipulated processing mode during choice, then elicited either willingness-to-pay or willingness-to-accept prices for the chosen good. We hypothesized, that there would be a greater endowment effect under holistic than analytic processing. This hypothesis was not borne out -- it seems that holistic evaluation increases preference for goods relative to analytic evaluation but there was no endowment effect under holistic processing. In subsequent experiments we explored the reasons for our failure to find an endowment effect in the holistic processing condition. First, we performed some partial replications of this condition with different products and different respondents in order to test further the possibility that our finding was due to a ceiling-effect in terms of how much consumers were prepared to pay for the products. A second possibility is that the endowment effect doesn't occur when people are allowed to choose, rather than being given, a product. We therefore examined whether preference for a product is different when people are allowed to choose it as opposed to being endowed with it. We discuss the impli-

cations of the results of these experiments for both psychological theories of choice and marketing practice.

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Positive-Negative Asymmetry in the Evaluation of Trivial Stimuli

When people make a series of dichotomous evaluative judgements they tend to do so asymmetrically, with a greater proportion of positive responses than would be predicted by chance alone. This positive-negative asymmetry effect has been shown to be a robust phenomenon and it is argued that this asymmetry is a manifestation of normal adaptive functioning (Peeters & Czapinski, 1990). Furthermore, research showed that the proportion of positive responses tends to be approximately 60%. This ratio is assumed to approximate an optimal figure-ground relationship between negatives and positives, because it makes the negatives maximally salient against a background of positives. The ratio may contribute to an organism's changes of survival due to the efficiency it contributes to affective processing (i.e., negative information can be processed faster). If this is the case then this ratio could be robust and also be present in the evaluation of trivial stimuli (e.g., inanimate objects without criteria for preference). In three studies we tested the hypothesis that when people make evaluative judgments about trivial stimuli (i.e., beans or beads) they do so asymmetrically and that the ratio of positive judgments will be around 60%. Results of all three studies were in line with this expectation.

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Diagnosing a disease: will a second opinion help?

The medical literature suggests that clinicians vary in how they make diagnoses. The direct implication of this observation is that variations between clinicians will lead to different management of patients who have the same presenting symptoms. We used subjective causal diagrams to determine whether intergroup variations among three specialist groups of clinicians can be attributed to: (1) differential identification of factors as predictive of a particular disease, and (2) differential subjective weighting of these factors. All three groups were found equally likely to identify key risk factors as predictive of a particular disease and no differences were found in the corresponding subjective weightings. However, there were differences among the groups in their selection and weightings of tests and symptoms to support a diagnosis. The practical implications of these variations are further discussed.

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The role of trust in communicating food risk to different stakeholders.

We report one from a series of studies designed to test principles of effective communication about food risks across different stakeholder groups (e.g. industry, consumer groups, public). In the study we investigate trust, a factor that previous research has shown to be critical for effective communication. We used an innovative methodology divided into three phases. In Phase 1 participants were presented with press cuttings describing an evolving food risk, followed by a thought-listing task to capture their mental model of the situation. In phase 2 participants received a risk communication designed to clarify the situation and give advice about appropriate action. However, the source of the message was systematically varied, with different groups told the message came from a scientist working with: industry, consumers, university, food standards agency. Then participants again thought listed. In phase 3 all participants answered questions about their behavioural intentions with respect to food, their trust in the source of the communication and questions designed to elicit their values and attitudes with respect to food risks. Our findings will focus on the impact of different risk communication sources on mental models and behavioural intentions and the role that trust and stakeholder differences play in this.

9. Satoshi Fujii (Kyoto University) and Tommy Gärling (Göteborg University)

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Effects of behavioral change on habitual choice making

A model incorporating attitude, habit, and script-based choice predicts that when the frequency of a behavior increases, attitude toward the behavior changes in positive direction and habitual choice making is strengthened. To test this hypotheses, a panel survey was conducted of 53 students at Kyoto University. The first wave was 2 months before graduation, the second wave after they were employed by companies in some other city than Kyoto 3 months after graduation. Since they had moved from Kyoto, their commuting travel behavior was changed. The data indicated that change in attitude toward public transport or automobile was not related to change in frequency to commute by them. In line with our hypothesis, the data did however indicate that the habit to use public transport (or automobile) increased for those who commuted by public transport (or automobile) more frequently after the move and decreased for those who commuted by public transport (or automobile) less frequently. Thus, it is implied that automaticity in decision making can be developed by increase in frequency of behaviors and can be weakened by decrease in it.

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The Effects of Payoff and Feedback on Confidence

The role of payoff and feedback on confidence was investigated following Hogarth et al. (1991)'s exactness concept. Exactness of the environment refers to the severity of penalties imposed for errors. In a cue-learning task, Hogarth et al. showed that environments with moderate exactness produced better learning. Extrapolating to a calibration task, the present study looked at the role of exactness on confidence judgments. Subjects (n=144) responded to true and false questions regarding property crime rates in U.S. cities. All subjects were given points after each answer according to the rule, $p = 50 - \alpha(c - y)^2$, where c refers to a confidence level that the statement is true (0-100 scale) and $y=100$ if item is true or 0, otherwise. The levels of exactness were $\alpha=\{0.03, 0.05, 0.5\}$. Payoff environment and outcome/no-outcome feedback were manipulated in a between-subjects design. Results demonstrated effects of exactness where subjects in the lenient condition used the most conservative confidence levels, followed by the moderate and the strict condition. Outcome feedback did not affect this relationship. Implications for understanding calibration data are drawn from the notion that incentives can alter confidence responses independently of knowledge.

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Selection of Strategies for Narrowing Choice Options: Antecedents and Consequences

In several recent studies we compared inclusion and exclusion processes when decision makers are faced with the task of screening a large number of choice options. A reliable finding is that size of the consideration set is greater for subjects excluding unacceptable options than for subjects including acceptable options, regardless of whether subjects were instructed to use a particular strategy or were allowed to select their own strategy. This finding supports a dual criterion model for inclusion and exclusion. The selection of strategies, however, varied across studies, thus raising the question of which is the more natural and effective strategy for different tasks. One potentially important factor is whether there is a clear criterion for a correct choice as opposed to a purely subjective judgment. This is being investigated in a current study where we are examining how the selection of inclusion or exclusion depends both on the availability of a clearly defined criterion of correctness and on a variety of individual difference variables related to cognitive style. We will then relate decision quality and decision maker confidence to choice of strategy.

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Applying the theory of reasoned action to organ donation decisions: Are some 'salient others' more salient than others?

The theory of reasoned action has been found to have predictive validity across a wide range of decisional domains. Despite the predictive success of the standard measures of the theory, a number of researchers have demonstrated the utility of incorporating measures of personal belief salience into the expectancy-value measure of attitude in improving the model's predictive and explanatory power (e.g., Van der Pligt & De Vries, 1998). The present research examined the role of a measure of personal NORMATIVE belief salience within the context of organ donation decisions. The main findings showed the composite score based on the personally salient evaluative normative beliefs to be more predictive of the direct measure of subjective norm than the score based on the non-selected beliefs. Additionally, the correlation with behavioural intent was significantly higher for the score based on the selected beliefs than that obtained for the score based on the full modal set. The findings are discussed in relation to the theoretical and practical implications.

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Retrospective evaluation under time pressure: Intuitive judgements reflect the entire sum of prior experiences

In retrospective evaluation people may use a peak-and-end-heuristic to form a judgment (Kahneman, et al., 1993). Accordingly, they may base their judgments on the average value of some outstanding events of a prior episode such as the most extreme and the most recent outcomes. However, people are not always able to recall events from memory, for example, under time pressure or when they lack concrete memories. Under these conditions, individuals' intuitive judgments reflect a sensitivity for the sum of the entire set of their prior experiences (Betsch et al., 2001). This finding has been replicated several times in the domain of monetary outcomes when people were presented with positive outcomes (gains). The goal of this study was to replicate prior findings in another domain (weather forecasts) with stimulus material containing both positive and negative information. We predicted that under time pressure evaluative judgments reflect the total sum of the values for prior information. Participants were presented with 48 tape-recorded weather forecasts for 4 cities while simultaneously performing a distraction task. Then, participants evaluated each of the cities under time pressure. We found that evaluative judgments reflected the sum of the entire series of previous information (positive, negative weather forecasts).

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Worst-case plans: Active information search for the probability of detecting the negative event

Experiments with quasi-naturalistic risky tasks show that decision makers actively search for risk defusing operators (RDOs) which reduce the risk connected with an otherwise attractive alternative. In relation to the negative event, two types of RDOs can be distinguished: Worst-case plans (e.g., medical treatment) need not to be initiated before and unless the negative event (e.g., infection) occurs, whereas Pre-event RDOs (e.g., a vaccination) must be initiated before. For successful application of a worst-case plan it is necessary to detect the occurrence of the negative event in good time, which is often not trivial. In our experiment we investigated the effect of different cues on subjects' recognition of detection uncertainty. 30 subjects chose in three tasks, with two alternatives each (one with Worst-case plan, one with Pre-event RDO). Three types of cues were varied: 1) no cue (first task), 2) possibility of detection uncertainty was mentioned, 3) possibility of a miss was mentioned explicitly (task 3). The number of subjects searching actively for detection probability information increased from condition 1 to the conditions 2 and 3, but is small also in condition 3. Only extremely few subjects detected the possibility of a false alarm.

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Sources of the durability bias: Focus and subjective theories

Numerous studies demonstrate that people overestimate the duration of emotions resulting from events or decisions (e.g., after failure). This tendency often has an impact on behavior, for instance leading to decisions that fail to maximize experienced utility (Kahneman & Snell, 1990). As sources of the durability bias we examined the impact of the focus on consequences (Study 1) and of subjective theories about the course of emotions over time following emotional events or decisions (Study 2). In two experiments, we confronted participants with different scenarios relating to positive and negative consequences. In Study 1, we manipulated the focus (narrow vs. wide) by bringing a small or a larger number of other sources of well-being to mind. As expected, a wide focus lead to a shorter predicted duration of the emotions than a narrow focus. In Study 2, subjective theories about the course of emotions over time (continuity vs. reduction) were primed. As assumed, the predictions were a function of the primed theory. Both studies support our assumptions that the durability bias in the prediction of emotional states resulting from events or decision is partly a function of the focus and of subjective theories about the course of emotions.

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Contingent Weighting and Future Outcomes in Decision Making

Two experiments were performed to investigate the sunk-cost effect defined as the irrational tendency in decision making to continue to invest assets following unsuccessful investment. Building on previous research demonstrating that both past and future outcomes determine choices to continue or discontinue investments, the experiments were conducted with the aim of investigating factors that affect how prior investment and returns are weighed relative to current investment and future returns. In Experiment 1 it was predicted that a goal of minimizing losses would make the participants place more weight on sunk outcomes than would a gain-maximizing goal. The loss-minimizing goal did however not lead to the expected different weighing, only a general tendency to discontinue investments. More choices to discontinue was also observed for business decisions than personal decisions. The results differ from previous research in that more responsibility led to less escalation, and in that escalation occurred both for positive and negative prior outcomes. An important procedural

difference partly accounting for this was that the future returns were explicit. In Experiment 2 an expected differential weighting was observed when participants were promised monetary rewards based on either only the future outcomes or on both future and prior outcomes.

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Process and Representation in Subjective Probability Judgment

Where do probability judgments come from? In the late sixties the answer was that probability judgments are fairly accurate reflections of extensional properties of the environment such as frequencies (Peterson & Beach, 1967). This changed with the influential heuristics and biases program in the seventies and eighties, which emphasized that probability judgments are guided by intensional aspects like similarity (Kahneman, Slovic, & Tversky, 1982). The nineties saw a renewed interest in the idea that extensional properties of the environment are reflected in peoples' probability judgments as specified by the ecological models (Gigerenzer, Hoffrage, & Kleinbölting, 1991; Juslin, 1994). A third alternative combines intensional and extensional properties in an exemplar-based model to produce similarity-graded probabilities (Juslin & Persson, 2000). We compare four models of the processes and representations in probability judgment. The models represent three principles that have been proposed in the literature: 1) the representativeness heuristic (interpreted as relative likelihood or prototype-similarity), 2) cue-based relative frequency, and 3) similarity-graded probability. An experiment examined if these models account for the probability judgments in a category learning task. The results indicated superior overall fit for similarity-graded probability throughout training. In the final block, all models except similarity-graded probability were refuted by data.

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Evaluating methods of translating one person's verbal probabilities to another.

When communicating uncertainties, people use a wide lexicon of verbal probability expressions. For instance, when Budescu, Weinberg & Wallsten (1988) asked 20 participants to estimate probabilities of 11 different graphical displays, the participants produced 111 distinct probability phrases! If forecasters (Fs) and decision makers (DMs) use different terms to refer to the same events and probabilities, there is opportunity for many errors in communication. In an effort to facilitate the communication and decision-making process, we investigated various ways of "translating" verbal probabilities produced by one person (e.g. the F) to the terms usually used by another (e.g. the DM). The participants in our study judged the probabilities of 19 distinct graphically displayed events using both numerical and verbal probabilities. We examined the communication error rate between all pairs of participants, and evaluated the quality of several translation methods in terms of their capability to reduce the error rate and improve the quality of communication.

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Personnel decisions after failure: The influence of choice and accountability

The presented study investigates choice (e.g. Staw, 1981; Staw, Barsade & Koput, 1997) and accountability (e.g. Lerner & Tetlock, 1999) as determinants of escalating commitment. The paradigm is a role-play of a personnel decision case. Subjects had to decide up to eight times whether they keep or dismiss a poor performing employee. They also had to explain their decisions. Contrary to our hypothesis there was no additive effect of the manipulated variables on the point of dismissal. Instead the results showed an interaction which leads to the presumption that choice and accountability are related to different cognitive mechanisms. This assumption is supported by the pattern of subjects' reasons (e.g. Brockner & Rubin, 1985; Lerner & Tetlock, 1999). More specifically, subjects in the choice-condition used selfjustification explanations for their commitment, whereas accountable subjects explained their behavior with information search needs. In a second experiment information search behavior was more closely investigated and the results of the first experiment are crossvalidated.

20. Stephanie Kurzenhäuser & Ulrich Hoffrage (Max Planck Institute for Human Development)

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How physicians estimate utilities and risks of mammography screenings

When facing the decision to participate in a mammography screening programme, women have to weigh benefits against costs: To what extent does participation reduce breast cancer mortality? What risk does the additional radiation exposure pose? Physicians are a very important source of information in this decision-making process; how do they estimate utilities and risks of mammography screenings? We mailed questionnaires to 350 German gynaecologists. They were asked to estimate breast cancer incidence and mortality for women who do or do not participate in screening programmes, the amount of radiation-induced cancers and the amount of false-negative and false-positive results. Three different versions of the questionnaire were used: Questions asked for estimates either in the form of a single-event probability or a frequency judgement, or made no specific suggestion. Previous work by Gigerenzer, Hoffrage and colleagues has shown that the use of frequency formats instead of probabilities improves statistical reasoning. Hence, we hypothesized that prompting frequency representations in the questionnaire would be equally beneficial for estimation accuracy. Results show that, although estimates vary considerably, physicians' estimates are indeed more accurate when the questionnaire asked for frequency judgements instead of probability judgements. The implications of these results for medical risk communication are discussed.

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Relating Individual Differences in Attitude toward Ambiguity to Risky Choices: An Extreme Groups Design Approach

Two independent studies were conducted to relate individual differences in attitude toward ambiguity to risky choices. In part one of each study, an ambiguity-probability tradeoff task (cfr. Lauriola & Levin, 2000) was administered to a large sample (N=700) of undergraduate psychology students. Attitude toward Ambiguity was operationally defined as the number of choices of an ambiguous over a non-ambiguous option across variations in probability of succeeding. In part two of the first study, students having extreme preferences in part one and students in a control condition (N=68) were called back to complete a risky decision-making task, in which they had to choose between a "Sure Things" and a Risky option with the same expected value. In part two of the second study, students (N=95) also completed additional tasks involving the element of risk. Individual differences in Attitude toward Ambiguity were significantly related to risky choices when the task required a choice between a riskless and a risky option but not when the choice was between two risky options. From these data it appears that the common process to both reactions to ambiguity and reactions to risk is the tendency to reduce uncertainty in decision-making.

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Partitive Formulation of Conditional Probability: Beyond Heuristics and Frequency Format Explanations

I propose a simple theory of the use of the base rate according to which neither heuristic nor frequentistic factors underlie demonstrations of the occurrence or the elimination of the base-rate fallacy. According to this view, what is crucial for the occurrence or elimination of the base-rate fallacy is the absence or presence respectively of what can be called a partitive formulation (Macchi, 1995) of the conditional likelihood datum. A partitive formulation defines the set of which the numerical datum is a part (in terms of percentages or frequencies). The predictive power of this hypothesis is shown by comparing responses to different versions of problems containing the same implied heuristic principles and supplied data, but which differ in the way the information is presented (partitive vs. non-partitive). Whether probabilistic or frequentistic, the partitive versions lead to an almost complete elimination of the bias which remains when non-partitive versions are used. On the basis of these experimental results, the paper includes a critical discussion of heuristic, "frequentistic" theories.

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Validating group elicitation of prior belief distributions

A Bayesian solution to some awkward problems in the interpretation of clinical data requires elicitation of expert belief in the form of a distribution across an exhaustive range of possible outcomes. Elicitation methods with built-in validation are very laborious, e.g., a one-hour interview by a statistician assisted by an interactive computer program. Methods usable with groups have generally had little or no validation. We tested a graphical elicitation method with a group of clinicians attending a research seminar. At three stages during the seminar, each respondent completed an identical set of three response forms designed to elicit one unconditional and two conditional belief distributions concerning the effectiveness of a new therapy. After the first set, a talk was given about logical relationships among beliefs and statistical evidence. After the second set, a talk was given about results from an ongoing, large clinical trial of the therapy. Predictions were formulated about qualitative attributes and directional changes in belief distributions that should logically result from these interventions. Overall, the results were disappointing, with none of the 13 participants generating distributions entirely in accordance with the predictions and with some showing grossly implausible belief structures.

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The Role of Frequency and Pictorial Formats in Bayesian Reasoning

Recent studies suggest that presenting Bayesian reasoning problems in a frequency rather than probability format dramatically improves performance (Cosmides & Tooby, 1996; Gigerenzer & Hoffrage, 1995; Hoffrage, Lindsey, Hertwig & Gigerenzer, 2000). Two experiments are reported which attempted to replicate and extend these findings. In the first study, participants were presented with a probability, frequency or frequency plus tree diagram version of the 'medical problem' (Eddy, 1982). The probability version generated 6% correct solutions that rose to 23% correct for the frequency version and to 47% correct when the frequency information was presented in a tree diagram. In the second study, a further condition was added in which the frequency information was presented in a contingency table. In this study the probability version produced 4% correct solutions, which rose to 31% for the frequency version, and to 52% for the tree diagram. The contingency table version produced 67% correct solutions. The results indicate that presenting the problem in a frequency format does improve performance, but the effect size is smaller than previously reported. Presenting frequency information in a pictorial format also has a considerable impact on performance. The implications of these findings for theories of probabilistic reasoning are discussed.

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The effect of expectations and overconfidence on emotions

We investigate predictions of decision affect theory (Mellers et al., 1997, 1999) in athletic and academic performance tasks. The theory predicts that as outcomes improve pleasure increases. Relevant counterfactual comparisons also influence emotions. Finally, the theory predicts surprising outcomes produce more intense emotional reactions.

Recreational basketball players judged their confidence of success before attempting shots from various distances from the basket. Undergraduates participating in a spelling bee judged their confidence of success after spelling each word. Both groups rated their feelings after each result. As the theory predicted, pleasure with success and failure increased as confidence in performance decreased. Participants were also generally overconfident of success.

The theory also predicts the effect inaccurate expectations have on hedonic experiences. Holding all else equal, overconfident participants should experience failures as more surprising and successes as less surprising. In short, overconfidence should reduce the pleasure of emotional experiences.

The affective benefits of calibrating confidence with performance were investigated in two additional studies. The performance tasks were repeated, and one group in each was taught about overconfidence and given benchmarks to refer to when judging confidence. Those who received debiasing information were less overconfident and felt better about their performances than the control group.

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Common Aspects of Behavioural Decision Making and Suggestional Processes

Two links between behavioural decision making (BDM) and suggestional processes (SP) are claimed. The first link affects the predominantly sceptical interpretation of both domains. Decision research has shown that people systematically violate the SEU-principle. Often these violations were pessimistically qualified as irrational (Jungermann, 1986). Meanwhile it has often been argued that such violations can be functional in everyday life (e.g. Simon 1955). Usually, SP are judged to be negative. Gheorghiu (1996), however argues that SP (like BDM) might have adaptive functions.

The second link affects the overlapping contents. For example, Cialdini (1993) describes suggestive sales techniques. Many of them can be interpreted in terms of prospect theory, e.g. changing the reference point of the value function. Another common issue affects coping with ambiguity. Both, BDM and SP deal with behaviour in ambiguous contexts.

Besides these theoretical analyses data of an exploratory study are reported. Subjects were tested by a suggestibility scale (Gheorghiu & Molz, 2000). Ambiguity avoidance was measured by means of a modified Ellsberg task. Substantial negative correlations were found between ambiguity avoidance and items measuring negative emotions during application of the suggestibility scale. These findings and plans for further research are discussed.

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Rules and Exemplars in Multiple Cue Judgment

Egon Brunswik (1903-1955) introduced the idea of a Darwinian-style adaptation of cognitive processes to the environment in which they operate and the idea has been successfully applied to multiple-cue probability judgment. However, this research has not been much concerned with what cognitive representations underlie the judgments, and how the representation adapts to the demands from the environment. We report studies that aim to ascertain in which circumstances judgments are based on cue-criterion rules versus episodic memory of exemplars. These studies extend methods from categorization research and investigate factors like analogue versus conceptual presentation of information, binary versus continuous judgment variable, and training-test compatibility. The results suggest that the flexible change of representation is an important mode of adaptation.

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Dying and other significant life events: Assessment of teen expectations

The ability to assess accurately the probabilities of uncertain events is an important part of learning to manage risks. Hence, risk perception plays a central role in theories of adolescent development and health behavior. As part of the 1997 National Longitudinal Study of Youth, a large, random sample of US teens provided probability judgments for 18 future life events (e.g., getting pregnant, finishing school). Overall, their judgments showed good construct validity. Respondents used the entire response range, with average responses corresponding well to statistical estimates, no marked individual-difference tendency to give high or low responses, and good correlations between individual expectations and responses to related questions on other survey modules. Although these findings provide reasons for taking teens' probability judgments seriously, respondents strikingly overestimated the probability of dying (from any cause, either within one year or by age 20). Mean judged probabilities on these two questions were approximately 20%, with medians around 10% (compared with a population rate of 0.08%). Follow-up analyses and a second study lent partial support to three explanations: (1) direct environmental threats, (2) threats to psychological well being, and (3) an inability to imagine oneself in the future.

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The odds of throwing a '6': Subjective predictions in playing dice

In games of dice usually everyone knows the exact probability of each outcome and that these probabilities are the same for every outcome. But when persons were asked to predict the outcome of throwing a die, the resulting distribution of predictions showed a clear deviation from the expected uniform distribution. More precisely, the "1" and the "6" were too seldom and the "3" and "4" too

often predicted. Two replications confirmed this unexpected observation. In a series of further experiments, participants were confronted with other materials than dice, but with the same equal (and known) probability for every outcome. The results again revealed the same deviation from the uniform distribution. It thus appears that people in these cases use a general error minimization strategy, that is, by favouring a medium outcome they minimize the maximally possible error with respect to the true outcome.

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How to make the best of confirmation bias

The purpose of this paper is to derive a theoretical model for hypothesis testing behaviour from both Popper's falsificationism and confirmation theory, and to investigate it experimentally. In much research on reasoning a normative standard is assumed. In hypothesis testing research, this standard is falsificationism. A reasoner can either look for confirming or falsifying evidence. Falsifying evidence is the better option, according to this standard (Popper, 1963), taken from the philosophy of science. A huge number of experiments have shown that people prefer some form of confirming evidence, however (see for a review Evans & Over, 1996). I will first elaborate on what could be understood by 'looking for falsifications'. Second, I will derive the probability-value model (Poletiek, 2001). It leads to the prediction that, under some conditions, people favouring a hypothesis might precisely wish to falsify it, because this strategy maximizes the probative power of a possible confirmation. Finally, I will present some experimental results predicted from this view on testing behaviour (Poletiek & Berndsén, 2000). Participants expressed their preference for tests varying as to their probability and the probative value of a confirming result.

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On the relevance of "irrelevant" information: extensional vs. representativeness heuristic reasoning

This study is concerned with people's use of "irrelevant" stereotypic information in estimating the likelihood of an event and individual differences in probability errors. Forty-one students were presented with three conditional, fully explicit, rule (if ... then) and were asked to choose among two probability predictions. One hundred-fifty-four students were presented with the same rule plus a stereotypic description of the characters of the story that seemed to contradict the rule. All students, in both conditions also filled in the Need for Cognition Scale. When no stereotypic information was presented, virtually all individuals draw a congruent inference in line with an extensional reasoning. However, respectively 29%, 28% and 66% of the participants reasoned non-extensionally when the description was added to the rule. The authors propose that when presented with apparently inconsistent information, individuals don't integrate the two kinds of information: rule and diagnostic information. Extensional reasoning is impeded both by the type of displayed diagnostic information and by individual differences such as a low need of cognition.

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Putting Anticipated Decision Outcomes in Context: Implications of Focalism for Regret Aversion

Post-decisional regret for foregone opportunities has been interpreted in terms of focalism. In other words, people's evaluation of an earlier decision focuses on the outcome of the decision itself and fails to take into account events that may have influenced that decision. We tested the hypothesis that anticipated pre-decisional regret is also (at least in part) a function of focalism. If this is true, then prompting decision makers to consider future events relevant to them other than the decision itself should reduce the impact of anticipated regret on decision-making. Results showed that providing future frames of reference did lead to the predicted preference reversal in investment decisions. The psychological processes underlying these reversals are further discussed.

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Why did my doctor recommend that treatment?

Two studies investigated what doctors are attempting to optimise when they recommend treatment for children with congenital heart disease. Eighty doctors attending a paediatric cardiology conference were given patient details. They rated four possible courses of action, and drew subjective multi-state survival graphs for these different treatment options. These graphs indicated their subjective probability for three outcome states (dead, alive with poor heart function, and alive with good heart function) over a 20-year time frame. In a second study, 13 doctors from a single institution undertook a similar exercise with different patients. Probability judgements varied considerably between doctors, and were related to how doctors receive feedback about long-term outcomes. Preferences for different options were most closely related to the probability of good heart function at the end of the time frame considered. This suggests that good heart function rather than survival per se and far-future rather than immediate outcomes were, in general, the goals that determined treatment preferences. Preferences are consistent with optimising the probability of the best outcome (longevity with good heart function) without necessarily minimising the likelihood of the worst outcome (early death).

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Trust and Reciprocity in Social Interactions

Social interactions usually have an ongoing character. The game theoretical prediction for these situations often leads to a large number of equilibria. I argue that individuals use simple strategies that incorporated fairness principles for decision making in social interactions to select among equilibria. In a repeated two-person bargaining experiment, one participant decided how much of an initial endowment he wanted to invest whereas the other participant decided how much of the then tripled

investment she wanted to return. The initial endowment for the second participant was varied in two experimental conditions. This resulted in a strong effect on the allocation decisions, which could be explained by fairness principles. However, there was a substantial variance among the outcomes obtained. In order to explain which particular outcome was reached, the decision process was modelled with simple strategies. Overall, the constructed heuristics are able to predict the majority of outcomes and impart insight into the cognitive decision process of individuals in social interactions. The main building blocks of these heuristics are initial trust, forgivingness, and reciprocity. The study demonstrates that the repetition of social interactions is a powerful tool for building up trust and reciprocity.

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When Preference Reversal Disappears

Preference reversal (PR) between alternatives (lottery gambles) are systematically observed when different procedures (choosing vs. pricing) are used to elicit such preferences. PR is usually explained without taking into account the response mode specificity of each procedure: when choosing subjects compare gambles within pairs (using a binary scale), while they assign a value to one gamble after the other (using a numerical scale) when they price. In our experiment, subjects were asked to evaluate both attractiveness and minimum selling price using the same response mode: either they compared gambles within pairs with a binary scale (A), or they assigned a value to gambles presented one by one using a numerical scale (B). Subjects in a control group (C) followed the classical procedure. Preference reversal did not occur in the A & B conditions, while it did in the C condition, suggesting PR is the result of the different response modes used to elicit preferences.

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The effect of risk information on respondents' perception of the chance of getting a child with Down Syndrome

The aim was to investigate the effect of risk information on women's perception of the risk of getting a child with Down Syndrome (DS). A questionnaire was sent out to 659 women. All women received a leaflet with information about a prenatal screening test. Risk information was given about the chance of getting a child with DS as a function of age. Before and after reading the leaflet women were asked what they thought their chance was of getting a child with Down Syndrome: as a verbal risk (e.g. a large chance), as a numerical risk (e.g., 1 out of 10.000) and as a relative risk (e.g., larger than average). Analysis showed that risk information had different effects on the change in women's risk perception as expressed in the three different ways. While risk perception expressed as verbal risk and numerical risk increased, the risk perception expressed as relative risk hardly changed. In addition, the correlation with the actual age-related risk of women increased for risk perception expressed as numerical risk, but not for risk perception expressed as verbal and relative risk.

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I almost made it, but I never had a chance: Practising retroactive pessimism following a near miss

When we confront disappointing events the realisation that things could have easily turned out in our favour will probably make us feel much worse. If we decide, however, that what happened was in a sense inescapable or "bound to happen" these bitter outcomes may become more palatable. Indeed, in an attempt to regulate disappointments people were found to change their perceptions of the events leading to an undesirable outcome so that in retrospect this outcome seems almost inevitable (Tykocinski 2001). Throughout life we experience many disappointments, the magnitude of which is affected, among other things, by the perceived distance from achieving the goal. As Kahneman & Tversky (1982) demonstrated, a "near miss" is more painful than a far one. Thus, a near miss is likely to produce both greater disappointment, and stronger motivation to find comfort in concluding that one never had a chance. The goal of the current experiment was to examine a situation in which the objective probability of reaching the goal is obscured by the psychological need to believe that the chances for success were in fact very slim. It was hypothesised that with mild disappointment, participants' retroactive judgements of their chances of success will reflect the objective situation (i.e., higher probability ratings in the near than the far miss condition). Sensitivity to the objective situation was expected to decline, however, when the disappointment was grave.

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Preferences for Anticipated Emotional Reactions to Decision Outcomes

In two experiments employing 80 undergraduates, we measured anticipated emotional reactions to certain as well as risky decision outcomes. In contrast to some previous research, measures were made of two dimensions of core affect, valence and activation, defining the affect circumplex. The results indicated that both these dimensions are needed to describe the anticipated emotional reactions. When the measures of the anticipated emotional reactions were combined to a nonlinear dimension in the affect circumplex ranging from elation to disappointment, the results closely replicated previous research showing that both outcome magnitude and probability affect anticipated emotions. Preference for the decision outcomes was furthermore found to be related to both dimensions of core affect. Taken together the results suggest that anticipated emotional reactions are better assessed with methods that measure both valence and activation, not a single elation-disappointment dimension.

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Mood and Decision Making

We present a study into the effects of mood on decision making processes. Such effects are often studied with computerised information boards, and negative mood has been found to lead to more alternative-wise and more elaborate decision processes. We used a standard information board, registering subjects' mouse-clicks in the cells. We also used a board in which the information in the cells remained visible all the time and subjects' eye-fixations on the cells were registered with eye-tracking

equipment. To our knowledge, this method of process-tracing has not been used before in research on the influence of mood on decision making. In our study we had two groups of subjects. With subjects in the 'sad' condition, a negative mood was induced through a combination of looking at pictures of sad faces and listening to sad music, after which they made their decisions. Subjects in the other group were not subjected to a mood induction prior to their making the same decisions as the sad group, but this group was subsequently presented with a decision task that would induce sad mood. The sequences of mouse clicks or eye-fixations on the information board were registered and subsequently analysed, to reveal the underlying decision processes.

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Does frequency necessarily improve statistical reasoning?

Recent developments in probability judgment research may be characterized by a confrontation between two opposing views. A group of theorists emphasized the role of "natural frequencies" in facilitating probabilistic correctness. In opposition, other researchers noted that visualizing probabilistic structure of the task facilitates normative reasoning, and frequency representation is one way to achieve such facilitation. In this study, the following isomorph of the "Monty-Hall dilemma" is tested: "A factory manufactures artificial gemstones. Each gemstone has a 1/3 chance that it is blurred, a 1/3 chance that it is cracked, and a 1/3 chance that it contains neither. An inspection machine removes all cracked gemstones, and retains all clear gemstones. However, the machine removes 1/2 of blurred gemstones. What is the chance that a gemstone after the inspection is blurred?" A 2 by 2 design was administered. The first variable was the use of frequency representation. The second manipulation was the use of a diagram that illustrated the relationship between the prior and the posterior probabilities. Results showed that frequency alone had limited effects, while the diagram achieved facilitation in logical reasoning.

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Brain activation in evaluative judgements and uncertainty judgements: A Functional Magnetic Resonance Imaging study

Neuroimaging research investigates which areas of the brain are activated to what extent in different mental activities. In the present study, functional Magnetic Resonance Imaging was used, which enables a high spatial resolution (3-5 mm), but a less fine temporal resolution. Neuroimaging research up to now investigated mainly tasks involving (semantic) memory retrieval. In the present study we introduced additionally evaluative judgements and uncertainty judgements. We contrasted four types of tasks: 1) Semantic memory retrieval (e.g. Schröder is Germany's minister of foreign affairs), 2) episodic memory retrieval (e.g. I have been in New York), 3) evaluative judgements (e.g. I like Leipzig), and 4) uncertainty judgements (e.g. I will live in Leipzig for the rest of my life). 13 healthy volunteers were scanned while answering the questions. All four conditions (60 items each) plus the baseline condition and null events were presented in random order. In contrast to memory retrieval, evaluative judgement produced significant activations in both the anterior fronto-medial cortex and precuneus. Uncertainty judgements produced less pronounced activations in these cortical areas, but additional activations were found in the dorsolateral and fronto-polar prefrontal cortex.