FINAL PROGRAM

&

BOOK OF ABSTRACTS

16 - 20 August 2015
Budapest, Hungary

Subjective Probability, Utility, and Decision Making (SPUDM) Conference

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Dear SPUDM participants,

Welcome to the 25th SPUDM conference at Corvinus University of Budapest. A 25th anniversary is a great milestone of the life of any institution; it usually exhibits a rich history and enduring efforts by its people. The journey of SPUDM conferences started at the end of the sixties in Hamburg when the first conference was held. Since then SPUDM has travelled all around Europe from Jerusalem to Helsinki. May be not many of you know that SPUDM actually returns to Budapest after many years since the city hosted SPUDM already in 1981.

We, at Corvinus, are very proud that our school is hosting this well-respected event. Corvinus Business School is arguably the most prestigious and acknowledged institution in the field of management and economics in Hungary hosting various international conferences every year. Yet, SPUDM is not one of the many: more than 300 participants are taking part in this meeting giving around 250 talks and presenting more than 60 posters in five days. These numbers demonstrate that the field of judgment and decision making and the related areas are getting more and more popular these days. It is a special pleasure that many of our participants are in the early years of their careers bringing fresh ideas and new visions to this community.

Here, I would like to thank the members of the scientific committee – Ana Franco-Watkins, Andreas Glöckner, Ido Erev and Balázs Aczél for their support and helping comments. The warmest thanks are also addressed to those colleagues who were willing to review the many abstracts that we had received; all of them provided us with a priceless resource. Nevertheless, many thanks are due to my fellow organizers; without them this event would not be the same.

I hope that your stay in Budapest will be fruitful and stimulating: you will meet old friends and colleagues and find new ones, but please, do not forget to taste a bit the Hungarian culture, the cuisine and meet locals during your stay in Hungary.

Richárd Szántó
Head of the Organizing Committee

16 - 20 August 2015
Budapest, Hungary

FINAL PROGRAM

SUNDAY (16/08/2015) VENUE: HOTEL GELLÉRT

16.30-17.00	**Early Registration**
17.30-18.00	**Welcome and Opening**
18.00-19.00	**Presidential Address**
19.00-21.00	**Welcome reception**

MONDAY (17/08/2015) | VENUE: CORVINUS UNIVERSITY OF BUDAPEST, BUILDING "C"

08.00-09.00	**Registration**						
09.00-10.00	**Keynote Address** | Room Grand Auditorium **Barbara Mellers**: The Secrets to Better Forecasts						
10.00-10.30	***Coffee break***						
10.30-12.30	**Choice 1** **Room C V** **Chair:** Patric Andersson	**Risk 1** **Room C VI** **Chair:** Ben Newell	**Emotion** **Room C VII** **Chair:** Aidan Feeney	**Symposium 1: When samples are small: Learning and decision making** **Room C VIII**	**Symposium 2: Applications and Innovations of Eye-Movement Research in Judgment and Decision Making** **Room C IX**	**Symposium 3: Cognitive Processes in Unethical Behavior** **Room C X**	**Experts & Wisdom** **Room 104** **Chair:** Derek Koehler
	Why do bettors prefer combo bets? On conjunction errors in real life (Nilsson&Andersson)	Knowing more or knowing less? When more information induces risk taking in the face of rare catastrophes (Newell et al)	The Effect of Positive Arousal on Preferences for Risky Monetary Options (Galentino et al)	On the relationship between the distinct “reliance on small samples” phenomena (Erev)	Areas of Interest as a Signal Detection Problem in Behavioral Eye-Tracking Research (Orquin et al)	Justifications shape ethical blind spots (Pittarello et al)	Can "false balance" distort public perception of consensus in expert opinion? (Koehler)
	Shifting the Basis of Perceived Similarity: Implications for Inference, Judgment and Choice (Urminsky&Bartels)	On the effective communication of uncertainty: Lessons from the climate change and intelligence analysis domains (Ho et al)	Regret, disappointment and situational labels in economic games (Martinez&Zeelenberg)	The inability not to learn – A serious metacognitive handicap (K. Fiedler)	Eyes of the prize? Evidence of inattention to obtained outcomes in repeated decisions from experience (Ashby&Rakow)	Temporal dynamics of cheating: Arousal and attention analysis (S. Fiedler et al)	Post decision facts distortion when experts and facts speak against your decision (Svenson et al)
	Dynamic dissonance effects: Predicting post-decision preferences (Kvam&Pleskac)	Rank-Dependent Integration in Decision-Making under Risk (Millroth)	Emotional State and Market Behavior (Breaban)	Why it can be helpful to ignore sample bias (Denrell)	Attention Bias Predicts Intertemporal Choice (Franco-Watkins&Mattson)	Detecting (un)justified lies: When Robin Hood Takes a Polygraph (Ayal et al)	Predicting NFL game winners: The wisdoms of heuristics, experts, and crowds (Luan)
	Does memory accessibility affect the order in which information about decision alternatives is considered? (Link&Dimov)	What is the essence of risk taking? (Frey et al)	To deliberate or not? The effects of deliberating under anticipated regret on valuation (Ang&Diecidue)	The curse of abundance (Kareev)	Sensitivity to affective information and investors’ evaluation of past performance: An eye-tracking study (Rubaltelli et al)	The Psychological Consequences of Extreme Rituals on Morality (Mitkidis et al)	Selecting experts for probabilistic expert knowledge elicitation (Bolger)

10.30-12.30	Do people use automatic or deliberate processes in decisions from memory? (Bröder&Graf)	A Dissociation Between Search and Choice in Decision Making Under Risk (Schulte-Mecklenbeck)	Work More the Feel More: The Influence of Effort on Affective Forecasting (Toma et al)	Small Samples and the Illusion of Linearity in Judgment (Juslin)	A closer look at decision making under time pressure (Johnson et al)		
ctd.	How we can influence people's choices by evoking counterfactuals (Canic et al)	Trends in forecasts: When past predictions change present risks (Teigen et al)	Regret and responsiveness to missed opportunities in young children (Feeney et al)				
12.30-13.30	**Lunch**						
13.30-15.30	**Choice 2** **Room C V** **Chair:** Norbert Becser	**Risk 2** **Room C VI** **Chair:** Olivier L'Haridon	**Cognitive processes** **Room C VII** **Chair:** Luca Polonio	**Symposium 4: Challenges and Advances in Charitable Giving Research** **Room C VIII**	**Symposium 5: Revisiting the exploration-exploitation tradeoff in decisions-from-experience** **Room C IX**	**Symposium 6: The Development of Decision Competence** **Room C X**	**Nudge 1** **Room 104** **Chair:** Nuria Rodriguez Priego
	Decision quality - Relations between different types of decision outcomes (Geisler&Allwood)	The Risk Attitudes of Professional Athletes (Bleichrodt et al)	Testing the level of consistency between choices and beliefs using eye-tracking (Polonio)	Pseudoinefficacy: Negative feelings from children who cannot be helped reduce warm glow for children who can be helped (Västfjäll et al)	Exploration, exploitation, and strategy use in experiential choice (Rakow&Ashby)	Age Differences in Memory-Based Decision Making (Josef et al)	In anthropomorphic figures we trust! Testing the effect of privacy nudges on passive and direct disclosing behaviour (Rodriguez Priego)
	The influence of personal mitigating factors on criminal sentencing decisions (Belton&Dhami)	Risk Taking and Social Ranking: An Evolutionary Perspective (Schmidt)	Tracking eye movements to reveal memory processes during rule- versus similarity-based decision making (Scholz et al)	Framing charity advertisements: Positive appeals are liked, but negative appeals work better (Erlandsson&Nilsson)	Decomposing complexity in decisions from experience: Exploration, exploitation and diversity of choice (Konstantinidis & Ashby)	The Development of Adaptive Decision Making: Recognition-Based Inference in Children and Adolescents (Horn et al)	Nudging and Dodging Vaccination through Defaults (Chapman et al)
	Less Is More: The Role Of Feedback Frequency In Repeated Binary Choice From Experience (Hagmann et al)	Investigating the Fluency-Affect relationship in judgements of (in)coherent risk (Gamblin)	Looking and weighting: How is gaze behavior affected by attribute importance in quantitative judgment? (Renkewitz)	Visceral needs and donation decisions: Do people identify with suffering or with relief? (Kogut&Harel)	Unpacking the exploration-exploitation trade-off in a changing world (Newell et al)	Lost in Search: (Mal-)Adaptation to probabilistic decision environments in children and adults (Betsch et al)	The Maximizing Norm. Encouraging to Get the Best Enhances Decision Avoidance (Van Putten&Nordewier)

	Number Preferences (Wang et al)	The Foreign Language Effect in Judgments of Risk and Benefit: The Role of Affect (Hadjichristidis et al)	Looking at Ingroup Love and Outgroup Hate: An Eye-Tracking Analysis of the Cognitive Processes involved in Intergroup Decision Making (Rahal et al)	Perceived Costs and Benefits Motivating Donation Decisions: Different Evaluability of Money and Lives (Rubaltelli et al)	Restless bandits: Exploring and exploiting in a changing environment (Speekenbrink)	The effects of normatively irrelevant feedback on children's and adults' probabilistic decision making (Lang&Betsch)	The role of domain knowledge, interfaces and mindsets on energy-saving decisions made with a recommender system (Willemsen et al)
13.30-15.30 ctd.	How to be a loser when you win: Lucky numbers, lucky stores, edge aversion, proximity aversion and lottery choices (Ayton&Reimers)	The effect of delay on risk tolerance and probability weights (Zielonka et al)	Does looking mean liking? Differences across perceptual and preferential choice processes (Yu et al)	Moderators of anchoring effects in charitable giving (Kleber et al)		The impact of natural cue presentation on children's utilization of probabilistic cues (Lehmann et al)	Tailoring energy-saving advice using a unidimensional Rasch scale of conservation measures (Starke et al)
	Patterns in the Lottery Game (Becser&Paprika)	Trust in deliberation: The consequences of deliberative decision strategies for medical decision making (de Vries)					Natural Frequencies Facilitate Diagnostic Inferences of Managers (Hafenbrädl et al)
15.30-16.00	***Coffee break 2***						
16.00-18.00	**Choice 3 Room V Chair:** Eldad Yechiam	**Risk&Uncertainty Room VI Chair:** Mandeep Dhami	**Intertemporal Choices 1 Room VII Chair:** Elke Weber	**Financial Decision Making 1 Room VIII Chair:** Tomás Lejarraga	**Loss & Ambiguity Aversion Room IX Chair:** Peter Wakker	**Social Aspects of JDM 1 Room X Chair:** Nathaniel Phillips	**Moral Issues 1 Room 104 Chair:** Shaul Shalvi
	Losses Increase the Sensitivity of Internet Searches to Stock Market Events (Yechiam et al)	Decision-making in aging: Age-related differences in decisions under ambiguity and decisions under risk (Rosi et al)	Giving the Future A Chance (Weber)	It's About How and not only What Investors Learn (Lejarraga et al)	Using Prospect Theory to Measure Ambiguity Aversion and Ambiguity Insensitivity within Five Minutes (Wakker)	Improving inner and outer crowd benefits with confidence (Philips et al)	Corrupt collaboration (Weisel&Shalvi)
	A new approach in studying Decision-Making: the EXogenous ACcumulation Task (EXACT) (Biscione&Harris)	The Value of Contradiction for Judgment under Uncertainty: The Consider-Two-Opposites Technique (Hütter&Hansen)	The effect of verb tenses on the perception of temporal distance from the present to the future (Stragà&Warglien)	Perceptions of financial volatility (Duxbury&Summers)	Ambiguity aversion in children (Kühberger)	Trust and Reputation in the Sharing Economy: The Role of Personal Photos in Airbnb (Ert)	"Was that a lie?" Motivated Interpretations of potentially painful information (Vainapel et al)

16.00-18.00 ctd.	How forgetting affects rule- and exemplar-based judgments (Hoffmann et al)	Bias or Sensitivity in Risky Choice? Lottery Decisions under Cognitive Load (Olschewski et al)	Delay discounting measured for uni-modal and cross-modal choices (Read et al)	Portfolio selection in bull and bear market: the role of aspirations, sensation-seeking, and affect in stock investments (Sokolowska)	A Robust Test of the Descriptive Value of Loss Aversion in Decisions under Risk and Uncertainty (Bleichrodt&L'Haridon)	The role of implementation time and coherence seeking in evaluations of political proposals (Montgomery et al)	The Theory of Planned Behaviour in Unlawful File Sharing: A Meta-Analytic Review and a Survey (Fleming et al)
	Single Process or Multiple Strategies: Which Framework of Multi-Attribute Decision Making describes Decision Makers' Stopping Behavior best? (Söllner & Bröder)	Conversational pragmatics as a mechanism of cross-cultural differences in interpreting verbal quantifiers of uncertainty (Sirota&Juanchich)	Automatic approach and avoidance in short versus farsighted intertemporal choice (Woyke et al)	Personal experience of low-probability events influence willingness to buy insurance: The mediating role of worry and subjective probability (Polec et al)	Meta analysis of loss aversion in risky context (Walasek et al)	Gender bias in hiring decisions: The role of decoy effects (Tang&Keck)	Kind beyond belief: fairness norms predict trust game reciprocity independently of second-order expectations (van Baar et al)
	Foreign Language and Moral Thought (Geipel et al)	From observation to prediction: Effects of kind and wicked experience (Soyer et al)	Do we discount time as we discount money? Gutierrez Morenol)	Money Doctors or Charlatans? Trust, Advice, and Risk Taking In Financial Investments (Q. Sun et al)	Choice Bracketing and Sequential Gambles: How Problem Representation Changes the Predictions of Prospect Theory (Webb&Shu)	The Wisdom of Crowds Within: Repeated Judgment Sampling in Two Natural Experiments (van Dolder&van den Assem)	Corrupt reciprocity (Leib et al)
	Fifty Shades of "Medium": The Psychology of Intermediate Attribute Levels (Schley&de Langhe	When Probable = Improbable: Sentential Context Effects in the Numerical Interpretation of Positive and Negative Linguistic Probabilities (Dhami&Mandel)		All's Well That Ends Well? On the importance of how returns are achieved (Zeisberger)	Double Reference Points: The Effects of Social and Financial Reference Points on Decisions under Risk (Lu)	When Your Strength Threatens Me: Supervisors Show Less Social Comparison Bias than Subordinates (Jia)	Unfair treatment corrupts compliance (Dezső et al)
18:15-19:30	**Early Career Event** | Room C VII						

TUESDAY (18/08/2015)
VENUE: CORVINUS UNIVERSITY OF BUDAPEST, BUILDING "C"

9.00-10.00	**Keynote Address** | Room Grand Auditorium Nick Chater: Virtual bargaining: A micro-foundation for social decision making and interaction						
10.00-10.45	**Jane Beattie Award winner presentation** | Room Grand Auditorium Timothy Pleskac: Ecologically rational choice and the structure of the environment						
10.45-11.15	***Coffee break 1***						
11.15-13.15	**Poster Session**						
13.15-14.15	***Lunch***						
14.15-16.15	**Theory 1** **Room C V** **Chair: Daniel** Navarro-Martinez	**Risk&Social Issues** **Room C VI** **Chair:** Shosh Shahrabani	**Learning** **Room C VII** **Chair:** Dries Trippas	**Financial Decision Making 2** **Room C VIII** **Chair:** Eric Johnson	**Symposium 7: Nudge: Testing the limits** **Room C IX**	**Social Aspects of JDM 2** **Room C X** **Chair:** Sule Guney	**Consumer Choice 1** **Room C 104** **Chair:** Yvetta Simonyan
	Uncertainty Regulation Theory: How the feeling of uncertainty shapes decision making (Navarro-Martinez&Quoidbach)	The relationship between type of army service and risky behavior among young people in Israel (Shahrabani & Garyn Tal)	How Learning by Comparison Impacts Decision Performance and Strategy Selection (Trippas&Pachur)	Sound financial decisions despite cognitive aging (Johnson)	Nudge awareness and the effect of good and bad defaults (Isoni et al)	Asymmetric impact of competitive and cooperative environments on decisions involving ambiguity (Guney&Newell)	Quality inferences about universities and consumer brands from memory (Simonyan & Goldstein)
	Rationality – the impact of conflict and context on the decision strategy (Sleboda)	It's not just about local warming: Perceptions of weather and climate change in the UK (Taylor et al)	Human behavior in contextual multi-armed bandit problems (Stojic et al)	Financial Loss Aversion Illusion (Merkle)	Warning: You Are About to Be Nudged (Hagmann et al)	The psychology of self-interested decisions: How (in)sensitive are we to the costs borne by others? (Barneron et al)	How bookies make your money (Newall)
	Fast logic: Evidence for intuitive logical judgements (Bago&de Neys)	Tornado Risk Perception from Visual Cues (Dewitt)	The Paradoxical Imitation of bad examples: Learning from unsuccessful strategies (Aharonov-Majar et al)	Retirement Investment Decisions: the Arena Where (Risk) Attitude Beats Age (Konečný&Bačová)	Ethically Deployed Defaults: Transparency And Consumer Protection Via Disclosure and Preference Articulation (Steffel et al)	Efficiency isn't always Bayesian: the case of perceptual decision making in groups (Floyd et al)	Absinthe + Brandy = Champagne: How Dyads Overcome Choice Overload (Reutskaja et al)

14.15-16.15 ctd.	The Dual Nature of Utility - Categorical and Comparative Evaluations in Economic Decisions (Zürn&Strack)	Deciding to help: effects of risk and crisis communication (Bakker et al)	Choosing Bad Over Good: Learning and Counterproductive Punishment (Sobolev&Erev)	Shallow Pockets, Kind Heart: The Effect of Perceived Personal Financial State on Prosocial Activity (Motsenok&Ritov)	Contrasting true preference and nudged preference (Lin et al)	How envy among team members impacts their helping decisions? (Montal Rosenberg&Moran)	Do consumers know how much electricity is used by their appliances? (Lesic et al)
	Why do decision makers value symbolic goods? (Caldwell)	Heat protection behaviors and positive affect about heat during the 2013 heat wave in the United Kingdom (Lefevre et al)	Salience and learning in multi-cue environments (Jonaityte&Warglien)	Cash in hand, crashes in mind (Gao&Liu)	Why Americans Oppose Nudges (Jung&Mellers)	Status&Empathy: Modulating Factors of Cooperation (LV et al)	Muscular Male Employees Increase Men's Conspicuous Consumption (Otterbring)
	Nonlinear decision weights or skewness preference? A model competition (Spiliopoulos&Hertwig)	Communicating Probability of Environmental Risk: Accounting for Face-threatening Contexts (Butt et al)	Metacognition and Variance in Two Arms Bandit Task (Hertz et al)	Sound credit scores and financial decisions despite cognitive aging (Li&Johnson)		Social Learning in Categorization (Puskaric et al)	The Effect of Peer Observation on the Consumption of Temptation Goods: Experimental Evidence (Grohman & Sakha)
16:15-16:45	***Coffee break***						
16.45-18.45	**Methods Room C V Chair:** Gijs van de Kuilen	**Heuristics and Biases 1 Room C VI Chair:** Gaelle Vallee-Tourangeau	**Sampling Room C VII Chair:** Christopher Olivola	**Individual differences 1 Room VIII Chair:** Wandi Bruine de Bruin	**Moral Issues 2 Room IX Chair:** Vladimira Cavojova	**Social Aspects of JDM 3 Room X Chair:** Ellen Evers	**Risk 3 Room C 104 Chair:** Eyal Peer
	Measuring (Higher Order) Correlation Aversion (van de Kuilen&Ebert)	Priming logical intuitions can reduce heuristic thinking in conjunction fallacies (Vallée-Tourangeau&Faure-Bloom)	A Decision-by-Sampling Account of Risk Preferences Regarding Frequent Small-Scale Deadly Events (Olivola)	"Thinking about numbers is not my idea of fun": Need for cognition mediates age differences in numeracy performance (Bruine de Bruin et al)	How does your attitude towards ethical issues affect your reasoning? (Cavojova et al)	When Do People Prefer Carrots to Sticks? A "Matching Effect" in Policy Evaluation (Evers)	The Malleability of Revealed Risk Preferences (Vosgerau&Peer)
	Co-variation Estimation in Danger: Unknown Singular Behavior of Pearson's Correlation Coefficient (Shiina)	Increasing cognitive load reduces the impact of heuristic thinking in conjunctive probability judgments (Faure-Bloom&Vallée-Tourangeau)	Decision by Sampling and Better/Worse-than-Average Effects (Han&Olivola)	What Were They Thinking? Understanding Decisions to Discontinue Failing Plans (Strough)	Why Enough is Never Enough: Greed and Overearning (Seuntjens et al)	A Multi-national Investigation of Cross-societal Cooperation and Discrimination (Dorrough & Glöckner)	Comparing Risk Aversion When Beliefs Differ (Baillon et al)

16.45-18.45 ctd.	Multi-attribute utility models as cognitive search engines (P. Analytis et al)	Overlap of Accessible Information Undermines the Anchoring Effect (Bahník&Strack)	Investigating the adaptivity of advice taking: Results from a sampling paradigm (Ache&Hütter)	Multiple numeric competencies and their relation to financial outcomes over time (Tompkins et al)	The winner takes it all (Schurr&Ritov)	The more we are, the less we care: A new paradigm for intergenerational dilemma decision making (Kieslich&Hilbig)	A scanpath analysis of the risky decision-making process (Liang et al)
	How not to measure overconfidence (Langnickel&Zeisberger)	Exploring decision-confidence in the conjunction fallacy tasks (Szollosi et al)	Reliance on Small Samples, the Wavy Recency Effect, and Similarity-based Learning (Plonsky et al)	Resistance to anchoring depends on crystallized ability: An individual-differences study (Del Missier et al)	Unethical Behavior under Different Modes of Competition (Tzini&Jain)	When do I do what others do? Social feedback, factual knowledge, and their impact on pro-environmental behavior (Kause et al)	Regret theory and risk attitudes (Somasundaram& Diecidue)
	Development and Validation of the Scientific Reasoning Scale (Drummond&Fischhoff)	Optimism Bias in The Context of Project Planning: A Study of Subjective Probability Distribution of the Maximum of Multiple Durations (Liu&Huang)	Ownership History and Experience-Based Decision Making (Wang et al)	The impact of cognitive reflection versus calculation in decision making (Sinayev&Peters)	May the best man lose: When moral emotions reduce competitive behavior (Haran)	Spontaneous cooperation for prosocials, but not for proselfs: Social value orientation moderates spontaneous cooperation behavior (Mischkowski)	Informing affects framing effect (Damnjanović)
	Measuring Subjective Graph Literacy in Diverse Samples and Cultures (Garcia-Retamero et al)	An Integrative Model of Anchoring Effects (IMAE) for the Prediction of Quantitative Judgments (Schley&Turner)	Acting fast vs. biding time: Effects of competitive pressure on information sampling (Markant)	Developmental trajectories of psychological regulation predict later decision-making competence: a nine-year longitudinal study (Weller et al)	The self-other discrepancy in moral judgment (Rao)	The role of recipients' identifiability in allocation decisions among individuals and groups (Ritov)	Difference in perception of active vs. passive risk taking: the role of accountability (Bereby-Meyer)

WEDNESDAY (19/08/2015) VENUE: CORVINUS UNIVERSITY OF BUDAPEST, BUILDING "C"

09.00-10.00	**Keynote Address** | Room Grand Auditorium Botond Kőszegi: Unrealistic Expectations and Misguided Learning						
10.00-10.30	**Coffee break**						
10.30-12.30	**Theory 2** **Room C V** **Chair:** Timothy Pleskac	**Heuristics and Biases** **Room C VI** **Chair:** Balázs Aczél	**Experience** **Room C VII** **Chair:** Thorsten Pachur	**Individual differences 2** **Room C VIII** **Chair:** Stefan Herzog	**Symposium 8: From Anomalies to Forecasts: The toll-free critique and the Choice Prediction Competitions solution** **Room C IX**	**Social Aspects of JDM 4** **Room C X** **Chair:** Bettina von Helversen	**Data & Information** **Room C 104** **Chair:** Nigel Harvey
	Simulating human decision making about frequency and duration with artificial neural networks (Titz&Sedlmaier)	An Importance Heuristic in Decision Deferral (Krijnen et al)	Incorporating descriptions into decisions from experience (Weiss-Cohen et al)	Signal detection in the wild: How to quantify the error tradeoffs of decision makers who are unable or reluctant to reveal them (Herzog)	The toll-free critique of behavioral decision research (Erev)	The Legitimacy of Power influences Sharing in the Dictator Game (von Helversen & Schöbel)	Judgment accuracy: Do more data help? (Harvey)
	Modeling the effect of stereotypes on the decision to use deadly force (Pleskac&Cesario)	Calling an action stupid: a reflection of people's rationalistic expectations (Aczel et al)	Cross Cultural Differences in Decisions from Experience: Evidence from Denmark, Israel, and Taiwan (Di Guida et al)	Relating decision-making styles to social orientation and time approach (Geisler)	Observations from previous choice prediction competitions (Ert)	When less is better than more: Preferring equity over efficiency in allocation decisions (Gordon-Hecker et al)	Knowing the other's mind: Using process data to test process predictions of 'mind-reading' models (Scherndl et al)
	Modelling the effect of attribute conflict in pairwise comparisons through random multiattribute utility (Deparis&Bhattacharjya)	The Role of Psychological Ownership in Sunk Cost Effects (Dickert et al)	Modeling Probability Weighting in Decisions from Experience (Pachur&Hertwig)	The Seller's Sense: Buying-Selling Perspective Affects the Sensitivity to Expected-Value Differences (Abofol et al)	Choice prediction competition for decisions under risk and ambiguity (CPC2015) (Erev et al)	When Almost Fair Isn't Good Enough: Fairness Thresholds in the Ultimatum Game (Boyce-Jacino et al)	Eliciting and Aggregating Forecasts When Information is Shared (Palley&Soll)

	When Optimal Experimental Design Models are not Optimal: Sequential Search, Optimality, and Heuristics (Nelson et al)	A Magnitude Effect in Judgments of Subjective Closeness (Kanten&Teigen)	The Reversed Description-Experience Gap: Disentangling Sources of Presentation Format Effects in Risky Choice (Glöckner et al)	Utilize experimental games as objective personality measures - stability, reliability, validity (Schlösser et al)	My toll-free Number: the model that won CPC2015 (Cohen)	The role of personal values and empathy in cooperative game with strangers (LV et al)	The decision to collect information, and the coexistence of insufficient and over-checking (Roth et al)
10.30-12.30 ctd.	A Triple-Stopping Threshold System For Decision Making: A Cast-Net Stopping Rule Model (Fific&Buckman)	The Power of the Representativeness Heuristic (Bhatia)	Modeling Peoples' Risk-Return Belief Helps to Understand Preference from Experience (Hoffart et al)	Genetic correlations between risk-taking propensity and resting-state functional connectivity (D. Zheng et al)	What can we learn from Choice Prediction Competitions? (Spiliopoulos&Ortmann)	Spatial preferences in competitive and co-operative hide-and-seek games (Reimers&Ayton)	The dynamics of evidence accumulation and choice (Noguchi&Love)
		Motivated reasoning in the prediction of sports outcomes and the belief in the "hot hand" (Braga)	The description-experience gap in the sampling paradigm: a meta-analytic review (Wulff)	Genetic and environmental influences on gambling: A meta-analysis of twin studies (R. Zheng et al)		Preference and Belief Imprecision in Games (Butler et al)	Managing Consumers' Brand Judgments When Things Go Wrong: Order-Seeking as a Response to Goal Failure (Khenfer)
12.30-13.15	**EADM General Assembly** **Room Grand Auditorium**						
13.15-14.15	***Lunch***						

19.00-22.00	**Conference Dinner on Europa Boat (Optional Program)**

THURSDAY (20/08/2015) VENUE: HOTEL GELLÉRT

09.00-10.00	**De Finetti Prize Winner presentation** | Room Tea Szalon Jared Hotaling: Decision Field Theory-Planning: A Model of Planning On the Fly					
10.00-10.30	***Coffee break***					
10.30-12.30	**Consumer Choice 2** **Room Kávé Szalon** **Chair:** Michele Graffeo	**Medical&Health** **Room Gobelin** **Chair:** Geir Kirkebøen	**Intertemporal Choice 2** **Room Tea Szalon** **Chair:** Zhihua Li	**Individual differences 3** **Room Panoráma** **Chair:** Predrag Teovanović	**Nudge 2** **Room Forrás** **Chair:** Eric Stone	**Moral Issues 3** **Room Zene Szalon** **Chair:** Simon McNair
	Individual differences in competent consumer choice: the role of impulsivity and numeracy (Graffeo et al)	"The Median Isn't the Message" (1982) – thirty years later: How to communicate expected survival time to patients? (Kirkebøen)	Look forward or think back? An examination of reference-dependent intertemporal preferences (Li&Zhong)	Unfolding anchoring effect: Individual difference approach (Teovanović)	The Effect of Presentation Formats on Rational Information Search (Wu et al)	Hearts over heads? Age-related differences in moral decision making (McNair et al)
	A Lens Model Analysis of Individual Nutrition Judgments Using the Nutrition Fact Panel (Gonzalez-Vallejo&Carter)	What factors shape informed decision making about screening with benefits and harms? (Petrova et al)	Dynamic cognitive models of intertemporal choice (J. Dai et al)	Measuring Individual Differences in Social Value Orientation Using the Needleman-Wunsch-Algortihm: An Eye Tracking Study (Schlegelmilch&S. Fiedler)	Determining the theoretical mechanisms behind graphical display effects (Stone et al)	Signal Detection Decision Models of Forgiveness (Tan et al)
	Modern foraging: exploration and exploitation in supermarkets (Riefer&Love)	Partnering or persuading? Decision making during consultations between breast cancer patients and medical oncologists (Engelhardt)	Inconsistent planning in the allocation of time across enjoyable and boring tasks (McDonald et al)	Studying the Processes underlying Cognitive Reflection Test Performance (Szaszi et al)	Fostering informed decisions: How to encourage active processing of risk information using dynamic icon arrays (Okan et al)	Decision theory: A vehicle for reflective management? (Köves et al)

10.30-12.15 ctd.		Attention in Health Judgements (Mullett&McDonald)	Unpacking manipulation increases perceived temporal distance (Y. Sun et al)	Drift from rationality caused by affective processes is moderated by numerical skills (Fuławka&Traczyk)	Twenty years of natural frequencies: A systematic review and meta-analysis of the effect of natural frequencies on Bayesian reasoning (McDowell&Jacobs)	The politeness of donation request does not predict charitable behaviour but charitable behaviour predicts perceived politeness (Juanchich&Sirota)
			Distinct role of approach-avoidance motivation: Toward a new understanding of gain-loss asymmetry in temporal discounting (Liang)	Numeracy, education and wealth (Estrada-Mejia&Peters)		Distributive Justice behind the Veil: A Study of Social Preferences under Various Degrees of Ignorance (Woike&Hafenbrädl)
12.15-13.15	***Lunch***					

CHOICE 1

Why do bettors prefer combo bets? On conjunction errors in real life

Håkan Nilsson & Patric Andersson

The paper aims to investigate whether conjunction errors and overestimations of conjunctive probabilities affect, which have been found by prior research, affect choice behavior in real life situations. However, prior research is limited in that it mostly rests on findings from laboratory experiments and little is known whether the observed tendencies affect decision-makers in real life. Sports betting enables empirical tests of people's ability to assess probabilities in naturalistic settings. The paper studied actual choice behavior by bettors who were recruited at university campus or betting stores. As compensation for answering a survey, each bettor chose between a single bet (involving one event) and a combo bet (involving three events). The two bets had identical stakes and odds. After receiving the selected bet, the bettor assessed the chances that it (and the non-chosen bet) would be successful and motivated their choice. Study 1 had 340 bettors. While 50% was able to observe the bets before choosing, 50% was only informed about the types of bets, stakes, and the odds. The rationale was to control for contextual information. Study 2 had 100 bettors who did not receive details about the odds, but were informed about the stakes and the events that the bets involved. Half of them choose between bets with low odds, while the other half faced bets with high odds. Consistent with findings from laboratory experiments, the two studies suggested a significant preference for combo bets. This is irrational as the implicit probabilities derived from the odds indicate that single bets have slightly better chances to be successful than combo bets. Thus, people seem to overestimate conjunctive probabilities and commit conjunction errors even when money are at stake.

Shifting the Basis of Perceived Similarity: Implications for Inference, Judgment and Choice

Oleg Urminsky & Daniel Bartels

Decisions often depend on the similarity between stimuli encountered in the decision context. In six studies, we examine how judgments and choices are affected by systematic changes in the basis of perceived similarity. We distinguish between lower-level compositional similarity and higher-level thematic similarity, demonstrating that the basis of similarity shifts systematically over time and with other contextual cues. This shift in similarity the prices people anticipate and are willing to pay for products, and the impact of introducing an intermediate choice option in substitution effects (where it can cannibalize either one or another option's choice share).

Dynamic dissonance effects: Predicting post-decision preferences

Peter Kvam & Timothy Pleskac

A common finding associated with cognitive dissonance theory is that people tend to prefer an item more strongly after they have chosen it over another (bolstering). However, early work on the topic uncovered instances of the opposite effect, where preference strength was lower for a chosen item (suppression). In order to better understand and predict these effects, we examined the empirical time course of post-decision preferences in a multi-attribute binary choice and preference rating experiment. By comparing a condition where participants must choose between items then rate their preference against one in which they only rate their preference, we show instances of both bolstering and suppression effects resulting from oscillating preferences over time. Decision field theory [DFT] and similar classical probability models are unable to account for these effects because they represent preferences as dynamic but choice-invariant points. However, a quantum random walk version of DFT, which represents preferences as a superposition over multiple preference levels and treats decision-making as a constructive process, predicts both the suppression and bolstering effects as well as the oscillations within conditions. In a quantitative model comparison, we also find that quantum DFT provides better fits to the data than the classical model, suggesting that quantum DFT may provide a viable quantitative and dynamic account of pre- and post-decisional preference formation.

Does memory accessibility affect the order in which information about decision alternatives is considered?

Daniela Link & Cvetomir Dimov

Many every-day decisions are made under uncertainty. In these situations, people must form a best guess about some unknown decision criterion – such as product quality – by using information associated with decision alternatives as cues. According to the fast-and-frugal heuristics framework, people are equipped with a collection of simple cue-based decision strategies, or heuristics, which allow them to quickly make such inferences. One prominent example is the take-the-best heuristic. Take-the-best compares decision alternatives sequentially on cues in order of decreasing validity. Upon finding a cue which allows for a decision, information search is stopped and a decision is made for the alternative with the positive cue value. Although this heuristic has been shown to make accurate predictions in many environments, doubts about its psychological plausibility have been raised. Instead of retrieving cues in the order of a pre-established hierarchy, people could rather rely on the cues' fluency, or the speed with which they are retrieved from memory. In an experiment, we test the assumption of cue ordering according to validity against cue ordering according to retrieval fluency. We manipulate the frequency with which cues are presented in a learning phase. We find that retrieval fluency affects estimated cue usage and cue validity, as well as the weight attributed to cues in a subsequent decision phase. We argue that the frequency with which cues and objects co-occur in the environment might provide a psychologically plausible mechanism to order cues for the take-the-best heuristic as well as guide strategy selection in inferential decision making.

Do people use automatic or deliberate processes in decisions from memory?

Arndt Bröder & Michael Gräf

Despite being common in everyday life, decisions from memory are an underresearched topic. Nevertheless, conflicting results have been reported, suggesting either the prevalence of simple sequential heuristics (Bröder & Schiffer, 2003) or of automatic compensatory ("intuitive") processes (Glöckner & Hodges, 2011). In three experiments, we systematically investigated the impact of procedural differences between both lines of research. Automatic parallel processes were more prevalent when the cue validity hierarchy (Experiment 1) and cue directions (Experiment 2) were self-evident, whereas counterintuitive hierarchies and non-obvious cue directions fostered sequential heuristics. This led to the hypothesis that the explicit representation of cue directions and hierarchies burdens working memory and prevents simultaneous processing of all cue information. To test the hypothesis, a third experiment used a classical load manipulation and yielded comparable results, supporting the working memory explanation of the processing differences documented by different labs.

How we can influence people's choices by evoking counterfactuals

Emina Canic, Neil Stewart, Marc Scholten & Daniel Read

There are many demonstrations of how reference points, past outcomes, other people's outcomes or alternative outcomes influence judgments and decisions. For example, Scholten and Read (2015) show that people prefer an option including the attribute value "pay £0" over the same option including "receive £0". These results are interesting because in both options – pay zero and receive zero – no money is being exchanged. One possible explanation for this mutable-zero effect is that pay zero evokes less favorable counterfactual comparisons whereas receive zero evokes more favorable comparison values. Hence, the option including the pay zero attribute appears relatively better than the option including the receive zero attribute value.

Here we test whether the different comparison values triggered by the words "pay" and "receive" are causing people to choose the option including pay zero over the option including receive zero. The results presented suggest that we can evoke favorable and unfavorable counterfactual values if the comparison value is neutral (Experiments 1A, 1B and 1C) but we cannot "enforce" cross-category counterfactual values (comparing pays with receives) if the comparison value already belongs to a natural category (Experiments 2A and 2B). When less favorable counterfactual values are evoked participants become more likely to choose an option as opposed to when more favorable comparison values are triggered.

RISK 1

Knowing more or knowing less? When more information induces risk taking in the face of rare catastrophes

Ben Newell, Tim Rakow, Eldad Yechiam & Michael Sambur

Do reports of the risks observed in danger prone regions dissuade travelers? Does hearing about catastrophes arising from climatic changes cause concern and promote action? Data from two experiments (total N = 180) involving over 70,000 discrete choices suggest not. Perhaps counter-intuitively, we find that adding information about forgone outcomes increases the propensity to expose oneself to catastrophic risk. In the experiments, participants selected a house to “live in” in one of three regions over successive rounds. Each region was described as associated with different levels of risk of a natural disaster: no risk, rare with moderate impact, very rare but catastrophic impact. Participants received global, local or no foregone feedback regarding the extent to which their own and other regions had suffered catastrophes. Provision of global foregone feedback, in which participants learned about damage in all three regions, led to a risky region being selected on 55% of occasions. In contrast, when participants received only local foregone feedback – information pertaining to the extent of damage in their own current region – or no foregone – information only about their own current dwelling – risky regions were selected on 40% and 43% of rounds, respectively. We argue that this pattern of responses is consistent with participants underweighting rare catastrophic events and show that this underweighting tendency persists even when risky regions have a lower expected value than safe ones.

On the effective communication of uncertainty: Lessons from the climate change and intelligence analysis domains

Emily Ho, David Budescu, Mandeep Dhami & David Mandel

Public policy-makers routinely receive, act on, and communicate information characterized by uncertainty. Given that consequential decisions are made on the basis of such information, it is imperative that these uncertainties are communicated effectively. Many organizations have developed standardized lexicons for communicating uncertainty using verbal probability expressions, but the policies and guidelines vary greatly and lack empirical validation. Accordingly, the effectiveness of such lexicons is questionable. We develop empirical methods to standardize the language of uncertainty so that verbal probabilities achieve maximal agreement among all parties in a communication. We implement these methods in two policy-relevant domains: climate change and intelligence analysis. In both domains, we show that evidence-based lexicons exhibit much higher rates of compliance than the current organizational policies.

Rank-Dependent Integration in Decision-Making under Risk

Philip Millroth

The common assumptions in descriptive models of decision making under uncertainty has been that people either (i) try to maximize utility by consistently using multiplicative integration of the probability and value of all outcomes, or that they (ii) apply non-compensatory lexicographic heuristics. However, the integration function in decision making under risk and uncertainty has arguably been neglected; additive integration have in many other areas of psychology been successful in explaining behavior, yet it has not been sufficiently tested in the current context. Also, the assumption of consistent multiplicative integration may be premature as people may integrate focal and non-focal information differently – a notion that has not yet been tested. We show that people engage in rank-dependent integration: our participants integrated probability and value multiplicatively only for the focal outcome (the outcome with the highest value), whereas the integration for the other, non-focal, outcomes was performed by simpler additive integration. We argue that rank-dependent integration may be a functional adaption to the environment given cognitive constraints of the decision maker. We also argue that the results can provide explanations for the vast literature that shows that people (from young age) and animals can compute, and rely on, expected value calculations for simple problems, but that for more complex problem they have to involve heuristic strategies which often have the characteristics of linear and additive models.

What is the essence of risk taking?

Renato Frey, Andreas Pedroni, Rui Mata, Jörg Rieskamp & Ralph Hertwig

What is the essence of risk taking? Despite decades of research and different traditions of measuring risk taking (self-report measures vs. behavioral measures), this question remains largely unanswered—partly because most previous studies have employed only a single measure of risk taking. But is risk taking indeed a global construct that can be captured with a single measure? How do different measures relate to each other? And how robust and externally valid are different measures? In the Basel-Berlin Risk Study, a total of 1,000 participants took part in a day-long session in which we collected a series of behavioral (e.g., the Balloon Analogue Risk Task) and self-report (e.g., the Domain-Specific Risk-Attitude Scale) measures that are commonly used to assess risk-taking propensities, measures related to risk taking such as working memory, affect, sensation seeking, or impulsivity, and frequencies of real-life risk-taking behaviors such as substance use. Correlations between measures across the two traditions were relatively low and clearly higher within traditions, respectively. Moreover, self-report measures correlated more strongly with each other as compared to the behavioral measures. But what are the underlying factor structures? A comparison of different measurement models revealed that 4 factors could be extracted from the self-report measures and 3 factors from the behavioral measures. That is, several of the self-report measures captured relatively clear constructs, whereas only a few behavioral measures captured constructs that generalized across tasks. Moreover, the factors extracted from the self-report measures (compared to those extracted from the behavioral measures) were more closely related to participants' real-life risk-taking behaviors.

A Dissociation Between Search and Choice in Decision Making Under Risk

Michael Schulte-Mecklenbeck, Thorsten Pachur, Ryan Murphy & Ralph Hertwig

Investigations into the cognitive processes underlying decision making often assume a close link between measures of information acquisition and subsequent choices. For instance, the search direction (i.e., attribute-wise vs. alternative-wise) or the amount of search have been used to make inferences about whether participants followed a compensatory or heuristic strategy. We test the boundary conditions of this link. In a risky choice experiment, using the popular process-tracing methodology MouselabWeb, we examine to what extent differences in patterns of information acquisition, induced by subtle differences in acquisition costs, are accompanied by differences in choices. Specifically, we manipulated whether participants acquired a piece of information by moving the mouse over it or by clicking on it, recorded their information acquisitions, and decomposed subsequent choices using cumulative prospect theory. Whereas the amount, length and sequences of participant's information acquisitions differed considerably between the conditions, choice behavior was completely unaffected. These results demonstrate that differences in process measures are not necessarily indicative of differences in the underlying cognitive process. Moreover, they highlight that subtle features of the methodological set-up used to track information acquisition—such as whether information is revealed by clicking a mouse or simply moving it—can critically influence properties the process measures obtained.

Trends in forecasts: When past predictions change present risks

Karl Teigen, Sigrid Hohle & Erik Løhre

Aim: How do people perceive uncertainty in forecasts about climate change? Lay forecasting is typically based on projected trends. For instance, graphs showing a continued increase in global temperatures over a century make people project this trend into the future, regardless of their beliefs in climate change (Lewandowsky, 2011). We raise in this paper two questions: (1) what is the minimal number of observations required to perceive a trend, and (2) do people think that observed trends in probabilistic forecasts will continue into the future?

Method: Participants in five experiments were told about experts' probabilistic forecasts of various natural events (climate changes, landslides, earthquakes) at two points in time. The revised forecasts at T2 were either higher or lower than the original forecasts at T1, suggesting increasing or decreasing probabilities (risks). Participants were then asked to predict the experts' future forecasts (at T3).

Results: A majority of participants in all experiments believed that a changed forecast would lead to further changes in the same direction in the future, rather than thinking that both previous forecasts have some merit (and should be averaged), or that the most recent forecast should be trusted as most valid, incorporating the expert's own future projections. Thus an "upgraded" landslide risk from low to medium will appear more threatening than a risk that is "downgraded" from high to medium.

Conclusion: Lay predicted forecasts appear to violate "The golden rule" of forecasting (Armstrong, Green & Graefe, in press) by being anything else than conservative, going beyond the most extreme current forecast. Past forecasts make current forecasts evaluable by providing information of forecast trends, which are projected onto the future.

EMOTION

The Effect of Positive Arousal on Preferences for Risky Monetary Options

Andrea Galentino, Nicolao Bonini & Lucia Savadori

We investigated whether inducing incidental affective states (which arise independent of a decision) at high or low levels of positive arousal differently influences preferences for monetary offers varying in risk. Evidence from research on arousal and cognition suggests that positive arousal is associated to heuristic processing, cognitive depletion, willingness to engage in risky activities. Therefore, we predicted that introducing a pleasant arousing cue as part of the decision scenario would increase preferences for the riskier option. In one experiment we found supportive evidence for this prediction. We also found that arousal influences time taken for making decisions. We discuss implications for real-world decisions, consumer behavior as well as future research on affect and decision making.

Regret, disappointment and situational labels in economic games

Luis Martinez & Marcel Zeelenberg

Emotional states exert an influence on bargaining game behavior. Prior research on regret and disappointment showed that the former decreased trust and trustworthiness, whereas the latter increased them. However, conflicting findings have been demonstrated regarding behavior in ultimatum-type games. Other research had shown that regret had a beneficial effect on cooperation by increasing prosocial behavior, whereas disappointment had a detrimental effect on cooperation by decreasing prosocial behavior in those games. We argue that the reason for this apparent inconsistency lies on situational game labels, as different representations of equivalent allocation processes might lead to distinct behaviors. Results of our experiment showed that structurally identical bargaining games instigated divergent offers, depending upon the framing. In a game labeled "Community Game", disappointment lead to higher offers than regret, thus replicating trust game results. On the contrary, in a game labeled "Wall Street Game", regret lead to higher offers than disappointment, thus replicating ultimatum-type game results. The implications of our results are discussed. The findings once again demonstrate that emotions play a crucial role on decision-making.

Emotional State and Market Behavior

Adriana Breaban

We consider the dynamic relationship between trader emotions and asset market behavior. We create experimental asset markets with the structure first studied by Smith, Suchanek and Williams (1988), which is known to generate price bubbles and crashes in the laboratory. To track traders' emotions in real time, we analyze participants' facial expressions with facereading software before and while the market is operating. We correlate the emotional responses measured by the facereader software with the market activity and individuals' decisions. We find that a more positive emotional state captured by valence predicts more purchases and overpricing. Fear predicts low prices, price decreases, and selling. The experiments confirm the intuition that emotions and market dynamics are closely related.

To deliberate or not? The effects of deliberating under anticipated regret on valuation

Dionysius Ang & Enrico Diecidue

In the face of highly consequential decisions with difficult trade-offs, common sense suggests that careful deliberation is essential. Our studies challenge this common supposition by highlighting the downsides of deliberating under anticipated regret. Specifically, we show that deliberating under anticipated regret inflates valuation of the preferred option (Studies 1 and 2). The effects of deliberating under anticipated regret is reduced when there were justifications for choice (Studies 3 and 4).

Work More the Feel More: The Influence of Effort on Affective Forecasting

Claudia Toma, Gabriela Jiga-Boy & Olivier Corneille

When we invest effort into something, most of us expect material or emotional pay-offs. For example, when putting effort into a research project, we expect satisfaction and proud if the project gets funded, but disappointment and anger if the opposite happens.

The question we address in this paper is whether people use effort as a cue when forecasting their affective reactions to future events. Four studies tested the hypothesis that more effort triggers more intense affective forecasts.

Studies 1 and 2 examined how effort shapes affective forecasts in case of positive events. In Study 1, PhD students awaiting an editorial decision estimated the effort they had invested in preparing the manuscript and how happy they would feel if it were accepted. Subjective estimates of effort were positively related to participants' anticipated happiness, an effect mediated by the higher perceived quality of one's work. Study 2 replicated this effect, this time using a manipulation of effort in the context of creating an advertising slogan.

Study 3 further showed that effort not only shapes affective forecasts, but it actually enhances affective forecasting biases: Participants' affective forecasts (happiness, proud and satisfaction) were higher than their real affect, an effect that was stronger for participants in the high-effort condition than in the low-effort condition.

Study 4 extended those findings to negative events: Participants who took an anatomy exam expected to feel much worse about failing the exam than it was really the case, an effect again moderated by the effort condition.

We discuss the implications of the relationship between effort and affective forecasting and the conditions under which such relationship is functional.

Regret and responsiveness to missed opportunities in young children

Aidan Feeney, Eimear O'Connor, Teresa McCormack, Eoin Travers & Sarah Beck

Regret is a functional emotion experienced when we realise that we could have obtained a better outcome had we chosen differently. Despite a large amount of adult work, we know relatively little about the role played by regret in children's decision making. We do known that children as young as 6 years of age appear capable of experiencing regret and in this group the ability to experience regret about a decision is known to predict choice switching when participants are provided with the opportunity to make the same decision again. In this study we wished to examine whether feedback that they have missed an opportunity impacts on children's subsequent decision making under risk. Eighty-two children aged between 6- and 8-years of age completed a sequential decision task where they received feedback on the size of missed opportunities. Younger children did more poorly on the task and made more risky decisions overall. Missed opportunities predicted risk taking in older children but not in younger children. However, because the younger children took more risks, they also experienced somewhat fewer missed opportunities than the older children. Overall, these results provide further support for the claim that the ability to experience regret may play an important role in the development of decision making.

Symposium 1

When samples are small: Learning and decision making

Convenor: Robin Hogarth
Discussant: Tomás Lejarraga

Recently, several scholars have emphasized how learning – through sequentially experiencing samples of data – has important implications for decision making. For example, Fiedler, Juslin, and colleagues have explored the naïve intuitive statistician metaphor that suggests that people learn by processing the information they happen to sample. Moreover, lacking meta-cognitive abilities, people implicitly assume that the samples they observe are representative of the population about which they are making inferences. Denrell has demonstrated how people's interactions with the samples they happen to encounter impacts their judgments; Kareev has highlighted phenomena related to small samples; and Erev and others have made extensive investigations of how people make choices by experiencing samples of data as opposed to being presented with descriptions of problems.

The purpose of this symposium is to review and assess current knowledge of these different sampling paradigms in order to clarify similarities and differences and to suggest directions for future research. The issues to be discussed include:

- *What do people learn from small samples? Do processes of learning differ for beliefs as opposed to preferences?*
- *What is the role of prior knowledge in learning? When does this help or hinder effective behavior?*
- *When people know their experience is biased, how could or should they correct for this?*

On the relationship between the distinct “reliance on small samples” phenomena

Ido Erev

Previous research shows that many behavioral phenomena can be explained with the hypothesis that people, and other animals, tend to rely on small samples of past experiences. The current paper tries to clarify the relationship between the different "reliance on small sample” phenomena.

Our analysis starts with a focus on situations in which a decision maker (DM) is presented with a sequence of observations, where each observation has at least two properties. For example, the payoff obtained from each of two alternatives. The DM is then asked to answer a multiple choice question. The model assumes that the DM recalls a small sample of k (the model's single parameter) observations, and provides the best answer under the naïve assumption that the sample perfectly represents the population. We show that this assumption implies sufficient conditions to eight well-known phenomena: underweighting of rare events, probability matching, payoff variability effect, pseudo contingency and illusory correlation, overestimation of correlations, overconfidence in probability estimate, over precision (overconfidence in confidence interval), and the big eyes effect. The different phenomena are the expected deviations from maximization under distinct environments (objective distributions of the observations' properties, and distinct questions). Importantly, it is not necessary to assume different k levels. For example, all the phenomena are expected with $k = 5$. At the second stage of our analysis we consider the case in which the DM' choices affect the observations that she sees. The analysis of this setting reveals the significance of the ninth phenomena: the hot stove effect. In addition, the option to affect the available information can mask some of the phenomena considered in the first stage of our analysis.

The inability not to learn – A serious metacognitive handicap

Klaus Fiedler

Going beyond the metaphor of a naïve intuitive statistician, who uncritically takes the validity of information samples for granted, this paper illustrates the impact of a more deeply rooted metacognitive inability, namely, the inability not to learn from increasing samples. Even when participants are explicitly instructed to disregard selectively repeated information which might bias their judgments, or when they fully understand that sampled information is invalid or selective, they cannot stop learning from the inductive experience. In previous demonstrations of “metacognitive myopia” (Fiedler, 2012), we have shown that the selective repetition of the stock-market news or of positive or negative target attributes in a personnel selection task can lead to strong biases, despite instructions to ignore repetitions. Analogous evidence is now presented from a detection of change paradigm, in which participants have to decide whether the proportion p of a focal feature (smiling) in a binary sample (smiling or frowning faces) has decreased, remained equal, or increased relative to the preceding sample. Increases (decreases) in p are only detected readily when sample size n increases (decreases) too. This confusion of intensional (probability) and extensional (sample size) information is only obtained when samples are experienced, not when described in percentage format, reflecting the inability to stop learning inductively from growing samples. Neither explicit instructions to focus on p nor explicit feedback not to let changing p be influenced by misleading n can undo the robust bias. The final discussion is concerned with possible remedies to that might help judges and decision makers to deal with this metacognitive impediment.

Why it can be helpful to ignore sample bias

Jerker Denrell

Research on sampling and the 'naive intuitive statistician' (Fiedler & Juslin, 2006) argues that several well-known judgment biases can be explained by the biased sample of information decision makers access. According to this perspective, people's judgments accurately reflect the data they have been exposed to but they fail to correct for sample biases. In contrast, this presentation argues that trying to correct for selection bias is not always advantageous. Specifically, I argue that robust and adaptive methods for dealing with data with selection biases often avoid correcting for selection bias. The rationale for this argument comes from recent discussions in statistics about when to correct for selection bias and from demonstrations in psychology and elsewhere that simple but biased methods for integrating information are often more robust than complex and unbiased methods. Formulated differently: correcting for sample bias may reduce bias but often increases variance hence reducing predictive accuracy. This argument suggests a rationale for why decision-makers sometimes behave as if they ignore sample biases. It also offers a theoretical framework that can help to explain when people do in fact correct for selection biases (Koehler & Mercer, 2009) and when they try to impute missing information (Henriksson et al, 2010).

The curse of abundance

Yaakov Kareev

Simulations of a simple choice and learning model prove that when people learn about the qualities of uncertain alternatives from their own experiences and seek positive experiences, they are subject to sampling asymmetries, whose effects depend on the size of the choice set. With choice sets identical in the distribution of the quality of the alternatives comprising them, but differing in the number of alternatives , smaller choice sets result in less conflict , less disappointment, and less regret, while the objective quality of the choice is as good or even better with the smaller choice set.

Small Samples and the Illusion of Linearity in Judgment

Peter Juslin

In this talk I discuss a hypothesis for why people tend to perceive their environment in terms of linear cue-criterion relations. If people often assess the relationship between two variables from small samples, perhaps often only two X, Y pairs, the process will have difficulty with detecting nonlinear relations and by default produce “linear slopes”. I present the results from two experiments, where people learn from feedback to predict either a Y criterion variable from a known cue variable X (point prediction) or to predict the effect of changing X a certain number of units on the change in Y (change prediction). The design includes extrapolation regions to test for rule-based or exemplar-based processes. The prediction was that while people should easily learn linear relationships by explicit rule-based processes, the nonlinear functions would either invoke more slowly learned “piecewise linear approximations” or memory for similar previous exemplars. In addition to confirming this prediction, however, with the nonlinear functions in Experiment 1 the participants performed much better when predicting the change in the criterion variable Y than in the point predictions of Y. One possible account of this finding that was tested in Experiment 2 derives from the observation that the changes (derivate) for the quadratic functions used in Experiment 1 are themselves linear functions. The data for Experiment 2 are currently collected and will be reported at the conference. In view of the outcome of Experiment 2 I will elaborate on the consequences for the theory that motivated the experiments as well as for the processes in function learning more generally.

Symposium 2

Applications and Innovations of Eye-Movement Research in Judgment and Decision Making

Convenor & Discussant: Michael Schulte-Mecklenbeck

One of the central goals of behavioral decision making research is to understand the cognitive processes involved in such decisions. Eye-tracking methodologies provide direct insight into the information uptake process and have become an increasingly popular methodology for the study of human decision making. Unfortunately most published research employing eye-tracking suffers from methodological inconsistency, and much of the research to date involved choices between described risky prospects or products which represent only a small subset of those encountered in daily life. Our symposium aims to (1) provide a framework for using eye-tracking methodologies in behavioral decision making, and (2) demonstrate novel applications of such methodologies and how they are being used to better inform theory. J. Orquin will begin the symposium presenting work aimed at defining best practices for the use of eye-tracking data in behavioral research. N. Ashby will discuss research using eye-tracking methodologies to test various assumptions underlying experiential learning theory. A. Franco-Watkins will demonstrate that attentional bias can provide novel insight into well-known phenomena related to intertemporal choice. E. Rubaltelli will present research showing that pupil-dilation can be used as a proxy for emotional processes in investment decisions. J. Johnson uses eye-tracking to operationalize low-cost (relative to mouse-tracking) information search and examine the effects on decisions under time pressure. M. Schulte-Mecklenbeck will conclude with a discussion on the need for standardization in eye-tracking methodologies and how eye-tracking methodologies can be used to provide novel insights into classical phenomenon.

Areas of Interest as a Signal Detection Problem in Behavioral Eye-Tracking Research

Jacob Orquin, Nathaniel Ashby & Alasdair Clarke

Decision researchers frequently analyze attention to individual objects to test hypotheses about underlying cognitive processes. Generally fixations are assigned to objects using a method known as area of interest (AOI). Ideally, an AOI includes all fixations belonging to an object while fixations to other objects are excluded. Unfortunately, due to measurement inaccuracy and insufficient distance between objects the distributions of fixations to objects may overlap, resulting in a signal detection problem. If the AOI is to include all fixations to an object it will also likely include fixations belonging to other objects (false positives). In a survey we find that many researchers report testing multiple AOI sizes when performing analyses, presumably trying to balance the proportion of true and false positive fixations. To test whether AOI size influences the measurement of object attention and conclusions drawn about cognitive processes we reanalyze four published studies and conduct a fifth tailored to our purpose. We find that in studies in which we expected overlapping fixation distributions, analyses benefited from smaller AOI sizes (0° visual angle margin). In studies where we expected no overlap, analyses benefited from larger AOI sizes (> .5° visual angle margins). We conclude with a guideline for the use of AOIs in behavioral eye-tracking research.

Eyes of the prize? Evidence of inattention to obtained outcomes in repeated decisions from experience

Nathaniel Ashby & Tim Rakow

Experiential learning is central to the human experience as many of our preferences are informed primarily by the outcomes of our previous decisions. One strong assumption underlying cognitive models of experiential learning is that decisions makers are highly vigilant, attending to and processing each outcome encountered. Using eye-tracking methodologies we test this assumption in two studies employing a decisions-from-experience framework. In both studies we find that strong claims of vigilance cannot be supported as decision makers frequently fail to attend to outcome information. Importantly we also find several aspects which influence vigilance: First, we find that vigilance to outcomes is lowest when options contain the possibility of losses, and that vigilance is greater for obtained rather than foregone outcomes, findings in line with theories of regret aversion. Secondly, we find that vigilance decreases over time suggesting that with sufficient experience decision makers might opt to decrease the cognitive resources dedicated to a task. In addition to insights into what influences vigilance we also find that the amount of attention an option receives is directly related to the likelihood of it being selected, irrespective of its current outcome. These findings suggests that current models of experiential learning would be better formulated if they accounted for the impact of attention of the decision making process. We conclude with a brief discussion of what the current results suggest for theory development and highlight the need for including processing tracing methods in basic psychological research.

Attention Bias Predicts Intertemporal Choice

Ana Franco-Watkins & Richard Mattson

Many decisions involve an intertemporal choice – a decision between a present alternative and a potential future prospect. Often, the immediate option might be more gratifying (e.g., spending one's salary) than the future option (e.g., saving for retirement), but can lead to detrimental long-term consequences if selected too often (e.g., no or little retirement savings). We examined whether attentional processing via eye-tracking methodology to different components of an intertemporal decision task predicted choice. Our findings reveal that those who tend to prefer the immediate option demonstrate attentional biases that were predictive of choice. When losses were at stake, selective attention biases also predicted unique variance in self-report measures of risk-taking, impulsivity, and self-control beyond what was accounted for by a discounting parameter. Overall, our findings suggest that eye-tracking measures of selective attention may allow for a better theoretical understanding of the mechanisms and processes involved in intertemporal choice.

Sensitivity to affective information and investors' evaluation of past performance: An eye-tracking study

Enrico Rubaltelli, Sergio Angoli, Laura Franchin

We used eye-tracking methodologies to investigate how affective reactions influence investment decision making. We also measured participants' trait emotional intelligence (trait EI), a construct related to people's sensitivity to affective information and how efficiently they regulate it. We hypothesized that people with higher trait EI should have larger pupil dilation (H1). In addition, we hypothesized that individuals with larger pupil dilation should be more willing to keep an investment regardless from its past performance (H2a). Finally, we tested the alternative hypothesis that larger pupil dilation should induce people to be more sensitive to past performance (e.g., selling their shares more often when the past performance of the fund was negative and buying additional shares more often when the past performance was positive; H2b). Results supported H1. People with higher trait EI have larger pupil dilation than people with lower trait EI. In addition, pupil dilation predicted participants' investment decisions. Larger pupil dilation led people to be more consistent and willing to invest more money on a fund regardless from its past performance (H2a). We also tested the hypothesis that individuals with larger pupil dilation should be more influenced by a fund's past performance On the contrary, results did not support the alternative explanation (H2b). Investment decisions made by people with larger pupil dilation did not depend on the previous performance of the fund. Finally, our data revealed that the effect of trait EI on investment decisions was significantly mediated by pupil dilation. This result is a novel finding and provides evidence of a cognitive mechanism linking individual differences in trait EI to investment behavior.

A closer look at decision making under time pressure

Joseph Johnson, Xiaolei Zhou, Gregory Koop & Ana Franco-Watkins

The current research makes empirical, methodological, and analytical contributions to our understanding of decision making processes. We investigated the impact of time pressure and transaction costs on information search and decision making, in part by using novel analytic techniques. In contrast to the typically coarse manipulations of time pressure used in decision-making research (e.g., high vs. low), we employed six levels of time pressure and investigated whether exposure to these levels in an increasing versus decreasing order would produce differential adaptation to the changing task demands. We also manipulated transaction costs by requiring either hand movements (higher cost; measured via mouse-tracking) or eye movements (lower cost; measured via eye-tracking) as the information acquisition method. Our results suggest that the effects of time pressure depend on the amount of effort required to retrieve information and the order in which changes in time pressure are administered. Theoretically, we discuss these results in the context of "micro-strategy" changes, following Maule (1997). Finally, to better investigate these effects, we employ a new analytic technique that allows for drawing more precise conclusions than common metrics. In this sense, the current work makes a substantial methodological contribution as well by introducing new procedures for the analysis of sequential acquisition data in eye- and mouse-tracking.

Symposium 3

Cognitive Processes in Unethical Behavior

Convenor: Andrea Pittarello
Discussant: Andreas Glöckner

Unethical behavior comes at a great cost for individuals and societies. However recent work shows that people tend to act dishonestly to increase their personal benefits. Interestingly, most people do so only to an extent that enables them to cheat while feeling moral. How do such ethical failures take place? Using different methodologies (i.e., eye tracking, lie detector, field experiments), the papers presented in this symposium explore the cognitive processes underlying cheating behavior in ethically questionable situations. Pittarello and colleagues assess how self-serving justifications shape dishonesty. By tracing participants' eye movements, the authors show that in ambiguous settings participants shift their attention towards tempting and more profitable information. In turn, this attention bias shapes the magnitude of dishonesty. Similarly, Fiedler and colleagues use eye-movements and pupil diameter to show that dishonesty results from both conscious and unconscious processes, as indexed by selective attention toward self-benefitting information and increased physiological arousal before a decision to cheat is made. Ayal and colleagues further explore how justifications influence the ability to detect cheating based on physiological arousal. Their findings show that lie detection techniques are sensitive to egocentric cheating that benefits the self, but not to altruistic cheating that benefits others. Finally, Mitkidis and colleagues conclude the session by showing that moral cleansing mechanisms (characterized by extreme rituals in Mauritius) may serve as moral licensing to cheat in subsequent decisions. Using a wide range of methodologies, this symposium contributes to the literature by shedding more light on the underlying mechanisms of unethical behavior.

Justifications shape ethical blind spots

Andrea Pittarello, Margarita Leib, Tom Gordon-Hecker & Shaul Shalvi

To some extent, unethical behavior results from people's limited ability to pay attention to moral standards, known as ethical blind-spot. Similarly, individuals benefit from dishonesty to the extent that they can find justifications for their misbehavior. In this work, we link these two areas of research, and suggest that in ambiguous settings individuals' attention shifts towards tempting information, in turn shaping the magnitude of their lies. Introducing a novel Ambiguous Dice Paradigm we asked participants to report the outcome of a die roll appearing closest to a fixation cross on a computer screen to determine their pay. Reporting higher rolls corresponded to higher payoffs. We varied the value of the die second closest to the fixation cross to be either higher (i.e., tempting) or lower (i.e., not tempting) than the die closest to the fixation cross. Results of two experiments revealed that people made self-serving mistakes by reporting tempting rather than not tempting outcomes. This pattern was accentuated in highly ambiguous settings. Tracing participants' eye-movements revealed that, when dishonesty pays, people's ethical blind spots are shaped by increased attention towards tempting information.

Temporal dynamics of cheating: Arousal and attention analysis

Susann Fiedler, Guy Hochman & Andreas Glöckner

In previous work people reported to experience ethical dissonance when behaving dishonest. One proposed explanation is that their self-interest maximizing behavior stands often in conflict with their moral self-image (Self-Maintenance theory) whereas another account suggests that people are cognitively limited and systematically biased in their moral judgments (Bounded Ethicality). In an eye-tracking study, we aim to test the validity of these two main theoretical accounts. If cheating behavior is predominantly unconscious, and motivated reasoning leads people to biased perceptions that the payoff-maximizing alternative is the correct and honest response, we should expect a confirmation attentional bias where the locus of attentional processing in dishonest responses is biased towards the high-paying alternative. On the other hand, if people first become aware of the correct answer and only then deliberately decide to act dishonestly, we should expect a more balanced locus of attentional processing that facilitates a more accurate representation of the available information and potentially a bias towards the higher incentivized option at a later stage of the decision process. The results show that the decision to cheat within a flexible dot task is mainly made before the concrete decision situation is even presented indicated by a pre-decisional increase in arousal in cheating decisions. However, we also found that attentional biases occur in the information search phase suggesting that people aim to avoid increased tension by preemptive biased processing. This pattern of results provides support for the relevance of both accounts with regard to the underlying mechanism of dishonest responses.

Detecting (un)justified lies: When Robin Hood Takes a Polygraph

Shahar Ayal, Dar Peleg, Guy Hochman & Dan Ariely

In the current study, we used choice behavior and lie detection to examine the interplay between dishonesty and the moral-self while participants engaged in either egocentric cheating which benefitted themselves or altruistic cheating which benefitted others. To test this issue, we employed an experimental paradigm in which players engage in a visual perception task that creates an incentive to cheat to alter monetary payoff. Participants were randomly assigned to different conditions where they were invited to play this perceptual task for their own benefit and/or the benefit of others. After completing the task, the participants were moved to another room, where they underwent a standard lie detector test about their performance on the task. The test used a traditional manual technique based on differences in psychological arousal. The results of two experiments strongly support our justified dishonesty predictions that people cheat more as the possibility to justify their dishonest acts with altruistic considerations increases. More interestingly, we also found that these altruistic cheaters were less likely to be detected by the lie detector test than people who cheated for their own benefit. We discuss the theoretical and practical ramifications of these findings as regards the way people set their moral standards, and the usefulness of physiological arousal devices to detect varieties of cheating.

The Psychological Consequences of Extreme Rituals on Morality

Panagiotis Mitkidis, Shahar Ayal, Shaul Shalvi & Katrin Heimann

Rituals have been suggested to affect people's prosocial attitudes and moral behavior by enhancing collective effervescence. Unanswered so far stays the question if this behavioral effect is modulated by a) the degree of participation in a ritual b) the group-association of the person profiting from a potential moral or immoral behavior. We addressed these issues via a cheating task in a real world setting of an extreme ritual in Mauritius. The results of our experiment showed that the behavior of participants is modulated by the degree of participation in the ritual as well as the identity of the party profiting from a moral or immoral attitude. Specifically, in comparison to active participants as well as the control group, passive participants showed significantly decreased cheating behavior after the ritual only when they themselves would profit from this behavior. We suggest that this might be due to ritual participation affecting moral cleansing mechanisms reminding of moral duty or licensing immoral behavior.

EXPERTS & WISDOM

Can "false balance" distort public perception of consensus in expert opinion?

Derek Koehler

Media critics have long expressed concern that journalistic “false balance,” or the coverage of both sides of an issue despite one side having clearly superior evidential support, can have a distorting influence on the public’s perceptions of what arguably ought to be non-controversial subjects (e.g., climate change, vaccine safety). I report several experiments testing the influence of presenting conflicting comments from two experts who disagree on an issue (balance condition) in addition to a complete count of the number of experts on a panel who favor either side. Some of the issues evaluated had strong consensus among experts on the panel and others did not. Compared to a control condition, participants in the balance condition gave judgments (reflecting their perception of the distribution of expert opinion) that did not discriminate as clearly between the issues that did and that did not have strong expert consensus. Participants in the balance condition also perceived less agreement (and greater uncertainty) among the expert panel members in general, and were less likely to think that there was enough agreement among experts on the high-consensus issues to use expert opinion as a basis for guiding government policy. These results suggest that “false balance” can distort perceptions of expert opinion even when participants have a complete count of opinions across the panel and are informed of the method by which the “balanced” expert comments are selected.

Post decision facts distortion when experts and facts speak against your decision

Ola Svenson, Nichel Gonzalez, Gabriella Eriksson & Marcus Mayorga

We tested hypotheses about strengths of post-decision consolidation to achieve decision coherence. In particular, we wanted to show how facts consolidation is influenced by social factors and to describe cognitive coping patterns after it has become clear that experts and facts speak against a decision.

We used a between-subjects design in two experiments, each with three conditions: (1) decision and post-decision expert/facts information, (2) decision no post-decision information, (3) judgments no decision or post-judgment information. Measures of post-decision consolidation were derived from numerical judgments and judgments on Visual Analogue Scales. Concurrent perceptual and memory distortions of facts were registered. Participants could change their decisions in the post-information phase.

Post-decision support from experts increased memory consolidation and expert disagreement with the participant's decision decreased consolidation but it remained strong enough not to change the decision in a medical decision problem. After a decision to choose among road construction alternatives to maximize time saved, facts that the decision was wrong reversed the decision for about half of the participants who were given this information. The consolidation was so strong that perception of magnitude of digits was distorted.

In summary, post-decision consolidation distorts perception of numerical facts as well as cognitive memory of facts. The achieved coherence in post-decision consolidation was threatened and weakened by disagreeing expert opinion and emerging counter-decisional facts. However, the initial decisions persisted beyond the rational.

Predicting NFL game winners: The wisdoms of heuristics, experts, and crowds

Shenghua Luan

The National Football League (NFL) is an enormously popular sports league in the United States. Inspired by an article by ESPN columnist Greg Easterbrook and an inference model named Δ-inference, we developed a family of simple heuristics that can be applied to predict NFL game winners. We tested the heuristics on 7,450 regular-season games (1983-2013) and found that the best heuristic is one that takes teams' records in the previous season into consideration and has slightly different mechanisms for the first and second halves of the season. We also collected predictions made by football experts from various news outlets (e.g., ESPN.com) from 2004 to 2013; the mean number of experts per year is 38. During that 10-year time span, the accuracy of our best heuristic is equivalent to that of an average expert. Finally, we investigated the prediction accuracy of two "crowds": football experts and gamblers. There are three notable findings from this analysis: (a) the gambler crowd has on average the best prediction accuracy; (b) the expert crowd does better than an average expert (hence, our best heuristic as well) consistently across the years; and (c) a crowd consisted of 9 randomly selected experts can predict on average as well as a crowd of all experts. Overall, our study shows the prowess of three distinct prediction mechanisms for NFL games and provides ideas for developing better prediction apparatus.

Selecting experts for probabilistic expert knowledge elicitation

Fergus Bolger

It is generally agreed that good decisions and policies should be "evidence based". To this end it is common to run statistical models on available data so as to provide the most objective forecasts and analysis possible. However, in practice, data is often "soft", scarce, or even completely unattainable. In such cases, an increasingly popular approach is to supplement available hard data with expert judgment by means of "expert knowledge elicitation" (EKE). In addition to estimates of quantities, decision and policy makers usually also require an appraisal of the uncertainty surrounding quantitative estimates: in this case we talk of "probabilistic expert knowledge elicitation" (pEKE). Several different pEKE protocols exist, each with their pros or cons, but all are only as good as the quality of the experts and their contributions. In this paper I present a structured approach to the selection of experts for pEKE that is grounded in psychological research.

Various definitions of expertise are considered, as are means by which judgments of quantities are made: models of subjective probability judgment are also described. On the basis of this review two new instruments are developed: a framework for profiling experts; and a questionnaire for determining the characteristics of experts, and of the judgment tasks that they encounter in their professional life. These two instruments guide the selection process, with expert profiles providing structure to the initial search, and an indication as to when the search can stop, while the questionnaire permits matching of potential experts to the profiles (as well as refinement of the profiles). In addition, the questionnaire helps to allocate experts to particular pEKE protocols, and to assess training needs.

CHOICE 2

Decision quality - Relations between different types of decision outcomes

Martin Geisler & Carl Martin Allwood

The aim of decision-making science is to investigate how decisions are made, what makes them better or worse, and to provide recommendations for improvement. However, this last aspiration rests on the notion of adequate criteria for good decisions. Hence, the issue of decision quality can be said to be at the core of decision-making science. However, this topic has to a large extent been overlooked or oversimplified, especially with respect to criteria of direct relevance for peoples' everyday life. In previous research, real-life decision quality has primarily been operationalized in terms of individuals' ability to avoid negative decision-making outcomes (as defined by normative standards). But researchers have pointed out that the subjective relevance of such definitions is not clear and needs to be investigated. In order to explore this issue, we investigated how normatively defined decision outcomes relate to subjective decision-making outcomes as indicated by reports of subjective well-being, daily hassles and perceived stress. We explored these relations in three samples: a community sample (Study 1, N = 175) and two professional samples (Study 2, n = 111; Study 3, n = 120). Overall, the results demonstrated clear relationships between the normative definition of decision-making outcomes and subjective outcomes in terms of daily hassles and stress. A relation between the normative definition and subjective well-being was also observed, but not as clearly manifested. In sum, our results suggest that normative definitions of decision quality indeed have relevance for people and their everyday life. However, at the same time, the benefit and usefulness of a multifaceted approach to decision quality is argued for.

The influence of personal mitigating factors on criminal sentencing decisions

Ian Belton & Mandeep Dhami

Criminal sentencing is a hugely important judgment task. Sentencing data show that the presence of mitigating factors, e.g. remorse or previous good deeds, has a significant impact on sentencing outcomes, yet there are currently very little empirical data on the relative weight given to different mitigating factors. Data regarding public opinion on mitigating factors are also scarce. Further, research to date has been based on self-reports or observation, rather than measuring sentencing judgments directly. Two experimental studies measured the effect of personal mitigating factors on individuals' judgments about sentencing fairness. Study 1a on burglary found that participants were more likely to judge a sentence as too harsh and less likely to judge it too lenient when the offender was involved in a drug/alcohol rehabilitation program, or had performed unrelated good deeds. However, an offender showing remorse had no effect on fairness judgments and assisting the prosecution may have made participants more likely to judge a sentence too lenient. The results of Study 1b extend the present research to the case of assault.

Less Is More: The Role Of Feedback Frequency In Repeated Binary Choice From Experience

David Hagmann, Jason Harman & Cleotilde Gonzalez

When decision makers repeatedly choose between a safe and a risky asset, the frequency of feedback can influence maximization. Myopic prospect theory proposes that agents evaluate each outcome on its own (rather than considering the series of choices as one large game) and prefer to avoid losses in individual periods, even if they are likely to make greater gains over the entire game. This implies that revealing outcomes less frequently may improve expected value maximizing behavior when losses are likely to be observed. An extensive literature has tested these predictions with decisions from description, where revealing outcomes does not provide new information about the nature of the choice. We explore the effect of reducing feedback frequency in decisions from experience, where participants have to learn about the options from feedback. In this setting, knowledge of outcomes is crucial.

Participants (n=1,200) are randomly assigned to one of four feedback conditions and one of three gambles. They make 110 incentivized decisions between a risky and a safe option and observe the individual realizations of their choices after every 1, 5, 10, or 20 trials. The three gambles hold fixed the expected value of the risky option, but vary on the high payoff (6.25 with p=0.8, 10 with p=0.5, or 25 with p=0.2).

Our experimental results confirm predictions from myopic prospect theory: in contrast to providing feedback after each trial, providing it only after 5, 10, or 20 trials increases the proportion of choices favoring the risky option in two of the three gambles. When the high payoff is common, the effect disappears. We find that delayed feedback helps overcome recency bias, where the probability of choosing the risky option depends on the last observed outcome.

Number Preferences

Tong Wang, Rogier Potter van Loon, Martijn van den Assem & Dennie van Dolder

We explore people's preferences for numbers in two types of lottery games. For the first game, we analyse 5 million choice combinations of 6 different numbers ranging from 1 to 45 for 175 Lotto draws over a two-and-a-half year period. For the second game, we analyse over 500 thousand choice combinations of 4 numbers ranging from 0 to 36 for two lottery events organized by a casino company. In the two games we observe similar preferences for specific numbers and for combinations of numbers. Players show a tendency to pick numbers that have a specific meaning to them, such as their age and the numbers appearing in their date of birth. They tend to combine numbers that form an arithmetic sequence. The visual presentation of numbers also matters: numbers in the center are more popular and there is a tendency to select combinations that form a visual pattern. Lotto players respond to prior draws by avoiding winning numbers from the latest draw but chasing numbers that occurred frequently in a longer series of recent draws. For the casino lottery, we observe that numbers are more likely to be selected when they appear in the voucher code that is required for participation. Our findings support the growing literature showing that simple labels can influence choice and that the presentation of choice options matters.

How to be a loser when you win: Lucky numbers, lucky stores, edge aversion, proximity aversion and lottery choices

Peter Ayton & Stian Reimers

We present two studies examining the strategies that people adopt to choose their lottery numbers. Study 1 uses real data from 20 years of UK national lottery draws to estimate the relative frequency with which each of the numbers 1 to 49 were chosen. The design of lottery entry slips has changed twice so we could unconfound the effects of spatial position and number preference on people's lottery choices. The results indicate that number choice varied across the different formats in ways consistent with edge aversion: Numbers were more popular when located away from the edges of the entry slip array than when on one of the edges. We also found proximity aversion – people avoid choosing pairs of numbers that were either vertically or horizontally adjacent. The similarity of people's choices results in "overcrowding": some predictable number combinations are very popular – resulting in reduced winnings for winners selecting these combinations. Study 2 used a between-subjects experiment, where 1,500 incentivized participants chose lottery numbers, with numbers displayed in one of the three formats. Edge aversion and proximity aversion were again found; both effects are much greater among participants reporting they chose randomly than by those using other strategies like significant or recently winning numbers. We also found some evidence for a "lucky store" effect – analogous to the hot hand fallacy – as well as the gambler's fallacy: participants thought that others would be more likely to buy their ticket from a previously winning shop, but would be less likely to choose a previously winning number. Implications for the perception and production of randomness, and the economic costs, and opportunities, of "overcrowding" are discussed.

Patterns in the Lottery Game

Norbert Becser & Zita Zoltay-Paprika

The experiment described here has been carried out twice (spring and fall) a year since 2010, as part of a "Decision Making Skills" class at Corvinus University of Budapest. The number of participants varied from min. 10 (2010 Spring) to max. 37 (2011 Fall). Typically, the students did not know each other too well prior to the experiment and came from 8-10 different countries. They were asked to choose six numbers out of 49. As the winner of the game received a few extra points for class participation, the students were motivated to take part in the experiment.

Students were given a lottery ticket with the following instructions: "You should choose six numbers from the set of 1 to 49 shown on the 7x7 size lottery sheet. The winner will be the person whose chosen numbers differ the most from those chosen by the others. For each player we will check how many other players chose the same number(s) and give one point for each match. The winner will be the person with the lowest overall score.

Analyzing the winning lottery tickets over the 11 semesters' period, the linear correlation coefficient value was found to be relatively high (0.82) when looking at the number of students and the winning overall scores. The number chosen most often was "1". Of the 267 players, 83 played this number and none of them won. The least chosen number was: 42 (13 players), which, however, was present in three of the winning combinations. Even more important than the above, however, is an extremely interesting fact: EACH winning combination spatially reflects a well recognizable geometric shape. Is this merely a coincidence or is it possible that choosing numbers in a spatially a geometric shape is the only winning strategy? If the latter, the variation of the different shapes is especially interesting.

RISK 2

The Risk Attitudes of Professional Athletes

Han Bleichrodt, Olivier L'Haridon & David van Ass

We compared the risk preferences of professional athletes versus non-professional athletes. The professional in our study were players of the Dutch men's field hockey team, one of the best in the world and winner of the silver medal in the 2012 Olympics and in the 2014 World Championships. We measured their risk preferences under prospect theory using a parameter-free method that imposes no simplifying assumptions and captures individual heterogeneity. The professionals showed more overweighting of probabilities for gains and more underweighting of probabilities for losses than the recreational group. Utility curvature and loss aversion were the same in the two groups. Together these findings help explain why some athletes decide to pursue a professional career while others don't.

Risk Taking and Social Ranking: An Evolutionary Perspective

Ulrich Schmidt

Taking an evolutionary psychological perspective we analyze the role that social comparison plays on risk preferences. Risk taking decisions can influence evolutionary fitness of animals and humans substantially. From an evolutionary psychological perspective there is a selectionist rationale for sex differences in the utility function as well as in the willingness to accept risk. Because male fitness depends on relative social standing to a higher degree than female fitness, we hypothesize that men's decisions will be more influenced by social comparison than women, leading to riskier decisions under social comparison for men. We present a theoretical model which accounts for sex differences in risk preferences with social comparison. The implications of the model are tested and confirmed by an experiment showing that risk taking increases when risks are correlated with a stronger effect for men than for women.

Investigating the Fluency-Affect relationship in judgements of (in)coherent risk

David Gamblin

Whilst the hedonic marking hypothesis (Winkielman et al, 2003) suggests that fluency evokes positive affect, it has been argued that fluency can instead increase negative affect if stimuli are negative, thereby amplifying affect (fluency amplification model; Albrecht & Carbon, 2004). Studies have also found that this affect is used as a cue for judgement (Topolinski, 2011).

The current study investigates how affect is evoked from coherence and how that affect is used in risk judgements. In 3 experiments, participants were shown risk items relating to various businesses, with coherence and riskiness being manipulated. Reading time, liking ratings, and risk judgements were measured as dependent variables.

Coherence was manipulated by consistency (Exp 1) or typicality (Exp 2) of risk items for given businesses. Coherent trials were processed faster than incoherent trials, which increased liking ratings for low risk items. For high risk items, coherence increased disliking ratings (Exp 1), which supports fluency amplification rather than hedonic marking. Neither coherence nor liking ratings affected risk judgements. Instead these were made rationally, based on the number of high risk items in the scenario - a pattern predicted by a tallying process (Dawes, 1979).

Experiment 3 forced participants to make rapid judgements of risk and liking. Results suggest that enforcing time limits caused coherence to have an effect on risk judgements for low risk trials: coherent trials were judged as less risky than incoherent trials.

The implications of the study are: support for fluency amplification; that risk judgements are less rational under time pressure; and that under time pressure, it is fluency and not affect that influences judgement.

The Foreign Language Effect in Judgments of Risk and Benefit: The Role of Affect

Constantinos Hadjichristidis, Janet Geipel & Lucia Savadori

We investigated whether the use of a foreign language influences lay judgments of risk and benefit regarding hazards such as "nanotechnology," "nuclear power plants," and "traveling by airplane." Combining evidence from bilingual and risk perception research, we predicted that hazards labelled in a foreign language, as opposed to the native language, would promote overall more positive affect and through that induce lower judgments of risk and higher judgments of benefit. In two studies, we found supportive evidence. Importantly, we also found that the effect of foreign language on risk/benefit judgments was mediated by affect. We discuss potential implications for international policies as well as for current theories of risk and benefit perception.

The effect of delay on risk tolerance and probability weights

Piotr Zielonka, Katarzyna Idzikowska, Tadeusz Tyszka & Marcin Palenik

People often face choices where outcomes are both delayed and uncertain. Numerous studies of delayed gains and losses show the hyperbola-like discounting process of delayed payoffs. We assumed that when evaluating a delayed lottery people act according to the prospect theory model, where payoffs are discounted according to a hyperbolic function. The problem that we addressed is whether the α parameter of the value function v( ) and the γ parameter of the probability weighting function w( ) differ for evaluations of delayed and instant lotteries. We found that when people compare delayed certain payoffs with delayed risky payoffs they are more risk prone than in situations where both certain payoffs and risky payoffs are instant. However, when people compare present certain payoffs with delayed risky payoffs they are less risk prone than in situations where both certain payoffs and risky payoffs are instant. Additionally, the probability weighting curves were more linear for delayed lotteries than for instant lotteries (people were more sensitive to changes of probability).

Trust in deliberation: The consequences of deliberative decision strategies for medical decision making

Marieke de Vries

Background: Decision aids (DAs) play an increasingly critical role in supporting patients in making preference-sensitive treatment decisions. One largely untested assumption of DA design is that patients should be encouraged to deliberate carefully about their options after being informed of those options.

Aim: The purpose of the present research is to test the impact of deliberative versus intuitive decision strategies in medical decision contexts.

Method: In 3 experiments, participants were randomly assigned to make a hypothetical medical decision either intuitively, or using various deliberative strategies. In Study 1 we predicted that deliberation would improve decision confidence while not changing decisions. In Study 2 our aim was to establish whether the observed increase in confidence was due to decision-making effort, confirmation bias, or both. In Study 3 it was predicted that deliberation would cause participants to become more confident in suboptimal decisions.

Results: Across three studies, participants who deliberated felt better about their decisions and decision process, even when the decision was the same as what would have been chosen intuitively (Studies 1 and 2), and even when the decision was normatively bad (Study 3). Study 2 additionally indicated that participants' confidence was driven by confirmation bias rather than effort justification.

Conclusions: Deliberative tasks may often fail to be an effective debiasing tool, and components of patient decision aids that ask patients to deliberate may serve to improve how patients feel without improving the quality of their decisions.

COGNITIVE PROCESSES

Testing the level of consistency between choices and beliefs using eye-tracking

Luca Polonio

We use eye-tracking technique to test whether players' actions are consistent with the expectations they have about their opponent's behavior. Participants play a series of two person 3 by 3 one shot games and state their beliefs about which actions they expect their counterpart to play (first order beliefs) or about which actions their counterparts expect them to play (second order beliefs). We perform a mixed model cluster analysis and classify participants into types according to both their information search patterns and choices. Players classified as strategic (Level-2 players) and players classified as having other regarding preferences like Inequity aversion and Prosociality exhibit attentional patterns of visual information acquisition and choices that are mainly consistent with their stated beliefs. Conversely, non-strategic (Level-1, Pessimistic, Optimistic) and anti-social players (Competitive) do not best respond to any specific belief, but apply simple decision rules regardless of whether they are playing or stating their beliefs. We suggest that they neglect the interactive component of the game, playing and stating their beliefs as if the two players are not involved in any strategic interaction. Implications for the theories of bounded rationality are discussed.

Tracking eye movements to reveal memory processes during rule- versus similarity-based decision making

Agnes Scholz, Bettina von Helversen & Jörg Rieskamp

Recent research suggests that when people retrieve information from memory they tend to fixate the location where the information had appeared during encoding. We used this phenomenon to investigate if different pieces of information are activated in memory when people use a rule- or a similarity-based decision strategy. In two studies, participants first memorized multiple pieces of information about job candidates (exemplars). In subsequent test trials they judged the suitability of new candidates that varied in their similarity to the previously learned exemplars. Results showed that when using similarity, but not when using a rule, participants fixated longer on the previous location of exemplars that resembled the new candidates than on the location of dissimilar exemplars. This suggests that people using similarity retrieve previously learned exemplars, whereas people using a rule do not. Furthermore, the results show that eye movements can provide new insights into the memory processes underlying decision-making.

Looking and weighting: How is gaze behavior affected by attribute importance in quantitative judgment?

Frank Renkewitz

Eye-tracking research in JDM typically tries to infer cognitive processes from gaze behavior. One auxiliary assumption often made in interpreting eye movements is that importance attracts attention. Thus, pieces of information that are fixated more often are assumed to be of higher relevance for the decision maker. However, with regard to the differential weighting of attributes this assumption has rarely been directly tested. We present two experiments in which we investigated the effect of the relative importance of attributes on gaze behavior in a quantitative estimation task. On a theoretical level, a close link between weighting and attention can be expected in this task based on evidence accumulation models. In both experiments, participants estimated the price of several fictitious goods that were described by their values on four different attribute dimensions. The importance of these attributes was manipulated by instructing different weighting schemes. On the aggregate level of analysis, the results clearly revealed that different weighting schemes are associated with different gaze patterns. However, the results also indicated that subtle characteristics of the stimulus material may affect eye movements and, thus, blur the relationship between looking and weighting. More importantly, on an individual level of analysis, gaze behavior was predictive of particpants' estimates: Gaze-based predictions showed a substantial correlation with participants' estimates in all conditions and consistently outperformed several baseline predictions assuming uninformative gaze behavior. These findings support auxiliary assumptions often made in JDM research to relate gaze data to cognitive processes and corroborate processing assumptions of evidence accumulation models.

Looking at Ingroup Love and Outgroup Hate: An Eye-Tracking Analysis of the Cognitive Processes involved in Intergroup Decision Making

Rima-Maria Rahal, Carsten De Dreu & Susann Fiedler

In intergroup decisions self-interest, ingroup love and outgroup hate collide. Yet, we only know little about systematic distribution preferences in intergroup contexts, and about the underlying cognitive processes driving them. The concern we have for others' outcomes is not only determined by our isolated preferences for distribution between us and them (Social Value Orientation: SVO), but also by their group membership. We investigate the processes underlying intergroup decision making using eye-tracking. Results replicate ingroup favoritism in terms of an increased probability of making altruistic choices in resource allocation tasks concerning the in- vs. outgroup, show that more cooperative decision makers consistently made more altruistic choices, and indicate an interaction between intergroup setting and decision maker's SVO: the influence of SVO on altruistic choices was more pronounced in the ingroup setting. Moreover, we report systematic differences in visual information search of decision makers in in- vs. outgroup decision depending on SVO. More cooperative decision makers showed increased response times and number of fixations, inspected more information and allocated less attention to their own payoffs. The same pattern was found regarding decisions made towards the in- vs. outgroup. Moreover, we found a significant interaction indicating that only individualistic decision makers invested relatively less effort into information search when making outgroup decisions, whereas with increasing cooperativeness in SVO, decision makers showed more similar gaze behavior for in- and outgroup decisions. Implications for intergroup research and for resolutions for intergroup conflict are discussed.

Does looking mean liking? Differences across perceptual and preferential choice processes

Shuli Yu, Timothy Pleskac & Taosheng Liu

Research in perceptual decisions has highlighted how attention improves performance in a variety of sensory tasks by enhancing early visual information processing. Yet it has also been established that attention, as measured by relative gaze exposure, is highly correlated with value-based preference. Does selective attention improve decision discrimination or does it simply bias choice? To answer this question, we compared choice formation in perceptual and preferential tasks with an experience-based paradigm that involved monitoring participants' eye movements as they chose between two rapidly updating options (fishing ponds). Specifically, participants were asked to look at the two ponds and choose the pond they would rather fish from (preference frame), or choose the pond which had more fish surfacing on average (perceptual frame).

Results show that attention biases choice. In particular, participants' eye gaze shifted toward the more favored option just before choice. An attentional cue also pulled choice in the direction of the cue. However, the biasing effect of choice was offset by how choice information was acquired. In perceptual choice, participants acquired more information and allocated more time shifting attention between the choice options as compared to the preferential choice. We use computational models to link the visual information acquired from the visual gaze to the choice. The modeling shows a similar evidence accumulation process is used to integrate information in both preference and perceptual choice, but even after controlling for information search differences, perceptual choice was associated greater information valuation and greater response caution than preferential choice.

Symposium 4

Challenges and Advances in Charitable Giving Research

Convenor & Discussant: Stephan Dickert

This symposium presents recent advances in research on the psychological processes underneath charitable giving decisions. The overall theme of the symposium is to highlight how and when donation decisions are influenced by effects and biases common in other decision making domains (including framing, anchoring, and affect)– and what sets these type of decisions apart. The symposium contributions showcase work from different research groups and employ a complimentary set of research techniques to investigate the causes for charitable giving and the underlying valuation of human lives. Specifically, the first talk focuses on pseudoinefficacy (a form of irrationality), the second talk presents findings on positive vs. framing in charity appeals, the third talk investigates the effects of ego-depletion on giving, the fourth talk examines the cost-benefit trade-offs for donors, and the fifth talk presents evidence on the limits of anchoring effects in charitable giving. All contributions represent critical tests of (partly competing) theories in judgment and decision making research. The discussion will provide an overview of the state of the art in the research on psychological mechanisms underlying donation decisions and the resulting challenges to the field.

Pseudoinefficacy: Negative feelings from children who cannot be helped reduce warm glow for children who can be helped

Daniel Västfjäll, Paul Slovic & Marcus Mayorga

In a great many situations where we are asked to aid persons whose lives are endangered, we are not able to help everyone. What are the emotional and motivational consequences of "not helping all"? In a series of experiments, we demonstrate that negative affect arising from children not helped decreases the warm glow of positive feeling associated with aiding the children who can be helped. This demotivation may be a form of "pseudoinefficacy" that is nonrational. We should not be deterred from helping whomever we can because there are others we are not able to help.

Framing charity advertisements: Positive appeals are liked, but negative appeals work better

Arvid Erlandsson & Artur Nilsson

Charitable organizations often use directed charity appeals to solicit donations from potential donors. However, charity appeals can be written either in a positive frame (where the aim is to induce a positive mood), or in a negative frame (where the aim is to induce guilt and general negative emotions). Both positive and negative affect have been linked to an increased motivation to help and while some studies suggest positive appeals to be preferable to negative or neutral appeals (e.g. Benson & Catt, 1978; Perrine & Heather, 2000), other studies have found that negatively framed appeals render higher donations (e.g. Small & Verrochi, 2009; Chou & Murighan, 2013). In two studies using different charity contexts, we tested this systematically by randomly allocating participants to read either a very positively or a very negatively framed charity advertisement. Participants were then asked if they would like to anonymously donate the buying price of endowed lottery tickets to the organization behind the ad. Manipulation-checks showed that the negative ad made participants experience more negative emotions (guilt, distress, sadness, and anger) compared to the positive appeal. In contrast, the positive ad made participants feel happier and more hopeful, and participants also liked the positive ad more than the negative ad. Despite this, the negative ad rendered significantly higher donations than the positive ad in both studies. Follow-up analyses showed that there were no differences in the likelihood of helping (the proportion of participants donating something was not influenced by the type of ad), but there were differences in the magnitude of helping (those reading the negative ad were more likely to donate all their resources than those reading the positive ad).

Visceral needs and donation decisions: Do people identify with suffering or with relief?

Tehila Kogut & Inbal Harel

We examine the relations between people's experience of an ongoing visceral need as well as the relief from that need and willingness to help needy others actively experiencing the same or a different need. Results reveal that overall people tend to be more generous when satisfied than when actively experiencing a visceral need. When experiencing an ongoing need, people tend to be less responsive to others' needs even when they match their own visceral-state. However, experiencing partial relief from a recent need, promotes the helping of others who are experiencing a corresponding need but does not promote helping in general.

Perceived Costs and Benefits Motivating Donation Decisions: Different Evaluability of Money and Lives

Enrico Rubaltelli, Dorina Hysenbelli, Stephan Dickert & Paul Slovic

We run a series of studies to assess how evaluability can influence people's decision to help children in need. In three experiments we tested a series of scenarios in which participants had a chance to accept or reject a donation plan. In each scenario we varied the amount of the donation (cost for the donor) required and the number of children that could be helped (benefit for the receivers). However, the amount of money required to help one child was kept constant. In each experiment we presented (in random order) seven scenarios ranging from $5 to help 2 children to $225 to help 90 children (€2.5 for each life helped). Since costs and benefits are separate dimensions (money vs. lives) people should perceive them differently. In particular, money should be easier to evaluate and the disutility of donating more money should be felt more than the utility of saving more lives. At some point, perceived benefit should no longer outweigh perceived cost and people should stop giving. The affective reactions attached to perceived cost and benefit should induce participants to be less willing to donate as these two dimensions increase, therefore showing a curve consistent with psychophysical numbing. Results from all three studies supported this hypothesis showing that as donation amounts (and number of children helped) increase willingness to donate decreases. In addition, Experiment 2 showed that the effect does not depend exclusively on participants' financial constrains; people do not reject plans requiring high donation amounts simply because they do not have enough resources. Finally, Experiment 3 significantly reduces the decrease of willingness to help by presenting participants with an unfamiliar currency, which is less easy to evaluate.

Moderators of anchoring effects in charitable giving

Janet Kleber, Stephan Dickert & Enrico Rubaltelli

Donation amounts of other people often function as a numerical anchor for potential donors, who orient themselves on this cue for their own donation decisions. Previous research indicated that the strength of such anchor effects can be influenced by situational cues. Another possible moderator of the importance of this numerical anchor, however, might be the ability to comprehend and use numbers (i.e., numeracy). The current research examines the impact of situational cues and numeracy on the importance of anchors on charitable giving. In Experiment 1, we investigated whether the effect of an anchor (low vs. high) depends on whether it refers to ingroup vs outgroup members. In Experiment 2, donation requests either presented an unidentified (affect-poor condition) or an identified (i.e., affect-rich condition) victim together with a numerical anchor (low vs. high). The results of both experiments consistently demonstrated that highly numerate individuals use the anchor in their donation decisions independent of situational cues. In contrast, less numerate individuals did not show an anchor effect in Experiment 1 and not in the affect-rich condition in Experiment 2. Hence, anchor effects are influenced by individual differences in interaction with situational cues.

Symposium 5

Revisiting the exploration-exploitation tradeoff in decisions-from-experience

Convenor: Emmanouil Konstantinidis

Discussant: Nigel Harvey

Interest in the impact of experience on behavior has grown in recent years. One framework has become the standard workhorse for such investigations: Decisions-from-experience (DfE). In DfE individuals learn about the value of options by making choices (real or simulated) and receiving feedback about the outcome that occurred. In addition to providing insight into learning processes DfE also allows for investigation of exploration and exploitation tradeoffs and how individuals adapt to change. Our symposium will present research aimed at providing a better understanding of how individuals tradeoff the costs of exploration against its benefits. T. Rakow will present work investigating the stability of exploration/exploitation within individuals, and how the tradeoff is impacted by the costs associated with exploration. E. Konstantinidis will discuss the impact of increasing choice on exploration and exploitation. N. Ashby will present work investigating how individual differences in exploration strategies relate to learning in stationary environments and adaptation in dynamic ones. B. Newell will present work involving dynamic environments allowing for insight into the optimality of human behavior. M. Speekenbrink will present computational models that allow for links between behavior and underlying cognitive processes to be made. N. Harvey will conclude with discussion on the implications of these results for cognitive theory.

Exploration, exploitation, and strategy use in experiential choice

Tim Rakow & Nathaniel Ashby

In experiential decision making tasks it is often assumed that an exploration (learning) phase precedes an exploitation phase (in which the decision maker prioritizes profit). In two studies we examine how distinct these two phases are, how the amount of exploration varies with its costs, and whether individuals show a preference for diversification in choice. Study 1 employed several novel tasks and examined how the amount and pattern of exploration varied with different associated costs. In Study 2, we increased choice complexity (more options and/or outcomes per option) and introduced a paradigm allowing a choice policy to be used in place of making choices sequentially. We find the amount of exploration to be somewhat sensitive to information costs but limited in all conditions. Individuals showed high consistency across conditions in their degree of information acquisition and patterns of exploration, suggesting that each individual might have a default threshold, and preferred strategy, for exploration. Furthermore, we find, counter to what is often assumed, that reduced rates of alternation do not imply a move from exploration to exploitation as alternation rates were similar across distinct exploration and exploitation phases (that were imposed by the study design). Lastly, participants' policies revealed a preference for choice diversification. Together, our findings suggest that exploration and exploitation are not as easily distinguished as is often proposed, and that individuals with strict preferences might still alternate between options on successive choices as part of their exploitation strategy.

Decomposing complexity in decisions from experience: Exploration, exploitation and diversity of choice

Emmanouil Konstantinidis & Nathaniel Ashby

Research on decision-making under uncertainty has predominantly focused on choice behaviour between binary options. In a behavioural study involving repeated decisions-from-experience, we explored decision dynamics in conditions with increasing levels of structural complexity; including 2, 4, 8, or 16 options in the decision environment. Across levels of structural complexity, choices are made proportional to the rank order of available options according to their expected value (EV). In other words, people do not solely select the most profitable (maximising) option but they spread their choices in a quasi-normative way (i.e., relative to each option's expected value), even after extended exploration of the available options. We sought to understand the underlying psychological mechanisms that give rise to this effect by employing computational modelling analysis. Specifically, we used a reinforcement-learning model which incorporates basic decision processes such as learning of each option's value, the exploration-exploitation trade-off, and action inertia mechanisms. Inspection of the model parameters for each level of complexity revealed that participants exhibited increased exploration as the number of options increased. Importantly, this explorative behaviour cannot be accounted for by differences in learning each option's value and may indicate a tendency to diversify choices even after a great deal of experience.

Unpacking the exploration-exploitation trade-off in a changing world

Ben Newell, Daniel Navarro, Christin Schulze

Many decisions in the lives of animals and humans require a fine balance between the exploration of different options and the exploitation of their rewards. The balance required in these situations is commonly referred to as the exploration-exploitation tradeoff. However, this seemingly simple characterization belies a more complex relationship. This talk will discuss how exploration and exploitation are best conceptualized as points on a continuum, and that the extent to which an agent's behavior can be interpreted as exploratory or exploitative depends upon the level of abstraction at which it is considered. The talk will then present data from two versions of a task in which the opportunities for obtaining rewards or information are completely isolated, and show that in both static and dynamic environments sufficient experience leads to behavior which approximates the optimal policy.

Restless bandits: Exploring and exploiting in a changing environment

Maarten Speekenbrink

Rather than reasoning about fully described decision problems, we often have to learn to make decisions by taking actions and experiencing their outcomes. In such situations, there is a dilemma between choosing alternatives that we believe will provide good outcomes ("exploiting") and choosing alternatives in order to learn more about their outcomes ("exploring"). How to balance exploration and exploitation is a fundamental issue in reinforcement learning and especially pertinent in volatile environments where the action-outcome contingencies change over time. I will present two studies investigating how people learn and make decisions in "restless bandit" tasks involving repeated choices between multiple alternatives with changing rewards. I will show that exploration in such tasks depends on subjective uncertainty regarding the rewards associated with each option and that decisions of many participants follow a principle known as Thompson sampling. Thompson sampling is a form of probability matching, and while this is generally thought to be suboptimal, I will show that this behaviour is well suited to decision making in changing environments.

Symposium 6

The Development of Decision Competence

Convenor & Discussant: Tilmann Betsch

Whereas most research in the field of JDM still deals with adults a growing number of researchers of the JDM community start looking at the young and elderly decision maker. This symposium focuses on the lifespan development of abilities relevant for successful decision making in a probabilistic environment. It includes talks examining (1) how memory development accounts for differences in strategy selection between younger and older adults (2) the role of experience for successful application of heuristics (3) children's ability to use probabilities for selective information search (4) the influence of feedback on children's use of probabilistic information (5) the impact of naturally presented cues on children's strategy application.

This recent research does not only broaden our perspective on the decision maker beyond young adulthood but also implies insights in successful as well as ineffective strategy application in general.

Age Differences in Memory-Based Decision Making

Anika Josef, David Kellen, Yee Lee Shing, Thorsten Pachur, Ralph Hertwig & Rui Mata

Episodic memory functioning undergoes profound reorganization over the life span with rapid increases during childhood and steady declines from adulthood to old age. Especially old age is marked by decreases in the ability to bind independent memory features into a bound memory representation as well as the ability to strategically select and control memory content during retrieval. These changes likely affect decision making in situations in which information is not conveniently presented to decision makers but rather needs to be retrieved from memory. We present results of studies investigating the role of memory demands in determining the developmental patterns of memory-based decision making from adulthood to old age. More concretely, we compared groups of young and older adults in two decision conditions varying in their memory demand. Participants were asked to engage in a simulated personnel selection scenario, in which they had to decide which candidate would be best suited for a job given a number of previously learned attributes when either none (high-memory-demand condition) or a few pieces of information (low-memory-demand condition) about the candidates were presented on the screen. The studies suggest that age differences in decision performance are moderated by memory demands and mediated by quality of cue recall, with especially older adults showing poorer performance with increasing memory demand. Moreover, computational modeling of decision strategies suggests that age differences in both strategy selection and execution may underlie such performance differences.

The Development of Adaptive Decision Making: Recognition-Based Inference in Children and Adolescents

Sebastian Horn, Thorsten Pachur & Azzurra Ruggeri

Although a growing body of research indicates that basic-level abilities to consider probabilistic cues in judgment tasks may develop relatively early, the strategic and adaptive use of such information may hinge on experience and thus emerge considerably later. We examined developmental differences in probabilistic inference, where the relative criterion value of real-world objects could be inferred from a simple cue: whether the object was familiar. A model of a frugal strategy that capitalizes on such old-new discrimination is the recognition heuristic (RH). The usefulness of this strategy depends on the task environment, and particularly the correlation between the recognition cue and the criterion (recognition validity). We examined (a) to what extent children and adolescents already apply the RH and (b) at what age adaptivity emerges. Primary-school children ($M = 9$ years), younger ($M = 12$ years), and older adolescents ($M = 17$ years) made inferences in task environments with either high or low recognition validity. We measured reliance on the RH with a hierarchical Bayesian implementation of a multinomial model. The results indicated that the use of simple heuristics does not progress unidirectionally. Primary-school children already used the RH. However, only older adolescents adaptively adjusted strategy use between environments and reduced their reliance on the RH when recognition validity was low. Our findings suggest that 9-year olds can consider simple predictive cues, as required for the RH, to make inferences about the world. However, the adaptive use of this information appears to develop later and may depend on a richer knowledge base.

Lost in Search: (Mal-)Adaptation to probabilistic decision environments in children and adults

Tilmann Betsch, Anne Lehmann, Stefanie Lindow, Anna Lang & Martin Schoemann

Adaptive decision making in probabilistic environments requires individuals to utilize probabilities as weights in pre-decisional information search and/or subsequent choice. Introducing a child-friendly computerized environment (Mousekids), we track children's (5-6 years, n = 105; 9-10 y., n=100) and adults' (21-22 y., n = 103) search behavior and decisions under different probability dispersion (cue validities: .17; .33; .83 vs .50, .67, .83) and constraint conditions (instructions to limit search yes vs. no). All age groups limit depth of search under high dispersion (.17 to .83) and instructions to limit. In contrast to adults, children fail to use probabilities as weights for their search, which is, instead, largely unsystematic. Choices, however, reveal that elementary schoolers (in contrast to preschoolers) are able to systematically use probabilities as weights in their decisions. This suggests that an intuitive understanding of probabilities and the capability to use them as weights during integration is not a sufficient condition for the application of simple selective search strategies that place one's focus on weight distributions.

The effects of normatively irrelevant feedback on children's and adults' probabilistic decision making

Anna Lang & Tilmann Betsch

Learning from feedback is an important ability for increasing decision quality over the life span. However, research with adults shows that in probabilistic environments feedback does not always improve decision making, e.g., when the feedback is normatively irrelevant because the decision maker is already provided with sufficient information about the task structure by description. We examined children's and adults' performance in decisions in which both sources of information – description and feedback – are available. We studied preschoolers (5-6 years), elementary schoolers (8-9 years) and adults decision making in a closed (Exp. 1) and open (Exp. 2 and 3) information board paradigm using a computerized child-friendly version of the mouselab tool ("Mousekids").Contrary to expectations, children did not benefit from a feedback-free environment to adjust search or choice behavior more systematically to the initially provided cue validities. Consequently, a large part of preschoolers and a substantial part of elementary schoolers used a simple switching rule (between options) instead of any analytical decision strategy. Only very few children used feedback systematically at all, by implementing a change after failure strategy.

The impact of natural cue presentation on children's utilization of probabilistic cues

Anne Lehmann, Tilmann Betsch & David Buttelmann

Decision making in risky environments constitutes a complex thought process, which requires not only basic cognitive abilities but also the understanding and proper use of probabilistic information. Recent research in Judgement and Decision Making exploring risky decision making in children and adults using a child-friendly information board procedure, observe that some children at the age of nine are able to systematically use probabilistic information while children at the age of six fail to take the probabilistic information into account for their decisions. However research in other domains indicates that children younger than six years are able to use probabilistic information if the information is expressed similar to their natural experience, for instance in learning tasks. To explore if children`s probabilistic decision making improves when probabilistic cues are displayed in a more natural and easily comprehensive fashion, we modified the presentation format of the probabilistic information in a child-friendly mouse lab procedure ("Mousekids") by adapting cue presentations, often employed in developmental research. Specifically we confronted six and nine year old children with probabilistic cues, advice givers that differ regarding their relative frequency of engaging in helpful behavior. Contrary to our expectations this did not foster the systematic use of probabilistic information in six and nine year old children. This suggests that it is not the display of probabilistic information but rather the lack of explicit understanding of probabilistic information that is hindering its systematic utilization in children's decisions.

NUDGE 1

In anthropomorphic figures we trust! Testing the effect of privacy nudges on passive and direct disclosing behaviour

Nuria Rodriguez Priego, Rene van Bavel, Shara Monteleone & Alessandro Acquisti

Research on privacy protective behaviour shows that, despite privacy awareness, individuals end up making disclosure decisions that are risky or that they later regret. The instruments usually adopted by data controllers to be compliant with the law are privacy notices. However, it doesn't ensure that individuals make the best disclosure decisions as they do not always read the notices, do not understand them, do not take any action on them, or do not disclose information consciously.

An online experiment was conducted (n = 3,229) with the aim of testing several privacy-policy "nudges". Subjects were asked about personal information in passive and direct ways to evaluate how the nudges affected to the quantity of personal data they revealed. A probit and poisson regression models were built to analyse the determinants of passive and direct disclosure. Results confirmed that participants who visualized and anthropomorphic figure disclosed more information in both ways. Country differences showed that subjects from Italy disclosed more information passively than the rest of the countries. However, they were the ones who disclosed less information when asked directly. Younger individuals disclosed more information directly, whilst older subjects revealed more data passively. Females revealed less than males in a direct way, and higher educated subjects revealed less in a passive way.

Although both passive and direct disclosure are different concepts, the anthropomorphic nudge makes subjects reveal more information in both approaches. As a conclusion, individuals may increase their feeling of trust when visualizing an anthropomorphic figure. Future research should test the effect of different anthropomorphic characters and its relationship with individuals' trust

Nudging and Dodging Vaccination through Defaults

Gretchen Chapman, Meng Li & Elaine Leventhal

Nudge interventions can encourage healthy behaviors, but individuals may also find ways to dodge their effects. Outpatients (N=886) received an opt-out letter that automatically scheduled them for a flu shot appointment that they could cancel, or an opt-in letter informing them that they could make a flu shot appointment, or no letter. On-site vaccination was higher in the opt-out condition (27%) than in the opt-in (18%) or no-letter (17%) conditions. However, this default effect was limited to flu shots received during the flu shot appointments that were the subject of the letters. Flu shots received during regular doctor's office visits were not affected by the letter manipulation, but neither were they displaced by the manipulation. In addition, of the opt-out patients who retained their appointments, 62% did not show up for their scheduled appointment—a potential burden to the clinic. 298 of the patients completed a follow up questionnaire about flu shots received on-site at the clinic as well as off-site at workplace or pharmacy. The letter manipulation affected self-report of on-site vaccination (36% vs. 21% vs. 19%) but did not affect self-report of off-site vaccination.

There was no detectable displacement effect (the letter manipulation did not have a significant negative effect on off-site vaccination), and self-reported vaccination at any location showed a small but significant default effect after controlling for age and vaccination last year (74% for opt-in vs 66% control).

Thus, prescheduled vaccination appointments do increase onsite vaccination rates, but at the expense of a high no-show rate. In addition, the size of the effect is diluted when considered in the context of on- and off-site vaccinations.

The Maximizing Norm. Encouraging to Get the Best Enhances Decision Avoidance

Marijke Van Putten & Marret Noordewier

Wanting the best for others is a noble ambition. The most straightforward strategy to fulfill this ambition seems to encourage people to only settle for the maximum outcome. In many situations, people are indeed assumed to opt for maximum outcomes. For example, among our students we regularly notice that good is not good enough and see their disappointment when they pass sufficiently rather than with excellence. In the present research we investigate what the effects are of assuming a maximizing norm on decision making. Previous research on maximizing showed that people who habitually strive for maximum outcomes are less satisfied with their decisions and experience more decision regret (e.g., Schwartz, Ward, Monterosso, Lyubomirsky, White, & Lehman, 2002). Recent findings show that instructing people to choose the best option also decreases satisfaction and increases regret (Ma & Roese, 2014). Notably, these are prime determinants for decision avoidance (e.g., Anderson, 2003; Beattie, Baron, Hershey, & Spranca, 1994). Thus, encouraging people to strive for the best might seem like a good strategy to motivate people to act. However, the consequences of the resulting maximizing mind-set might have the opposite result. This leads to the counterintuitive prediction that encouraging people to go for the best is not motivating at all, but actually leads people to avoid decisions altogether. Our results confirmed this new prediction. We found that setting a maximizing norm increases the score on the Maximization scale (Study 1), that it leads to decision avoidance tendencies (Study 2) and increases the likelihood of decision avoidance (Study 3).

The role of domain knowledge, interfaces and mindsets on energy-saving decisions made with a recommender system

Martijn Willemsen, Ron Broeders & Bart Knijnenburg

In several studies we investigate the role of domain knowledge, user interfaces, and mindsets on energy-saving decisions made by users of an energy-saving recommender tool. In our initial work consisting of several experiments with a Multi-Attribute Utility Theory (MAUT) based recommender, we tested different preference elicitation interfaces. Matching the interface with users' domain knowledge increases their satisfaction with the system and the measures chosen and makes them select larger energy-saving measures. In a subsequent study we manipulated mindsets (using why and how questions) and show, consistent with construal level theory, that those in an abstract mindset select fewer but larger energy-saving measures in our recommender system, compared to those in a concrete mindset. The final study provides ecological validation of mindset manipulations on a real-life website (N=1578). Manipulating the mindset through different introductory texts, we find that users in an abstract mindsets show more engagement with the website and select more energy-effective (more desirable) measures, but those in the concrete mindset condition show more behavioral intention to implement the energy measures chosen.

Tailoring energy-saving advice using a unidimensional Rasch scale of conservation measures

Alain Starke, Martijn Willemsen & Chris Snijders

Initiatives that promote energy conservation, mass-media campaigns in particular, are often unsuccessful in motivating individuals to conserve energy, as they do not tailor their conservation measures to the individual (Abrahamse et al., 2005).

This paper proposes a novel approach to energy conservation, by introducing an energy recommender system that does tailor conservation advice using the Rasch model (Kaiser et al., 2010). Rasch can assign execution difficulty levels to different conservation measures, based on (self-reported) behavior of individuals. This way, Rasch can create a unidimensional scale of conservation measures sorted in terms of their difficulty that can be used to estimate the energy-saving ability of individuals (cf. Bond & Fox, 2006).

In study 1 (N=263), we estimated a Rasch scale using 88 conservation measures and found that 79 of them could be fitted on an unidimensional scale, despite their diverse (multidimensional) nature, containing both curtailment (e.g. unplugging chargers) and efficiency behaviors (e.g. PV cells).

In study 2 (N=198), we tested what energy recommendations users should be recommended: those with a difficulty level above or below one's ability? We developed a web-tool that determined a user's ability based on our Rasch scale. The system provided conservation measures with difficulty levels above, equal to, and below the user's ability. To measure the perceived appropriateness of these measures, users had to rank-order the recommendations in preference order.

The experimental analysis indicates that users perceived conservation measures with a difficulty below their own ability as more appropriate than those with a difficulty above it, demonstrating the usefulness of a unidimensional energy-saving scale in a recommender system.

Natural Frequencies Facilitate Diagnostic Inferences of Managers

Sebastian Hafenbrädl, Ulrich Hoffrage & Cyril Bouquet

In a Bayesian inference tasks, information about base rates, hit rate and false-alarm rate needs to be integrated with Bayes' rule after the result of a diagnostic test became known. Numerous studies have found that Bayesian inference tasks with information presented in terms of natural frequencies lead to better performance compared to variants with information presented in terms of probabilities or percentages. Natural frequencies are the tallies in a natural sample in which hit rate and false-alarm rate are not normalized with respect to base rates. The present research replicates the beneficial effect of natural frequencies with four tasks from the domain of management, and with management students and experienced executives as participants. The percentage of Bayesian responses was almost twice as high when information was represented in natural frequencies compared to a representation in terms of percentages. In contrast to most tasks previously studied, the majority of numerical responses were lower than the Bayesian solutions, which cannot be accounted for by "base-rate neglect". An implication of our work is that textbooks explaining Bayes' theorem should be rewritten, using natural frequencies instead of probabilities or percentages.

CHOICE 3

Losses Increase the Sensitivity of Internet Searches to Stock Market Events

Eldad Yechiam, Eli Arditi & Gal Zahavi

Experimental studies have suggested that losses lead to increased search among relevant alternatives. Additionally, studies have shown that individuals are more sensitive to differences between monetary losses than to differences between respective gains. Utilizing data from Google trends, we evaluated the implications of these findings to real world Internet search of stock-related information. Specifically, we investigated the relationship between stock-specific events and related Google searches. We studied daily data from 13 stocks from the Dow-Jones and NASDAQ100 indices, over a period of 4 trading years (a total of 16,081 observations). Focusing on Intensive Search Periods (ISPs) of these stocks tickers, we found a correlation between the magnitude of the stock return at the beginning of the period and the volume, peak, and duration of Internet search generated during the period. This correlation was considerably magnified in cases of negative stock returns at the beginning of the ISP. However, across all ISPs, we did not find that losses were associated with increased Google searches. Thus, rather than increasing search, losses improved the sensitivity of the search volume to the magnitude of the market event. The findings demonstrate the robustness of the effect of losses on sensitivity to differences between external events.

A new approach in studying Decision-Making: the EXogenous ACcumulation Task (EXACT)

Valerio Biscione & Christopher Harris

Human decision-making has been analysed from two viewpoints: 1) the perceptual process that allows observers to accumulate information; and 2) the decision rule that observers employ to decide when to stop collecting information and make a response. In a classic reaction time task the decision rule can only be analysed by assuming a particular perceptual process. We propose a new approach in which the accumulation of information is "hard-coded" in the experiment, so that the researcher can make inferences on the decision rules without having to assume a particular perceptual process. We call this design the "EXogenous ACcumulation Task", because the accumulation of information happens outside the participant's mind. We show experimentally how this paradigm can be used to analyse decision rules. We also compared four different decision rules and show that the modified Reward Rate model fits data better than the Bayesian Risk, Reward Rate, or Reward/Accuracy models. We also show how several features of the response distributions, usually found in classic RT tasks and deemed as side-effects of the perceptual process, are also found with the EXACT and may therefore be explained by the decision rule alone. We hypothesize how Piéron's Law, a psychophysical law that connects speed of response with stimulus intensity, may be the result of the decision rule adopted. We propose several ways in which the EXACT Paradigm could contribute to the understanding of decision-making mechanisms in humans.

How forgetting affects rule- and exemplar-based judgments

Janina Hoffmann, Bettina von Helversen & Jörg Rieskamp

People often forget acquired knowledge over time such as names of former classmates. Judgment and decision processes, however, rest on on the knowledge people process. Accordingly forgetting should influence judgment processes. Judgment research has emphasized that people can use two types of judgment strategies that reflect different knowledge representations: rule-based and exemplar-based strategies. Whereas exemplar-based strategies rely on the retrieval of specific exemplars from long-term memory, rule-based strategies rely on inferring cue-criterion relationships and do not require retrieving past exemplars. Therefore, forgetting might harm judgments more in an exemplar- than a rule-based judgment task. Furthermore, the inability to retrieve specific exemplars could induce people to rely more on rule-based strategies. To investigate this idea we conducted two studies that manipulated forgetting by varying the time delay (immediate, one day, one week) between learning to make judgments and a test phase within participants (study 1) or between participants (study 2). In both studies judgment accuracy decreased with longer time delays and this decrease was stronger in the exemplar- than the rule-based task. However, time delay decreased accuracy less in the first than in the second study. Cognitive modeling further indicated that in the first study participants did not change judgment strategies over time, whereas in the second study participants tested after one week in the exemplar-based task switched from an exemplar-based to a rule-based strategy. In sum, forgetting may harm the ability to make accurate judgments, particularly if people need to remember stored exemplars. Furthermore, the effect is stronger the less participants can practice the judgment task.

Single Process or Multiple Strategies: Which Framework of Multi-Attribute Decision Making describes Decision Makers' Stopping Behavior best?

Anke Söllner & Arndt Bröder

For multi-attribute decision tasks different frameworks exist that describe the process of decision making and its adaptation to diverse problems and situations. Multiple-strategy-models (MSMs) assume that decision makers choose adaptively from a set of qualitatively different strategies, whereas single-process-models assume that a single, uniform mechanism is employed, but adapted to the environmental change. For example, in evidence accumulation models (EAMs) the individual evidence threshold can be increased and decreased respectively. Both frameworks account well for many empirical findings concerning multi-attribute decisions and were repeatedly claimed to be hard to disentangle empirically. However, they make diverging predictions concerning the information acquisition behavior - namely, that search is terminated according to the selected strategy's stopping rule (MSMs) or that information is acquired until the individual evidence threshold is passed (EAMs). In three experiments, we contrasted these predictions by providing participants with varying degrees of evidence in a half-open-half-closed information board. For the majority of participants we find that their stopping behavior is well captured by the notion of an individual evidence threshold that is either undercut or passed by the given evidence.

Foreign Language and Moral Thought

Janet Geipel, Constantinos Hadjichristidis & Luca Surian

We investigated how the use of a foreign language influences moral judgment. Participants judged the moral wrongness of offensive-but-harmless actions (intended but unsuccessful favoritism of employees) and of everyday social and moral norm violations (cutting in line when in a hurry), either in a foreign language or in their native language. Combining evidence from bilingual and moral judgment research, we predicted that the use of a foreign language would attenuate the evaluation of the moral wrongness of such violations. Consistent with this prediction, we found that the use of a foreign language led to less harsh moral judgments and less confidence in one's moral evaluations. We propose that foreign language influences moral judgment by reducing the activation of relevant social and moral norms. Such norms are typically learned and experienced in a context where the native language is used, and thus the native language acts as a better cue for activating them. The present findings carry implications for international level decisions, such as those made by NATO or the UN, where many diplomats have to decide on the basis of communications in a foreign language.

Fifty Shades of "Medium": The Psychology of Intermediate Attribute Levels

Dan Schley & Bart de Langhe

Prior research has demonstrated that individuals prefer compromise options when presented with three or more alternatives. Surprisingly, less is known about how changes in attribute levels for intermediate options influence individuals' assessments of value and choice. Four studies, employing a myriad of stimuli and dependent measures, demonstrate that the relationship between attribute levels and subjective value is consistently inverse S-shaped. Specifically, individuals are relatively less sensitive to changes in attribute levels near the middle of the attribute range than to changes near the extremes. We contrast this result with other potential patterns of results within the literature. Three additional studies demonstrate that simple variations in stimulus presentation, increasing or decreasing the accessibility of ordinal relationships, moderate sensitivity to intermediate attribute levels. We conclude that the inverse S-shaped curvature in the attribute-value relationship can be traced (in part) to individuals' tendency to mentally apply ordinal labels to options.

RISK & UNCERTAINTY

Decision-making in aging: Age-related differences in decisions under ambiguity and decisions under risk

Alessia Rosi, Elena Cavallini & Riccardo Russo

The extent of age-related differences on decision-making abilities may depend on the type of decision situation (decision under ambiguity vs. under risk). However, the studies that examined the effect of aging on decision under ambiguity and under risk reported either inconclusive or mixed results. In addition, it has been suggested that the age differences in decision under ambiguity may depend on the complexity of the features of the decision task used. No study has examined the age differences in this decision condition through tasks of different complexity of features.

The aim of this study was to test whether age-related impairments in decision-making is attributable to the type of decision-making situation, or to the complexity of the features of the task used or to the difficulties in cognitive abilities. For this purpose, 50 young (M=23.02) and 50 old adults (M=71.78) completed three different tasks: one decision task under risk, the Game of Dice Task (GDT) and two decision tasks under ambiguity of different complexity of contents: the Iowa Gambling Task (IGT) and the Hungry Donkey Task (HDT). In addition, participants performed tasks tapping working memory and executive functions.

Results showed that in the decision-making tasks under ambiguity old adults performed as well as young adults, where, however, the HDT resulted harder than the IGT. Differently, old adults showed poor performance on the GDT relative to young adults, indicating difficulty in making advantageous decision under risk condition. Significant correlations were detected between GDT performance and the years of education, working memory and inhibition process. These findings show that the pattern of age-related differences varies both as a function of the task used and of the decision situation.

The Value of Contradiction for Judgment under Uncertainty: The Consider-Two-Opposites Technique

Mandy Hütter & Jochim Hansen

Dialectical bootstrapping consists in the consecutive elicitation of different judgments to exploit the wisdom of one's inner crowd. We propose a consider-two-opposites (C2O) technique that employs the estimation of lower and upper bounds of a confidence interval. Experiment 1 demonstrated that the C2O technique has a high potential to generate contradictory estimates that bracket the true value. Moreover, participants showed a strong tendency to combine the bounds towards a final estimate. Experiment 2 replicated the potency of the C2O technique and additionally assessed the effect of an initial best guess on the elicitation of the inner crowd. The introduction of an additional estimation phase increased the accuracy of the final judgment, which can be traced back to a better calibration of the confidence interval. There was again a pronounced tendency to combine the bounds when forming a final judgment irrespective of the generation of a best guess. In summary, the C2O technique provokes contradiction in a decision maker's estimates thereby increasing the likelihood of bracketing the true value. Moreover, the present research illuminates participants' strategies of arriving at a final judgment. It will be discussed that participants appear relatively well adapted and that this effect can be traced back to participants utilizing the distance between estimates, but not to other insights into properties of their estimates.

Bias or Sensitivity in Risky Choice? Lottery Decisions under Cognitive Load

Sebastian Olschewski, Benjamin Scheibehenne & Jörg Rieskamp

In many real-world situations, including financial or medical choices, cognitive capacity for decision-making is limited due to multiple task demands or severe time pressure. To better understand decision-making processes under these circumstances, we propose a mathematical model of choice that allows to distinguish, whether behavior under limited cognitive capacities can be better explained as a shift in preference or sensitivity, that is the level of error.

To directly test these conflicting explanations in a unifying mathematical model we develop a hierarchical Bayesian logistic regression (Kruschke, 2011) to analyze data from binary lottery choices. This model yields novel insights on both individual and group level, as it provides a principled way to distinguish risk preferences from sensitivity with high statistical power.

As a first step, we ran a parameter recovery simulation to ensure that the model consistently distinguishes between different preferences and levels sensitivity. In a next step, we ran an empirical study with repeated, adaptive lottery choices to show that the current model can capture individual differences as well as sensible estimates on a group level. In a final step, we used this model in a dual-task paradigm (memorizing digits or N-Back task) to test how resource limitation influences risk preference and sensitivity on both, individual and group level.

We conclude that research on the effect of resource limitation in lottery decisions benefits from a mathematical cognitive modeling approach that explicitly allows to test a shift in preference against a change in choice sensitivity or error.

Conversational pragmatics as a mechanism of cross-cultural differences in interpreting verbal quantifiers of uncertainty

Miroslav Sirota & Marie Juanchich

Aim: Cross-cultural differences in the numerical estimation of verbal probabilities are well-documented. However, little is known about the underlying mechanisms and effective interventions reducing variability in cross-cultural interpretations. We suggest here conversational pragmatics as a potential underlying mechanism. We hypothesized that hearers' expectations of the communication intentions of speakers will account for the differences. An intervention tapping into this mechanism – featuring speakers that explicitly express their communication intentions as being informative only – should reduce cross-cultural differences.

Method: We tested our hypotheses in health-related contexts. In a large-scale cross-cultural experiment ($N = 864$), samples from the USA and India – in which different communication styles of doctors were assumed – were randomly allocated to a control or an intervention condition. In four scenarios, participants interpreted the communication intentions of doctors conveying uncertainty, estimated the conveyed probability and subsequently made a related decision.

Results: A series of multilevel models with a random intercept showed that Indians perceived higher probability of negative outcomes than Americans ($b = 11.16$, 95% CI [9.04, 13.29]). The attributed intentions to health practitioners partially mediated such effect ($ab = 0.31$, 95% CI [0.13, 0.50]). However, the intervention did not mitigate the cross-cultural differences ($b = -0.07$, 95% CI [-2.15, 2.00]).

Conclusions: We corroborated conversational pragmatics as a partial mechanism of the cross-cultural differences in perceived probability of verbal quantifiers of uncertainty. The mechanism appears to be robust, since the intervention did not mitigate cross-cultural differences.

From observation to prediction: Effects of kind and wicked experience

Emre Soyer, Tomas Lejarraga & Robin Hogarth

The accurate detection and assessment of covariation are critical for humans and animals as they make choices to further their goals. People typically learn about such patterns through experience and then then take actions based on their inferences. Of particular interest to the present investigation is the phenomenon of illusory correlation or the finding that in many situations people's assessments of covariation are systematically biased. We show how these assessments are closely related to the structure of the environment that provides people with experience. Our framework also allows for testing and discussing ways to reduce bias.

In three experiments, we explore how the information people acquire about the relationship between two variables is used when making predictions and choices. We find that such predictions and choices are often inconsistent with the judgments that led to them. In particular, even when participants judge that there is no relation between the variables they experienced, they make predictions as though such a relation exists. In addition, when they judge a relation to be positive or negative, this relation is amplified in their predictions. Moreover, the predicted relation is often stronger when the first setting involves a biased instead of an unbiased experience. This result holds even when decision makers are warned about and acknowledge the biases in their experiences.

When Probable = Improbable: Sentential Context Effects in the Numerical Interpretation of Positive and Negative Linguistic Probabilities

Mandeep Dhami & David Mandel

When we use positive and negative probability terms such as probable and improbable we intend for them to have different (e.g., polarized) meanings. The fact that these terms are used in sentential contexts, suggests that it is important to understand how such contexts affect the meaning of probability terms. We compared the effect of sentential context (i.e., when describing the chance of an outcome occurring versus not occurring) on numerical interpretations of positive (e.g., "probable") and negative (e.g., "improbable") linguistic probabilities. Significant outcome manifestation □ polarity of probability term interaction effects were found for the minimum, peak, and maximum numerical interpretations of probability terms. Specifically, positive and negative terms only differed in their numerical interpretation when they appeared in a sentence describing the occurrence of an outcome. There was no significant difference in interpretations of these terms when they described the non-occurrWhen we use positive and negative probability terms such as probable and improbable we intend for them to have different (e.g., polarized) meanings. The fact that these terms are used in sentential contexts, suggests that it is important to understand how such contexts affect the meaning of probability terms. We compared the effect of sentential context (i.e., when describing the chance of an outcome occurring versus not occurring) on numerical interpretations of positive (e.g., "probable") and negative (e.g., "improbable") linguistic probabilities. Significant outcome manifestation □ polarity of probability term interaction effects were found for the minimum, peak, and maximum numerical interpretations of probability terms. Specifically, positive and negative terms only differed in their numerical interpretation when they appeared in a sentence describing the occurrence of an outcome. There was no significant difference in interpretations of these terms when they described the non-occurrence of an outcome. Thus, the discriminability of positive and negative linguistic probabilities is reduced by sentential context. ence of an outcome. Thus, the discriminability of positive and negative linguistic probabilities is reduced by sentential context.

INTERTEMPORAL CHOICE 1

Giving the Future A Chance

Elke Weber

Bounded rationality and finite processing capacity make it understandable that homo sapiens focuses attention first on the here and now. But many individual and social problems require increased attention to future costs and benefits, with climate change as the most urgent challenge for decisions that fully and justly weigh the immediate and certain costs and benefits of business-as-usual or greenhouse gas mitigation efforts against their delayed, risky, and often disputed costs and benefits. Psychological theories from prospect theory to hyperbolic discounting and query theory predict that future costs of business-as-usual and future benefits of GHG mitigation efforts will get short thrift in the way such decisions are typically made.

I present data for three interventions that focus greater attention on future consequences and thus provide entry points for choices that better balance short-term and long-term goals and objectives. (1) In tradeoffs between immediate and delayed consumption, discounting of future consequences is reduced when choice options with future benefits are made the default and when decision makers are otherwise prompted to consider arguments for such choices first (Weber et al., 2007). (2) Individual and country-level data show that citizens may use perceptions of their country's age to predict its future continuation, with longer pasts predicting longer futures, and longer futures justifying greater investments into sustainability. Thus framing a country as a long-standing entity can promote pro-environmental behavior (Hershfield, Bang, & Weber, 2014). (3) Finally, individuals' motivation to leave a positive legacy can be leveraged to increase engagement with climate change and other environmental problems (Zaval, Markowitz & Weber, 2015).

The effect of verb tenses on the perception of temporal distance from the present to the future

Marta Stragà & Massimo Warglien

The aim of the present research is to explore the effect of verb tenses on the perception of future temporal distance. To our knowledge, no studies experimentally tested if expressing future events in the present tense can reduce the perception of the distance from the present. In this study we tested this prediction, asking participants to evaluate the distance of future events that were described either in the present or in the future tense (in Italian language, in which both forms are acceptable). Participants were presented with statements (in a random order) that described future events in first-person singular, and in the present or in the future tense, according to the condition to which they were randomly assigned. Four temporal labels (from a week to three months) were paired with five events (e.g., "going to the cinema"), for a total of 20 sentences. In addition, they were instructed to generate an event in the present or the future tense that was presented with each temporal label. Participants indicated the temporal distance of each event from the present placing a slider along a line (from very close to very distant). Results showed a significant interaction between objective temporal distance and the condition: as the objective distance increased, the temporal distance was perceived as greater in the future condition than in the present condition. This effect was found both with given events and self-generated events. Our results show a new way in which language can affect perceptions: even though the objective temporal distance from the present was explicitly mentioned, the perceived distance decreased when events were described in the present tense, especially for longer durations.

This effect could have interesting applications, for instance on delay discounting. If tenses affect perceived distance, they could influence delay discounting as well: the future option, described in the present tense, should be perceived as nearer and, as a consequence, people should be more willing to wait in order to receive a larger reward in the future. Future studies will address this issue.

Delay discounting measured for uni-modal and cross-modal choices

Daniel Read, Rebecca McDonald & Robin Cubitt

We distinguish between uni-modal and cross-modal discounting decisions: uni-modal decisions involve tradeoffs among the same type of option (e.g. money now versus more money later), while cross-modal decisions involve tradeoffs among different types of option (e.g. buy a car now versus take a vacation in one year). Simple economic theory predicts that measured discounting will be independent of whether choices are uni-modal or cross-modal. The aim of this research is to empirically investigate the difference between discounting in cross-modal and uni-modal decisions. We test the equivalence of the discounting types (n=1,004) using a novel delayed-compensation method, which allows us to assess both cross-modal and uni-modal discounting. We find that uni-modal discounting is much greater than cross-modal, a result that cannot be accommodated in any standard economic model. We explain the finding with a multi-attribute choice model in which (a) time of receipt is one attribute of a dated good, and (b) the weight on an attribute varies inversely with the number of other attributes that differ in the choice set. Our results call into question the idea that there is a unique discount rate.

Automatic approach and avoidance in short versus farsighted intertemporal choice

Isabel Woyke, Iris Ikink, John Monterosso, Mike Rinck, Karin Roelofs & Bernd Figner

Behavioral and neuroscientific research on intertemporal choices typically shows substantial individual and contextual differences in impulsivity, i.e., the tendency of humans to choose the ultimately inferior, but sooner smaller reward (SS), instead of the objectively larger but later reward (LL). Currently, it is not yet well understood at a mechanistic level what makes sooner rewards so attractive, i.e., which processes are responsible for their strong impact on intertemporal choice. Here, we investigated the role of motivational processes, namely automatic approach and avoidance (AAA) tendencies on intertemporal choice. We combined an intertemporal choice paradigm with a well-established joystick response format: In a within-subjects design, a total of 94 participants either had to accept (vs. reject) a target option (either SS or LL) by either pulling (approach, congruent condition), pushing (avoidance, incongruent condition), or making right/left movements (neutral condition) with a joystick. Participants were overall faster and more often chose the LL in the congruent than in the incongruent and neutral conditions. Crucially, however, the overall patience-increasing effect of the congruent condition was moderated by the differences in subjective value between SS and LL. Only when the LL had the higher subjective value, did the congruent condition increase its choice; when the SS had the higher subjective value, the congruent condition increased choice of the SS. Thus, the congruent (as well as the neutral) condition led to choices more consistent with subjective value, compared to the incongruent condition.

Do we discount time as we discount money?

Mohammed Abdellaoui, Cédric Gutierrez & Emmanuel Kemel

In many situations, individuals make decisions that involve both time and money consequences. For instance, a company that starts the development of a new product will spend both money and time with the hope of getting future financial benefits. Similarly, a student that decides to pursue a university degree accepts to invest time in the short term in order to get a higher salary in the long term. People also have to decide on a daily basis between future time-allocation plans in their private and professional lives: "Do I prefer to do a task now or postpone it for the future?". Behavioral research has studied extensively the psychology of intertemporal discounting of money. However, despite the fact that time is a scarce and valuable resource, very few studies have analyzed the way people discount time.

The goal of our paper is therefore to understand whether people discount the value of time as they discount the value of money. We investigate this issue using a laboratory experiment where consequences are measured in units of money or in units of time and real incentives are implemented in gains and losses of time.

We observe significant differences between the discounting of time and the discounting of money. The paper also brings to light the complexity of time as compared with money and studies heterogeneity in discounting behaviors when outcomes are expressed in units of time.

FINANCIAL DECISION MAKING 1

It's About How and not only What Investors Learn

Tomás Lejarraga, Jan Woike & Ralph Hertwig

The world has just experienced the most severe economic crisis since the Great Depression. According to the depression baby hypothesis, experience of such macroeconomic shocks results in reduced financial risk taking in the future. This hypothesis has previously been tested against survey data. We tested it in a simulated experimental stock market (based on the Spanish stock index fund, IBEX-35), varying both the length of historical data available to participants (including or excluding a financial crisis) and the source of learning about economic fluctuations (through sequential experience or symbolic descriptions). Participants who learned about the market from personal experience took less financial risk than did those who learned from graphs, thus echoing the description–experience gap observed in risky choice. Furthermore, early negative experiences reduced financial risk taking long after they had occurred. In a second experiment, we reversed the market, turning the crisis into a boom. The description–experience gap persisted, with those who experienced the boom taking more financial risk that those who did not. Overall, the patterns of investment behavior were captured by a class of heuristic that tracks the momentum of the stock price. Our findings highlight the crucial role of the source of learning for financial risk taking and, therefore, in the provision of financial advice.

Perceptions of financial volatility

Darren Duxbury & Barbara Summers

Stock prices in financial markets rise and fall, sometimes dramatically, thus asset returns exhibit volatility. In finance theory, volatility is synonymous with risk and as such represents the dispersion of asset returns about their central tendency (i.e. mean). The conventional measure of volatility in finance theory, therefore, is the standard deviation of asset returns. When individuals make investment decisions, influenced by perceptions of risk and volatility, they commonly do so by examining graphs of historic price sequences rather than returns. It is unclear, therefore, whether standard deviation of return is foremost in their mind when making such decisions. We conduct an experiment to examine the factors that may influence perceptions of financial volatility, including standard deviation along with a range of price-based factors (e.g. number of changes in direction, number of peaks and troughs, number of highs and lows, mean absolute price change etc.). While standard deviation may have a role to play in perception of volatility, we find evidence that other price-based factors play a far greater role, thus calling into question the finance theory

Portfolio selection in bull and bear market: the role of aspirations, sensation-seeking, and affect in stock investments

Joanna Sokolowska

In contrast to previous research, here the focus is on investors' biases that stem from their aspirations rather than from psychophysics. Under the assumption that investment strategies follow from aspirations, it was expected that such strategies are different in bull and bear markets. Investors might apply risk-avoiding strategies in bear market and risk seeking strategies in bull market. This hypothesis was tested in Experiment 1 carried out via the Internet with private investors (N=300), who were not paid and took part in the experiment voluntarily.

Respondents had to choose one of 4 portfolios, which consisted of shares of two funds described by graphs, which illustrated return rates and their variance in the last 10 years. Participants made 3 choices, assuming that they were acting either in bear or in bull market. Risky portfolios were chosen less frequently in a bear market than in a bull market. Here, variance of return rate was taken as the index of risk. Risk attitudes were related to individual differences in sensation seeking.

In the follow-up study, the influence of affect on the perceived relation between risk and return was investigated. To do this, the same experimental design was applied. However, the portfolios consisted of shares of two funds, which evoked either positive or negative affect. When the affect was consistent with the return rate and its variance, the findings were the same as in Experiment 1. In contrast, when the affect was in conflict with such information, investors' choices were better described by affect than by risk and return rate. However, in neither situation the inverse relation between risk and return was observed.

The findings are interpreted in terms of the SP/A model, Behavioral Portfolio Theory and affect heuristic.

Personal experience of low-probability events influence willingness to buy insurance: The mediating role of worry and subjective probability

Anna Polec, Jakub Traczyk, Agata Sobkow & Tadeusz Tyszka

Past research has shown that personal experience plays a significant role in the process of insurance decision making. Nevertheless, the conclusions drawn from these studies are highly limited due to their correlational rather than experimental designs. In the present study, we tested the hypothesis that personal experience of a low-probability natural disaster with severe negative outcomes would increase feelings of worry and subjective probability which in turn would influence willingness to pay for insurance. Seventy participants played a simple game, in which they had to build and protect a cardboard house during several virtual years. Depending on the experimental condition, their cardboard house could be destroyed by a windstorm resulting in a high financial loss. However, participants had an opportunity to protect against this loss by purchasing an insurance policy. As expected, we found that participants who experienced a disaster were willing to pay more for the insurance policy. Crucially, willingness to pay for an insurance was causally mediated by increased feelings of worry and a higher subjective probability that evoked from the personal experience of the disaster. Our study offers a novel approach in studying insurance decisions in laboratory settings but it also indicates that for a more accurate prediction of such decisions we need to better understand separate influences of affective and cognitive processes.

Money Doctors or Charlatans? Trust, Advice, and Risk Taking In Financial Investments

Qizhang Sun, Michael Gibbert, Thomas Hills & Eric Nowak

In a recent analytical paper in financial economics, entitled "Money Doctors", Gennaioli, Shleifer, and Vishny (2015) present a new model of money management, in which investors delegate portfolio management to professional advisors based not on performance but on trust. In the model, the advisor decreases the investor's perception of the riskiness of a given investment, which allows advisors to charge higher fees to investors who trust them, even though actual performance of advisors might be poor relative to market benchmarks. However, this still benefits investors, because the advisor encourages them to take higher risks, which they would not dare to bear just by themselves, and so earn superior returns.

We test the effects of advice and trust on risk taking in an experiment designed to elucidate under what conditions advice may increase risk taking, irrespective of advisor performance. In our study, investors made 100 decisions, selecting between one of two alternatives: risky or conservative. We manipulated the presence of an advisor, as well as the trustworthiness of the advisor (by increasing the transparency of the advice presented) to test the effect of the advice on risk taking. The results showed that individuals followed the advice they were given, and also showed a bias towards taking more risks following advice favouring risky choices. Moreover, trusted advice was more persuasive even though it was random.

All's Well That Ends Well? On the importance of how returns are achieved

Stefan Zeisberger

We demonstrate that investor satisfaction with an investment is heavily influenced by the price path with which the final return is achieved. We analyze various different paths in the gain and loss domain in a series of experiments. For both domains, investors are happiest if their assets first fall in value and then recover, they are least happy with the opposite pattern. Importantly, investors' emotional states systematically influence their valuation, beliefs, and trading behavior. Our results have far-reaching consequences as they allow a much more complete perspective on a wide range of areas in finance, such as the disposition effect, risk-taking behavior after previous gains and losses, and behavioral asset pricing.

LOSS & AMBIGUITY AVERSION

Using Prospect Theory to Measure Ambiguity Aversion and Ambiguity Insensitivity within Five Minutes

Peter Wakker

Tversky & Kahneman (1992) introduced the first empirical quantitative theory for ambiguity (unknown probabilities), giving a decision foundation to the theory of Einhorn & Hogarth.(1985). The ambiguity theory was, however, too complex to measure and, hence, at first, only the simpler risk-theory part of prospect theory received wide attention. There continued to be a disconnect between a flurry of theoretical models developed during the last decade, and empirical studies that usually were qualitative. Only after recent developments did it become possible to measure ambiguity quantitatively using descriptive theories. This paper introduces a new method way simpler than previously existing methods. We demonstrate its applicability in a representative, mainly nonacademic, sample of 1,935 households, requiring no more than 5 minutes per subject. Yet the measurements are reliable enough to predict real-life financial decisions. We confirm the main empirical predictions of Einhorn & Hogarth, with an important sensitivity component deviating from the universal ambiguity aversion assumed in most of the theoretical literature.

Ambiguity aversion in children

Anton Kühberger

In the well-known Ellsberg two-urn task (Ellsberg, 1961) people have to decide between a risky box (50/50 distribution of balls of two colors) and an ambiguous box (color distribution of balls not known). They consistently opt for the 50/50 box and avoid the ambiguous box. This task is typically done with students or adults; there is no data on the attitude toward ambiguity in children using this task, however. In two experiments we recruited children and adolescents of different ages and confronted them with a child-oriented version of the Ellsberg task. We also evaluated participant's understanding of the concept of probability, as well as their ability to anticipate regret. We found that children, just like adults, avoided the ambiguous urn. In addition, understanding of probability and regret increased with age, but this increase was unrelated to ambiguity avoidance. Thus, ambiguity avoidance in children cannot be accounted for by the reasons that are thought to drive ambiguity avoidance in adults. If neither the understanding of probability, nor of regret, contributes to ambiguity avoidance in children, this is also unlikely to be the case in adults. Rather, there seems to be some other reason, already existing at the age of about 4 years that is responsible for ambiguity aversion.

A Robust Test of the Descriptive Value of Loss Aversion in Decisions under Risk and Uncertainty

Han Bleichrodt & Olivier l'Haridon

In a series of papers, Ert and Erev have argued that loss aversion is context-dependent and disappears for small stakes. However, their findings are confounded by diminishing marginal sensitivity and probability/event weighting. We provide robust test of the question whether loss aversion depends on the size of the stakes. Our measurements of loss aversion are corrected for diminishing marginal sensitivity and probability/event weighting and they measure loss aversion under prospect theory in full generality. We found significant loss aversion for both small stakes and large stakes. There was some indication that loss aversion was lower for small stakes, but the effect was small and usually insignificant. Overall, the results indicate that stake size has little effect on the degree of loss aversion.

Meta analysis of loss aversion in risky context

Lukasz Walasek, Neil Stewart & Timothy Mullett

Recent research has shown that the magnitude of loss aversion is highly dependent upon the environment in which choices and judgements are made (Walasek & Stewart, 2014). People exhibit large loss aversion when the typical values on offer are skewed such that the average gains are twice as large as the average losses. However, when there is no such skew people are loss neutral and when the skew is reversed people actually exhibit loss seeking behaviour. This has important implications for existing findings. We are presenting a meta-analysis of loss aversion in risky context. We collected data on choices and valuations of mixed gambles in an effort to estimate the loss aversion parameter using the same functional form of the Prospect Theory. Our findings indicate that the majority of papers examining loss aversion used values with a significant skew in the distribution of gains and losses. In addition, there is a significant correlation between the size of this skew and the degree of loss aversion reported. By taking this design characteristic into account, we were able to determine what is the average level of loss aversion reported in the literature.

Choice Bracketing and Sequential Gambles: How Problem Representation Changes the Predictions of Prospect Theory

Elizabeth Webb & Suzanne Shu

We investigate how choice bracketing – presenting choices in a broad or narrow decision frame – affects the predictions of prospect theory for sequential financial gambles. Specifically, we evaluate how presenting gambles as an outcome distribution (broad bracket) versus a static text description (narrow bracket) changes risk-taking propensity across three gamble types: positive expected value, negative expected value, and pure-loss. In addition to measuring risk-taking preferences, we also measure risk perception to determine how changes in bracketing affect perceived risk levels. We find that broad bracketing reverses the predictions of prospect theory across gamble types such that: (1) participants are more likely to take positive expected value gambles when presented in a broad decision frame compared to a narrow decision frame; and (2) participants are less likely to take negative expected value and pure-loss gambles when presented in a broad decision frame compared to a narrow decision frame. Further, we find that the changes in risk preference caused by different decisional frames are separate from the significant effects of perceived risk. The results of this study can be used to understand important financial behaviors such as long-term investing and insurance decisions.

Double Reference Points: The Effects of Social and Financial Reference Points on Decisions under Risk

Jingyi Lu

The existing literature is inconsistent about how social comparison affects risk attitudes. We propose a framework where the total utility is composed of the social and financial utilities. The financial utility is consistent with prospect theory (i.e., an S-shaped utility function with a financial reference point), whereas the social utility is affected by both social and financial reference points. Therefore, social risk attitudes are determined by interaction between gains/losses in both social and financial contexts. Based on safety-first principle, we propose that when experiencing financial gains, individuals tend to seek upside potential and take social risks (i.e., a convex social utility function). In contrast, when facing financial losses, people would be more risk seeking in social gains but more risk averse in social losses to maximize security (i.e., an inverse S-shaped utility function). We also propose that the relative importance of financial and social utilities depends on the saliency of the reference points and size of stakes. Two studies demonstrated that participants were risk averse in both social gains and losses when facing financial gains, but risk seeking in social gains and risk averse in social losses when facing financial losses. The hypotheses derived from the theoretical framework were in general supported by our experiments.

SOCIAL ASPECTS OF JUDGMENT AND DECISION MAKING 1

Improving inner and outer crowd benefits with confidence

Nathaniel Phillips, Stefan Herzog, Julianne Kämmer & Ralph Hertwig

Groups can improve their decisions by relying on the decision of the most confident individual (a "two heads are better than one" effect). Similarly, individuals can improve their quantitative estimates by invoking an "inner crowd", that is, by generating multiple, non-redundant estimates and then combining them into a single average judgment. Can individuals also improve their judgments by relying on the judgment of the most confident 'member' of their inner-crowd? Moreover, if members of a group generate an inner-crowd prior to communicating, will the accuracy of the group's most confident member improve? To answer these questions, we had participants generate multiple estimates and confidence judgments for unknown quantities (US county populations) based on multiple cues. Like groups, we found that individuals increase the accuracy of their inner-crowd by relying on their own most confident estimate. Furthermore, "dialectical bootstrapping" (i.e., boosting the inner crowd by actively increasing the diversity of estimates) increases these confidence gains. Finally, we find that groups improve the accuracy of their most confident member when each member first generates a dialectical inner-crowd. We conclude that the dialectical bootstrapping not only improves confidence-based choosing within one mind, but also boosts the "two heads are better than one" effect.

Trust and Reputation in the Sharing Economy: The Role of Personal Photos in Airbnb

Eyal Ert

Airbnb, the Internet platform on which people rent living space they own to tourists, is one of the most successful businesses of the sharing economy. Since the sharing economy involves moral hazard for buyers and sellers, reputation and trust should play a major role in its markets. Yet, surprisingly, our analysis of the reputation mechanism of Airbnb reveals that its informational value is low, as almost all sellers receive very high review scores. We therefore tested the hypothesis that prospective customers rely on an alternative channel of signaling trust—the sellers' photos. In an empirical analysis of Airbnb's data and two controlled experiments, we found that the seller's picture plays a significant role in trust building. The more trustworthy the seller is perceived to be, the higher the price she charges for her listing, and the higher her probability to be chosen by customers. The results of the experiments reveal that when the review scores become informative, the role of the seller's picture in the choice process decreases.

The role of implementation time and coherence seeking in evaluations of political proposals

Henry Montgomery, Philip Gustafsson, Maria Sandgren & Girts Dimdins

We examine three factors that may contribute to how people evaluate political proposals (e. g, concerning taxes or laws): (a) amount of time that is necessary for implementing the proposal, (b) feasibility of the proposal (how easy or probable it is to implement the proposal within a given time period and (c) desirability of the proposal (how desirable it is to implement the proposal at any point of time). We assume that the evaluation may be construed as a result of seeking coherence between desirability and feasibility.

In two studies (N = 51 and 218 undergraduate students), we collected judgments of the evaluation, desirability, and feasibility of political proposals given with short or longer time frames.

Three models (rational model, feasibility driven coherence seeking, and desirability driven coherence seeking) were tested by using the mixed model SPSS package. Implementation time was a fixed factor with direction of causality experimentally given. The resulting pattern of likelihood estimates implied strong support in both studies for desirability driven coherence seeking (no effect of implementation time on evaluation, effect of implementation time on feasibility, effect of desirability on feasibility, strong independent effect of desirability on evaluation, very weak independent effect of feasibility on evaluation).

It was concluded that the students in our study evaluated political proposals in line with desirability driven coherence seeking, where realistic factors (implementation and feasibility) had no or very weak direct influence on the variation of evaluations across individuals. The extent to which this pattern is true for other groups of people, and in particular political decision makers, remains to be investigated.

Gender bias in hiring decisions: The role of decoy effects

Wenjie Tang & Steffen Keck

Prior research has found strong evidence that hiring decisions are frequently unfairly biased against women. Whereas this previous work typically solely considered situations in which decision makers evaluated only one candidate at a time we explicitly focus on the more realistic setting in which a number of candidates are directly compared with each other. Drawing on prior research on decoy effects in consumer choice, we suggest that such a joint evaluation of candidates might introduce a new form of gender bias. In two laboratory experiments we find that for a stereotypically male position such as engineering the presence of asymmetrically dominated applicants (so called decoy applicants) in the choice set strongly increases the odds of a male applicant to be chosen, but does have only very little positive effect for a female applicant. These results reverse when participants select applicants for a stereotypically female position such as employee counseling. Overall we find that the presence of decoy applicants leads to a strong gender bias in participants' hiring decisions. Our findings demonstrate a new source of bias that has not been considered in previous work and stand in stark contrast to prior research that has suggested that joint evaluations of candidates might actually cause a decrease in gender bias.

The Wisdom of Crowds Within: Repeated Judgment Sampling in Two Natural Experiments

Dennie van Dolder & Martijn van den Assem

The "wisdom of crowds" says that the aggregate of multiple judgments outperforms the typical individual judgment. Recent literature shows that this principle also applies to repeated judgments by the same person. We empirically investigate the crowd-within using proprietary data from two large-scale incentivized natural experiments. Customers of a firm received vouchers that allowed them to participate in a contest where they had to estimate the number of physical objects in a transparent container. We analyze the complete sets of data for both events, consisting of hundreds of thousands observations each. We find that aggregating across individuals and aggregating within individuals indeed both improve accuracy. The gain from aggregating across individuals is substantially larger than the gain from aggregating within individuals.

Furthermore, we find that the correlation between successive estimates by the same person decreases with the time between the attempts. Consequently, the relative merit of within-person aggregation improves with the delay.

When Your Strength Threatens Me: Supervisors Show Less Social Comparison Bias than Subordinates

Huiyuan Jia

Employee referral programs encourage employees to recommend outstanding candidates to their organizations. However, a superior candidate is a threat to a referee. People do not tend to recommend outperforming candidates who have the same strengths as themselves because these candidates are a threat to their self-positivity. Known as the social comparison bias (Garcia, Song, & Tesser, 2010), this tendency hinders the effectiveness of employee referral programs. We propose that supervisors (vs. subordinates) would show less social comparison bias. The results of three experiments and a field study showed that supervisors (vs. subordinates) presented less social comparison bias (Studies 1a, 1b, and 2). In addition, self-threat accounted for the difference between supervisors and subordinates (Study 2). Moreover, we verified that the difference in the willingness to provide a recommendation between supervisors and subordinates reflected social comparison bias, rather than complementary concern (Study 3).

MORAL ISSUES 1

Corrupt collaboration

Ori Weisel & Shaul Shalvi

Cooperation is essential for completing tasks individuals cannot accomplish alone. While the benefits of cooperation are clear, little is known about its possible negative aspects. Introducing a novel sequential dyadic die-rolling paradigm, we show that collaborative settings provide fertile ground for the emergence of corruption. In the main experimental treatment, player A privately rolls a die, reports the result to player B, who then privately rolls and reports the result as well. Both players are paid the value of the reports if and only if, they are identical (e.g., if both reported 6, each earns €6). Since rolls are truly private, players could inflate profits by misreporting the actual outcomes. Indeed, the proportion of reported doubles was 489% higher than the expected proportion if participants were honest, 48% higher than when individuals rolled and reported alone, and 96% higher than when people lie to benefit the other only. Modifying the incentive structure of player A or player B had nearly identical effects on the frequency of reported doubles. Our results highlight the role of collaboration—particularly on equal terms—in shaping corruption. Together these findings fit a functional perspective on morality revealing that when different moral sentiments—to be honest vs. to join forces in collaboration—clash, people opt for corrupt behavior which serves both their own and their group's interests.

"Was that a lie?" Motivated Interpretations of potentially painful information

Sigal Vainapel, Yaniv Shani & Shaul Shalvi

People want avoid feeling uncertain and search information even if its relevance is low. Here, we examined whether people would seek information about others' behavior when they have a reason to suspect the others were dishonest. In two experiments, participants learned that either a friend or a stranger was asked to roll a die that would determine both own and participants' outcomes. The other person was asked to roll the die three times, but payment was based only according to the reported first roll outcome. We find that participants suspect strangers are more likely to report a lie than friends; although the information regarding the second and third rolls was irrelevant to determining participants' outcomes, participants wanted to get information about the outcome of those rolls, especially when interacting with strangers (Study 1) and also used the information they obtained to support their conviction that they had been lied to (Study 2). The results suggest that people are more oblivious of their friends' behavior than of strangers' and. Therefore, they can be more easily deceived by them.

The Theory of Planned Behaviour in Unlawful File Sharing: A Meta-Analytic Review and a Survey

Piers Fleming, Steven Watson, Elisavet Patouris, Kimberley Bartholomew & Daniel Zizzo

Films, books and music are now available digitally on multiple devices when before they were bound to a single analogue medium. This convenience has led to a behavioural shift and media of all kinds are available to buy and consume digitally. However, people can also obtain digital media files by file sharing. Sharing media files is very common, but is often unlawful. This has created a complex situation for consumers, businesses and policy makers with competing pressures on all sides – e.g. to maximize welfare, to gain widespread product recognition, to maximize profits and to avoid mass criminalization of the population.

It is crucial to understand the psychological motivations of consumers in this complex situation. This is the first study to systematically integrate the existing research.

Part 1: We consider socio-cognitive predictors and moderators of unlawful file sharing using a meta-analysis within the framework of the theory of planned behaviour (TPB). All three TPB components were predictive of intention and behaviour in the meta-analysis. Past experience was identified as a moderating factor which explained the reduced influence of perceived behavioural control (PBC) for older people, non-students and software within the meta-analysis. Part 2: We tested these findings with a survey (N = 1395) which confirmed that past experience was positively associated with PBC and intention for music but not for eBooks. This supports an account in which the accuracy of TPB models is improved with greater experience and not diminished by habit. The practical implication is that a) interventions should target multiple socio-cognitive processes to maximise their efficacy and b) that interventions which target PBC should be more effective amongst experienced file-sharers.

Kind beyond belief: fairness norms predict trust game reciprocity independently of second-order expectations

Jeroen van Baar, Luke Chang & Alan Sanfey

A well-functioning society depends heavily on trust and reciprocity. Up to now, reciprocity has been explained in behavioral economics by use of guilt aversion models (Battigalli & Dufwenberg, 2007; Chang, Smith, Dufwenberg & Sanfey, 2011). In these models, guilt is conceptualized as a deviation from second-order expectations that yields negative utility. Apart from second-order expectations, however, there might be other norms driving reciprocity behavior. The role of an agent's own fairness norms, for example, has not yet been considered in models of reciprocity decision-making, in part because fairness norms in the classic trust game are often collinear to second-order expectations. We present a modified trust game, in which fairness norms and second-order expectations prescribe different behavior. We find that both fairness norms and second-order expectations are predictive of reciprocity behavior, and that these two motivations assume weights that vary between participants. We propose a novel computational model of trust game reciprocity that takes into account both second-order expectations and the trustee's own fairness norms.

Corrupt reciprocity

Margarita Leib, Shaul Shalvi & Simone Moran

Reciprocity is often encouraged and praised as a path to long term cooperation. But will people bend ethical rules in order to reciprocate others' generosity (or the lack of it)? Across two large-scale Experiments (N = 546; N = 160) we found that people who received generous amounts of money from another person tended to bend ethical rules (here: lied) in order to benefit the generous person (positive reciprocity). Furthermore, people who received ungenerous amounts lied in order to harm their ungenerous counterpart (negative reciprocity). These effects were eliminated when the source of the generous amount was a computer rather than a human. Evidence further suggests that such corrupt reciprocity is driven by pro-social (not selfish) people and is even extended to a third party (i.e., indirect reciprocity). The results provoke the question: should reciprocity always be encouraged?

Unfair treatment corrupts compliance

Linda Dezső, Jonathan Steinhart & Erich Kirchler

Unfair treatment, especially in the form of financial loss, could make people want to restore equity by cheating or stealing. People are even willing to pay to punish free-riders in public good games, showing an aversion in inequity and loss. Additionally, research on tax compliance shows increased subsequent evasion after being fined in an audit, solely due to equity restoration.

We combined these three findings and anticipated that people would under-comply after a financial loss if this could harm the person who imposed the loss on them, even when full compliance would result in substantial loss recovery.

To address this question we conducted a lab study (N=134) with three treatments, in a 2*2 factorial design with one structurally empty cell.

We find that people comply less after a financial loss and when under-compliance can financially hurt the originator of their losses. Additionally, people's believed group compliance level influences their own compliance such that lower believed group compliance leads to lower own compliance. We also found that the expected level of group compliance has an even stronger influence when there is a possibility to take revenge than when there is not. Additionally, when there is a possibility for revenge the average compliance is equal to the estimated group compliance, whereas it is higher when there is no possibility for revenge.

We conclude that experiencing and unfair treatment together with the possibility for revenge on the originator of the loss "erodes" morals. That is, people believe that the others will take revenge and they then act on this belief.

THEORY 1

Uncertainty Regulation Theory: How the feeling of uncertainty shapes decision making

Daniel Navarro-Martinez & Jordi Quoidbach

We present a theory of decision-making behavior based on the idea that when people find themselves in a situation in which they have to make a choice, they experience to some degree a feeling of uncertainty. Regulating that feeling is proposed to be a fundamental motivation in decision-making processes. We show how such an uncertainty-regulation account can explain and unify a large number of well-known decision-making phenomena, many of which have been given diverse explanations. Our theory does also make unique predictions about how those phenomena are affected by the feeling of uncertainty experienced by people in decision situations. We present three experiments that confirm those predictions in different areas of decision making.

Rationality – the impact of conflict and context on the decision strategy

Patrycja Sleboda

The aims of the presented experiment are to check: (1) whether trade-offs are a must component of rational decisions, (2) the relation between rationality defined by consistency with the symmetry and transitivity axioms and defined by using System 2 as proposed in Dual-Process Theories (DPT).

In the traditional approach rational decision is directly related to integration of outcomes and probabilities in a compensatory way and trade –offs are necessary (Muliti-Arribute Utility rule – MAU). Life decisions show that trade-offs are not always possible and people often use non-compensatory strategies such as conjunctive (CON) in line with Bounded Rationality proposed by Simon or lexicographic rule (LEX). The question is whether avoiding trade-offs is always irrational?

It is hypothesized that in line with Simon's concept a non-compensatory strategy still can be rational, in particular when they fulfill basic axioms of Utility Theory like symmetry or transitivity. In the study it was also checked what is the relation between rationality defined by consistency with the Utility Theory axioms and the score on rationality scale in REI (DPT, System 2).

100 Israelis participated in the studies. They were asked to choose 18 times 1 of 2 job candidates, described on 6 attributes with assigned weights. Chosen option indicated which strategy was used. To check rationality proceeding of axioms was checked and REI-24 short inventory was administrated.

The preliminary data point that CON strategy was applied more frequently than the LEX. Consistency with the symmetry and transitivity axioms was higher among those who used CON rule. The data on the relation between two concepts of rationality, i.e. consistency with the Utility Theory axioms and score in REI are still in proceeding.

Fast logic: Evidence for intuitive logical judgements

Bence Bago & Wim de Neys

Dual process theory of reasoning expect that people give an immediate heuristic response in some situations. Heuristic thinking is not thought to produce logical responses. To figure out the logical, correct response the engagement of the so-called system 2 is required. This system can produce more effortful, controlled thinking, thus it is able to produce a logical answer as well. Conflict detection studies of reasoning (De Neys, 2015) have revealed that people implicitly detect conflict between heuristic responses and basic logical principles. To further examine the nature of conflict detection, we used the two response paradigm, where people had to indicate their first, intuitive response to a reasoning problem and afterwards they had additional time to reflect on a problem before giving a final answer. Results show that among the people who gave the correct response the vast majority gives their response immediately. This suggest that for these people their intuitive judgement is the logical, correct answer. Results also suggested that people were stable in their response strategy; we were able to identify people who gave correct, or incorrect responses on both questions, and people who gave an incorrect initial response, and finally they changed to the correct response. This latest group were very unconfident in their first response, which was given very quickly, while they were thinking significantly more in their second answer, and were more confident as well.

Overall, this study showed – in opposition of the classic dual response hypothesis - that people are able to give intuitively a normative response. This effect was also explained by the extended theory of logical intuitions.

The Dual Nature of Utility - Categorical and Comparative Evaluations in Economic Decisions

Michael Zürn & Fritz Strack

Utility is perhaps the most central concept in modern economic theorizing. However, the behaviorist reduction to "revealed preference" not only removed its psychological content but also exposed numerous anomalies in experimental investigations. In this program of research, we focused on the psychological processes by which judgments of utility are generated. Specifically, we challenge the standard assumption of a homogeneous concept and propose that two evaluative components must be separated. These components are psychologically distinct and jointly establish a Dual Utility Model. In particular, judgments concerning categorical utility (uCat) infer category membership of an object based on its attributes which subsequently allows the application of semantic knowledge about the category. Alternatively, categorical evaluations may resort to affective information to generate a judgment. In contrast, comparative utility (uCom) relies on the interpretation of the distance between a target and standard on a specific dimension of comparison. Importantly, dimensions of comparison are manifold and context dependent.

In a series of experiments, we show that the resulting Dual Utility Model is able to explain several known anomalies in a parsimonious fashion. Moreover, we identify central factors determining the relative weight assigned to both utility components.

Finally, we discuss the implications of the utilitarian duality for both, the experimental practice in economics as well as the consequences for economic theorizing. That is, we propose that the Dual Utility Model can serve as an integrative framework for both the "rational" model and its anomalies.

Why do decision makers value symbolic goods?

Leigh Caldwell

People often care about things which demonstrably have no effect on their material wellbeing: for example, the fates of fictional characters, the wealth of other individuals remote from them, whether a penalty in a football match was awarded fairly, or the authenticity of "fake" and "real" branded items which are physically indistinguishable. In this paper I provide a theoretical explanation for why these and other symbolic outcomes might matter - based on a model of cognitive constraints, heuristics as strategies to work around those constraints, and subgoals which become elevated to the status of goals in themselves.

Nonlinear decision weights or skewness preference? A model competition

Leonidas Spiliopoulos & Ralph Hertwig

An extensive literature exists comparing the predictive power of Cumulative Prospect Theory (CPT) and Expected Utility Theory (EUT) in decisions from description. CPT accommodates the empirically observed deviations from EU primarily by the assumptions of a subjective probability weighting function and loss aversion. An alternative explanation for this behaviour is that decision makers have preferences for higher-order moments, beyond the mean and variance of gambles. To examine this explanation, we propose the Mean-Variance-Skewness (MVS) preference model. There are important differences between CPT and the MVS model. The latter is more parsimonious than standard implementations of CPT: it has two adjustable parameters compared to three or four parameters for CPT, depending on the parameterization of the probability weighting function. We test EUT, CPT and the MVS model using both decisions from description and experience, respectively. In the latter, CPT and EU require the explicit calculation of probabilities from experience; the MVS model, in contrast, only requires that decision-makers hold estimates of the three moments of the outcome distributions. We compare the predictive power of the models across four datasets. In decisions from experience with multiple (three) outcomes per option, the MVS model outperforms both CPT and EUT, thus implying that preferences for skewness are more predictive than nonlinear probability weighting. In decisions from experience and description with fewer outcomes (one safe option and one risky option with only two outcomes), we find significant model heterogeneity, that is, some participants are classified as using CPT and others as using the MVS model.

RISK & SOCIAL ISSUES

The relationship between type of army service and risky behavior among young people in Israel

Shosh Shahrabani & Sharon Garyn Tal

Aims: Previous studies examined the impact of military service on individuals' risky behavior. Yet most did not distinguish between legal and illegal risky activities and did not compare combat and non-combat soldiers. The current study examines the factors affecting the involvement of Israeli combat and non-combat soldiers and of ex-soldiers in both legal and illegal risky activities. The data are unique in that in Israel army service is compulsory. Methods: A questionnaire survey was randomly distributed in train stations in Israel among 413 soldiers and ex-soldiers between the ages of 18-30. Using logistic regression analysis, we examined the factors affecting the probability of engaging in five legal and illegal risky activities. The explanatory variables include type of service or battle experience, the Evaluation of Risks scale and socio-demographic characteristics. Results: High percentages of young people engage in risky behavior, especially illegal behavior. Combat and ex-combat soldiers are more likely to engage in legal risky behavior but less likely to engage in illegal risky behavior than are those that served in non-combat units. This may be because the tough discipline and harsh punishment in combat units overrides the willingness to enjoy illegal risky behavior. This effect is moderated after combat army service but does not disappear. Conclusions: Risk attitude and type of army service affect an individual's tendency to engage in legal versus illegal risky activities during and after army service. Mapping the factors affecting risky behavior, both legal and illegal, is important for designing policy plans to reduce risky behavior among young people.

It's not just about local warming: Perceptions of weather and climate change in the UK

Andrea Taylor, Wandi Bruine de Bruin & Suraje Dessai

Aims: Predictions based on the availability heuristic suggest that people's beliefs about climate change will be influenced by salient local weather events. Consistent with this, US research has found that Americans report greater change concern in hot weather. However, many other countries, including the UK, experience lower summer temperatures. This raises the question of whether other types of local weather affect climate change beliefs in those countries. We therefore examined 1) the extent to which UK residents perceive different types of whether to have changed over their lifetime; and 2) the relationship between perceptions of weather and climate change beliefs.

Method: We conducted a national survey with 2007 UK residents following a period of unseasonably low temperatures and widespread flooding. Participants were asked to rate the extent to which they perceived wet-weather, hot-weather and cold-weather related events to have changed over their lifetime. They also self-reported their climate change beliefs.

Results: Our UK participants tended to perceive wet-weather to have increased over their lifetimes, hot-weather to have decreased, and cold-weather to have remained unchanged. Multiple linear regression analysis indicated that perceiving a life-time increase in wet weather was significantly associated with greater climate change beliefs, while perceived life-time changes in hot weather were less strongly associated with climate change belief.

Conclusions: UK residents' perceptions of wet weather are more strongly associated with climate change beliefs than perceptions of hot weather. Our findings suggest that climate risk communicators should not limit their focus to heat-related impacts, especially in areas where other types of weather may raise more salient concerns.

Tornado Risk Perception from Visual Cues

Barry Dewitt

Using methods from quantitative psychology, we provide a general approach to studying lay perceptions of environmental risks. As a first application of these methods, we examine how people assess the risk of tornadoes. Due to the challenges of tornado forecasting, members of the public must often evaluate the risks on their own: in particular, laypeople check physical environmental cues (such as clouds) after hearing official risk communications and before deciding whether to take protective action. We study participants' (N = 400) perceptions of cloud formations, the most prominent physical environmental cue indicating tornado threat, by applying two methods from psychophysics: signal detection theory to study how well people can distinguish tornadic from non-tornadic clouds, and multidimensional scaling to study how people make judgments about the tornado danger of clouds. We find that participants have good heuristics, but with predictable biases, leading to misidentifying the tornado risk of certain cloud types. We discuss the implications of our results for hazard training, creating risk communications for the public, and anticipating inappropriate responses to physical environmental cues.

Deciding to help: effects of risk and crisis communication

Marije Bakker, José Kerstholt & Ellen Giebels

Effective communication is key to the way citizens make decisions in a crisis situation. Our study focusses on the (combined) effect of risk communication (before an incident) and crisis communication (during an incident) on helping behavior in a crisis situations.

We used a virtual environment in our experiments. Participants walked to a particular destination when unexpectedly an accident happened with two victims. Participants could react in several ways including talking to bystanders and victims and phoning the emergency services.

In the first study, we manipulated safety awareness by the participants' destination: they went to a company advocating either 'Safe Traffic' or 'Healthy Living'. Participants who were framed towards safety called the emergency number more often. Participants who had received specific courses of action less often moved the victims.

In the second study, we used a 3 (risk communication) x 2 (crisis communication) between subjects design. Before starting the experiment participants either read: 1) an article about the risk of traffic accidents; 2) the same article with the suggestion of not moving the victims or 3) an article about Dutch people on holidays (risk communication). During the experiment half of participants got explicit instructions not to move the victims (crisis communication). Behaviors like talking to victims and calling emergency services, as well as underlying constructs like risk perception and self-efficacy were measured.

In all, these experiments indicate that virtual environments provide excellent opportunities to measure the effects of risk and crisis communication as it is a more realistic task environment and allows for the direct measurement of behaviour.

Heat protection behaviors and positive affect about heat during the 2013 heat wave in the United Kingdom

Carmen Lefevre, Wändi Bruine de Bruin, Andrea Taylor, Suraje Dessai & Sari Kovats

Aim: Heat waves pose serious health risks, and are expected to become more frequent and intense due to climate change. Yet, UK residents seem to feel positive about hot weather. According to the affect heuristic, any positive or negative emotions evoked by potential risks may be used as cues to inform concerns about risk protection. If so, then positive feelings toward hot weather might lead UK residents to lower intentions to adopt heat protection behaviors. Here, we therefore examine the relationships between heat protection behaviors during the 2013 UK heat wave and having heard heat protection recommendations, feeling positive affect about heat, and seeing heat protection measures as effective.

Method: A UK-wide sample of 701 participants completed questions about having heard heat protection recommendations and implementing heat protection behaviors during the 2013 UK heatwave, intentions to implement heat protection behaviors in the future, perceived effectiveness of heat protection behaviors, and positive affect about heat.

Results: 55.1% of participants had heard heat protection recommendations during the 2013 UK heat wave. Those who had heard recommendations also indicated having implemented more heat protection behaviors, seeing heat protection behaviors as more effective, feeling more positive about heat, and having stronger intentions to implement protection behaviors in future hot summers. Mediation analyses found that heat protection recommendations may motivate heat protection behaviors by increasing their perceived effectiveness, but undermine their implementation by evoking positive affect about hot weather.

Conclusions: We discuss our findings in the context of the affect heuristic and its implications for heat protection communications.

Communicating Probability of Environmental Risk: Accounting for Face-threatening Contexts

Egle Butt, Gaelle Vallee-Tourangeau, Marie Juanchich & Miroslav Sirota

Verbal probability statements (e.g., there is a possibility that your car engine will fail) can be interpreted as either communicating likelihood or tactfully communicating very bad news. Research showed that when people interpreted probability statements as face-management devices, they estimated events as more likely to occur. Despite the robustness of the politeness effect, we still do not understand how outcome properties such as base rate and severity interact with the perception of speakers' intentions and, in turn, affect subjective probability. We addressed this gap in the environmental risk context. We studied how outcome severity and base rate interacted with the communicative function (tactful, avoiding blame or uncertain about an outcome) of two verbal probability expressions (possible vs likely) and influenced their subjective probability. We expected that severe and high base rate outcomes would increase the preference for face-management devices, and, in turn, prompt higher subjective probability estimates.

We found that when interpreting the communicative function of the phrase possible, severe outcomes and higher base rates led to increased preferences for face-management devices, but when interpreting the communicative function for likely, only severe outcomes significantly increased preferences for face-management devices. Results also showed that subjective probability of possible was only affected by higher base rates, whereas both severe outcomes as well as higher base rates significantly influenced subjective probability for likely. These findings suggest that the extent to which the severity and base rate influence probability judgment varies across different probability expressions and that the observed severity bias could be explained by politeness expectations.

LEARNING

How Learning by Comparison Impacts Decision Performance and Strategy Selection

Dries Trippas & Thorsten Pachur

In multiple-cue judgment tasks the type of learning task has been shown to affect decision performance and strategy use (Pachur & Olsson, 2012): following learning-by-comparison (LBC), people generalize better than after direct-criterion-learning (DCL). Cognitive modeling revealed that this difference is linked to an increased reliance on cue-abstraction after LBC and an increased reliance on exemplar-based strategies after DCL. The aim of the present study was to investigate this effect of LBC in more detail. We hypothesized that the mere presence of a reference object would promote cue abstraction and also decrease the burden on working memory. We tested these hypotheses by presenting participants in DCL training conditions where a reference object (with our without explicit criterion information) was shown alongside the to-be-judged target object. In line with our predictions, generalization performance improved in these conditions compared to a standard DCL condition. Also as predicted, working memory capacity explained 40% of the variance in learning speed in the DCL condition, but was not associated with learning speed in the LBC condition. Nevertheless, adding a reference object in the DCL condition hardly affected strategy selection: the majority of participants was classified as relying on an exemplar-based strategy following the new DCL training conditions. This suggests that the difference in generalization was caused by a quantitative (more efficient use of an exemplar strategy) rather than qualitative change in strategy use. Moreover, the effect of LBC to trigger reliance on a cue-based strategy seems to be due to other factors (e.g., the type of feedback) than simply providing a reference object during learning.

Human behavior in contextual multi-armed bandit problems

Hrvoje Stojic, Pantelis Analytis & Maarten Speekenbrink

Reinforcement learning (RL) models are often used to study human learning and decision-making. However, they have been rarely employed in decision environments with alternatives characterized by multiple features. Learning the function that relates the features to their expected values can be then used to generalize beyond the experienced alternatives, to predict the values of alternatives that have not been tried yet. Such contexts correspond more closely to decision problems encountered in the real world. We designed a novel contextual multi-armed bandit task where decision makers chose repeatedly between multiple alternatives characterized by two informative features. The values of the alternatives were governed by a noisy linear function. We compared behavior in this task with behavior in a classic multi-armed bandit where decision makers did not have access to any features. Behavioral analysis showed that participants in the contextual bandit outperformed those in the classic task and used the features to direct their exploration of promising alternatives. Moreover, choices in an extrapolation test phase showed that they acquired functional knowledge. To capture both functional and direct experiential learning we designed a novel function learning based RL model and compared it against classical RL models. Although some function learning was clearly in play, the classical RL models predicted behavior in the first part of the experiment better. However, in the extrapolation test phase new model outperformed the classic ones. The new contextual multi-armed bandit task brings us closer to realistic high-dimensional decision situations without giving away experimental control, however, our results call for development of better function learning based RL models.

The Paradoxical Imitation of bad examples: Learning from unsuccessful strategies

Efrat Aharonov-Majar, Michael Sobolev & Ido Erev

Previous studies of social learning show that in certain cases people behave as if they imitate unsuccessful behavior. For example, anorexics learn bad habits from their peers (Colton & Pistrang, 2004). The present research explores the relative importance of two likely contributors to this phenomenon. The first, referred to as the "copycat strategy," implies blind imitation. That is, in certain cases people imitate without considering the consequences of the behavior that they imitate. A second contributor, refers to as "inspired exploration," suggests that individuals only appear to copy unsuccessful strategies; in fact, observing failures only inspires them to explore similar, but different, strategies than the ones that led to failures. We believe that better understanding of the relative importance of the two contributors can be of theoretical and practical value.

In a decision-making task, participants received positive or negative payoff for typing two-letter combination (e.g., "ea","eA"). The exact payoff depended on the case (lower or Upper) of the second letter in the pair. Participants' initial experience was manipulated in a between-subject design. After 20 trials, participants occasionally received information on "another participant" who used incurred a large loss. The results suggest the observed failures inspired exploration of similar strategies. When the initial exploration was reinforcing, it led to the adoption of the new strategies even when these strategies impaired expected return. These results shed light on the conditions under which media coverage of problematic behaviors can lead to counterproductive results.

Choosing Bad Over Good: Learning and Counterproductive Punishment

Michael Sobolev & Ido Erev

Previous research suggests that people tend to overuse punishments, and part of this bias can be a reflection of a failure to understand the regression effect (Tversky & Kahneman, 1974). The practical significance of this tendency is demonstrated by the fact that it was necessary to use legislation that prohibits corporal punishment by teachers. Our investigation extends Tversky and Kahneman's analysis and clarifies its relationship to the recent study of decisions from experience. It highlights three features of human learning that can lead to the use of counterproductive punishments: (1) Insufficient exploration that implies a failure to understand regression to the mean; (2) reliance on small samples that leads to overuse of punishment when the frequent effect of punishment is positive but the average effect is negative; and (3) the hot-stove effect that enhances the tendency to use punishment when this behavior reduces risk. Experimental study that focuses on the use of verbal punishments shows that the second feature is the most important. That is, the tendency to overuse punishment is particularly strong when punishments are effective in most of the time, but lead to a counterproductive effect on the average. These results suggest that legislation and management policies that reduce the tendency to use punishments are expected to be most effective when the negative effects of punishments, or the positive value of rewards are rarely experienced.

Salience and learning in multi-cue environments

Inga Jonaityte & Massimo Warglien

A fundamental question is how people learn to assess the cue-outcome relationship when competing cues vary in relative salience. In complex, multidimensional and dynamic environments, selective attention helps decision-makers to cope with information overload. When all cues are equally salient, one may expect their relative validity to determine the allocation of attention and, thus, learning. Highly salient cues, on the other hand, have the power to attract attention and may bias the learning process. The mismatch between cue salience and validity can hamper various aspects of learning: information acquisition, decision accuracy, judgment confidence, and speed. In this study we focus on the two characteristics that define the decision environment, salience and validity of competing cues, and on the role they play in guiding learning. We hypothesise that the interplay between the cue salience and the validity affects the ability to accurately assess the cue-outcome relationship, detect changes in task environments, and adapt decision-making strategies accordingly. To test our hypotheses we first conducted a behavioural experiment (n=180) and then proposed a classification learning model that accounts for the observed behavioural phenomenon. The behavioural data analyses highlight that cue salience may significantly bias learning process. The simulation results illustrate that our classification learning model can replicate the human participant data. The best fit was shown when single-cue salience bias was modeled. This suggests that humans tend to favour decision-making strategies that arise from focusing on a single yet the most salient cue when assessing cue-outcome relationship in multi-cue environments. Finally, we discuss variations in our linear classification learning model and suggest extensions of our experiment.

Metacognition and Variance in Two Arms Bandit Task

Uri Hertz, Mehdi Keramati & Bahador Bahrami

When faced with two lotteries people tend to pick the more certain one, even if its expected reward is lower. However, in everyday situations such uncertainties are usually not explicitly available, and have to be tracked on a trial by trial basis. Here we look choices and confidence ratings made by participants in a two arms bandit task. Four stable experimental conditions were embedded in a continuous design. During all conditions mean rewards of one option higher than the other. The variance of the rewards changed across conditions and could be high (H) or low (L): L-L, H-L, L-H and H-H (for bad and good options). Participants were instructed to choose one of two doors in each trial and state how confident they were in choosing the door with the higher reward on a scale of 1-6. Participants' probability of choosing the good option was highest in the L-L condition, and lowest in the H-H condition. This behaviour could not be simulated by a model which tracks only mean rewards. It was only by adjusting the exploration rate according to the mean variance that this choice behaviour could be replicated. Fitting these two models to the data showed higher predictive power to the variance adjusted model. Confidence ratings were examined during exploration (choosing the bad option) and exploitation separately. When exploiting, confidence was higher when the good option had low variance and lower when it had high variance, regardless of the variance of the bad option. Overall confidence was lower during exploration than exploitation, and was similar across experimental conditions. Confidence may reflect the probability of avoiding a catastrophe – in our case getting a reward lower than the mean of the bad option. Taken together, choices and confidence reports suggest that variance of rewards is tracked in a trial by trial basis. The average reward variance of both options effect the exploration rate, while the variance of the better option determine choice confidence.

FINANCIAL DECISION MAKING 2

Sound financial decisions despite cognitive aging

Eric Johnson

Age-related deterioration in cognitive ability may compromise the ability of older adults to make major financial decisions. We explore whether knowledge and expertise accumulated from past decisions can offset cognitive decline to maintain decision quality over the life span. Using a unique dataset that combines measures of cognitive ability (fluid intelligence) and of general and domain-specific knowledge (crystallized intelligence), credit report data, and other measures of decision quality, we show that domain-specific knowledge and expertise provide an alternative route for sound financial decisions. That is, cognitive aging does not spell doom for financial decision-making in domains where the decision maker has developed expertise. These results have important implications for public policy and for the design of effective interventions and decision aids.

Financial Loss Aversion Illusion

Christoph Merkle

We test the proposition that investors' ability to cope with financial losses is much better than they expect. In a panel survey with real investors from a large UK bank, we ask for subjective ratings of anticipated returns and experienced returns. The time period covered by the panel (2008-2010), with frequent losses and gains in the portfolios of investors, provides the required background to analyze the involved hedonic experiences. We examine how the subjective ratings behave relative to expected portfolio returns and experienced portfolio returns. Loss aversion is strong for anticipated outcomes with investors reacting over twice as sensitive to negative expected returns as to positive expected returns. However, when evaluating experienced returns, the effect diminishes by more than half and is well below commonly found loss aversion coefficients. It seems that a large part of investors' financial loss aversion results from a projection bias.

Retirement Investment Decisions: the Arena Where (Risk) Attitude Beats Age

Matúš Konečný & Viera Bačová

Retirements of millions are being affected by their investment decisions. Which aspects of a choice situation are considered in individual retirement investment decisions? Most available investment advice suggests taking time horizon and personal risk attitudes into account. The effects of time horizon and risk attitude variations on retirement investment allocation decisions in hypothetical choice situations are explored in the present study. Implications for public policy are discussed.

Young Slovak adults (N=158) were provided with retirement investment advice and information describing a less risky bond fund and riskier equity fund. Subsequently, they were instructed to choose a fund allocation for themselves and for a set of hypothetical investors. The descriptions of investors varied within-subjects: 5 (age: 35 to 55 years) x 2 (risk attitudes: risk averse or risk seeking).

Riskier portfolios were chosen for hypothetical investors described as risk seeking. The time horizon seems to have had a smaller effect on allocations. The relation between the probability of loss and time horizon was shown to have escaped several participants.

Personal risk attitudes seem to matter more to people than time horizons in investment decisions. Considering personal risk attitude was consistent with the common advice. The advice to consider the time horizon seemed not to have elicited strong tendencies in choices.

Our investigation might be informative for deliberate designing of retirement investment decision environment. Experimenting with fund descriptions might help to define criteria for content and format of the information provided to investors.

Shallow Pockets, Kind Heart: The Effect of Perceived Personal Financial State on Prosocial Activity

Marina Motsenok & Ilana Ritov

Our research examines the effect of perceived personal financial state (FS) on participation in volunteering activities. First, a secondary analysis of data from the European Survey of Health, Aging and Retirement (SHARE) revealed that lower assessment of personal FS is associated with prosocial motivation for volunteering activities. Next, in a lab study we manipulated participants' perception of their personal FS. Participants randomly assigned to the low FS condition were more willing to volunteer in a social organization than participants assigned to the high FS condition. The results of the experimental manipulation support the causal role of subjective FS and volunteering.

Cash in hand, crashes in mind

Yu Gao & Ning Liu

We investigate how payment instruments influence consumers' risk attitudes. We exposed our subjects to two treatments. In the number treatment, the subjects gave valuations to simple lotteries with different outcomes and probabilities, with outcomes denoted by numbers. In the cash treatment, the subjects faced the same tasks as those in the number treatment, except that the lottery outcomes were presented with real cash notes and they were asked to give their valuations by placing real notes and coins. Subjects in the cash treatment gave lower valuations than those in the number treatment: they are more risk averse. Our methods enable us to investigate through which channel the treatments affect people's risk attitude. We found that subjects in the two treatments did not differ in utility curvature, but in probability weighting. Those in the cash treatment exhibited higher likelihood sensitivity and pessimism.

Sound credit scores and financial decisions despite cognitive aging

Ye Li & Eric Johnson

Age-related deterioration in cognitive ability may compromise the ability of older adults to make financial decisions. We explore whether knowledge and expertise accumulated from past decisions can offset cognitive decline to maintain decision quality over the lifespan. Using a unique dataset that combines measures of cognitive ability (fluid intelligence) and of general and domain-specific knowledge (crystallized intelligence), credit report data, and other measures of decision quality, we show that domain-specific knowledge and expertise provide an alternative route for sound financial decisions. In sum, cognitive aging does not spell doom for decision-making in domains in which the decision-maker has developed expertise.

Symposium 7

Nudge: Testing the limits

Convenor: Chengwei Liu

Discussant: Daniel Read

Nudging, or the use of behavioural economics to change behaviour by means of subtle changes in the choice environment, is rapidly becoming government policy all over the world. The idea of using such soft methods to influence decision makers to act in ways that are better for themselves and for society is undoubtedly appealing. But if nudging is going to be deployed effectively those nudges must be "scalable" in that they continue to be useful even when they are used repeatedly, they must be effective despite possible rebound effects, and they must work even when the nudgees know they are being nudged.

This symposium represents a set of papers focused on the robustness of nudges in the face of several factors. Three papers consider the effects of disclosing that they are being nudged by means of a default, and come to different but collectively heartening conclusions. Hagmann et al. found that when making advance directives people are not influenced by knowing in advance that one option is a default. This result is echoed by Steffel et al., who observed no effect of nudge awareness when people are choosing (for instance), whether to have green amenities in their new flat. Isoni et al., on the other hand, find a strong effect of nudge awareness using methods from experimental economics: people who knew they are being nudged make better choices than those who do not.

The effectiveness of nudging will depend not only on whether people respond to nudges when they are provided, but also in whether the broader public accept that nudging is an appropriate policy instrument. Jung & Mellers investigate public attitudes toward nudging, and find that a significant segment of (American) society does not, and that behavioural nudges are particularly likely to be resisted. On a more micro level, Lin et al. examine whether people who are nudged are seen as having less “genuine” preferences than those who are left to make their own choice in more conventional ways. They find that indeed choices made under an opt out system are seen as less “genuine” than those made under more conventional systems.

Taken as a whole, the papers in this symposium offer a rich and somewhat controversial account of what we know about nudge effectiveness, and the barriers to be overcome for the “nudge project” to achieve its goals.

Nudge awareness and the effect of good and bad defaults

Andrea Isoni, Chengwei Liu, Christopher Olivola & Daniel Read

The libertarian paternalistic approach to public policy, or 'nudging', exploits people's decision biases to achieve policy goals that are beneficial to the decision maker and society. The early successes of nudges, however, may have in part depended on people being unaware they were being nudged. As these nudges become mainstream and widely discussed in media their impact will likely change, so it is vital to know whether they remain effective when recipients become aware that they are being nudged and to what end.

We develop a new experimental paradigm to investigate the effects of nudge awareness when decision-makers are offered a default option. Our design allows us to test whether awareness has differential effects for default options that are better for the decision-maker than for defaults that are worse.

Study 1 examines how nudge awareness moderates the responses to good and bad defaults. We predict that nudge awareness will make people more alert and more likely to choose the superior option. The results support our prediction. The superior option was chosen significantly more often than in the corresponding default condition both when the default was good and when it was bad.

Study 2 examines how providing reasons for nudges moderates the responses to good and bad defaults. We predict that providing favourable reasons can induce trust and increase the chance of default option being chosen. The results offer a weak support to our prediction. This suggests that awareness works mainly by making participants more alert instead of inducing (mis)trust.

Overall, nudge awareness seem to work by alerting decision-makers against the dangers of blindly relying on defaults, leading them to better investigate the available alternatives and make more informed decisions.

Warning: You Are About to Be Nudged

David Hagmann, George Loewenstein & Cindy Bryce

Defaults have been shown in prior research to impact important decisions, including how people complete advance directives (which specify the medical treatments they want to receive if they become unable to communicate their wishes). However, defaults and other nudges are often criticized for violating individual autonomy, because those affected are typically unaware that they are being influenced. Ethical objections about nudges can be mitigated by disclosing their presence, but there is concern that doing so may diminish or eliminate the intervention's effectiveness. Although a frequently-raised worry in the policy domain, the theoretical work underpinning nudges does not depend on a lack of awareness. This suggests that nudges should be just as effective with disclosure. We report results from a study in which people filled out a hypothetical advance directive after being defaulted into either wanting or declining life-extending interventions. Participants were told about the nature of defaults either before or immediately after filling out the questionnaire. Then, they were asked to fill out the advance directive again, this time without any defaults. Defaults had no effect for a general question on preferences for end-of-life care, but substantially shifted preferences on specific interventions. Informing people ahead of time did not appreciably diminish the impact of the default, which also carried over to the second advance directive with no defaults.

Ethically Deployed Defaults: Transparency And Consumer Protection Via Disclosure and Preference Articulation

Mary Steffel, Ruth Pogacar, Elanor Williams & Ana Figueras

Marketers and policy makers alike often leverage defaults to influence consumer choices —in some cases, to promote the consumer's or society's interests, and in some cases, to promote the interests of the party instituting the default.

Critics argue that deploying defaults without informing those affected is unethical because of their covert power to shape decisions, but proponents caution that disclosing what the defaults are intended to do could render them ineffective.

We posit that disclosure is unlikely to diminish the effects of most defaults. It has been suggested that defaults are effective because people treat them as a reference point to which other options are compared, and typically focus on positive aspects of a reference point and negative aspects of its alternatives (Johnson, Haubl, and Keinan 2007). Disclosure is unlikely to reduce the tendency for people to treat defaults as reference points as they are not necessarily aware that they are doing so. However, encouraging consumers to articulate their preferences may help them to reframe the reference point of the decision (Tetlock 1992), thereby reducing default effects.

We examine whether defaults can be disclosed for transparency but still remain effective, and whether preference articulation can attenuate the influence of defaults when not in consumers' or society's best interests. Experiments 1a-c show that disclosing defaults does not necessarily reduce effectiveness. Experiment 2 demonstrates that, although business-benefitting nudges seem less ethical than those benefitting society, defaults remain equally effective even when the disclosure informs consumers that the default serves the interests of the business instituting it rather than the individual's or society's interests. Finally, experiment 3 shows that an intervention encouraging decision-makers to articulate their preferences before choosing can attenuate the effect of defaults serving business interests while leaving intact defaults serving society's interests, providing a potential solution for consumer protection.

Contrasting true preference and nudged preference

Yiling Lin, Magda Osman, Adam Harris & Daniel Read

When people choose an option by "default" it is reasonable to believe they might have a weaker preference than if they had made the same choice through active choice or even against the default nudge. There are many possible consequences of this, and here we explore one. If people are nudged by default to be an organ donor, and if they die with healthy organs, will their surviving relatives be less likely to agree with the organ donation if the donor had been defaulted into their choice. We asked people to estimate the likelihood that an individual's "true preference" was to donate under both opt-in and opt-out systems. As expected, participants judged it more likely that the individual's true preference was to donate in the opt-in system. This result reflected the perceived diagnosticity of the potential donor's registration as a donor across the different systems, P(registered donor | want to donate)/P(registered donor | DON'T want to donate). We discuss the general problem of nudges potentially producing people whose preferences are not reflected in their "choices."

Why Americans Oppose Nudges

Janice Jung & Barbara Mellers

Using two representative U.S. samples, we explored American attitudes towards nudges. Americans distinguished between informational nudges and behavioral nudges. They were more supportive of informational nudges that used educational warning signs or calorie labels than behavioral nudges that directly manipulated the choice context using default options or sequential ordering. We found that three individual difference variables correlated with opposition to nudges – individualism, reactance, and reduced empathy, and we examined how individuals with the three types of dispositions perceived nudges to understand their resistance. Individualists disliked nudges based on higher order beliefs about the social order. Reactant people disliked nudges based on threats to self-control. People who lack empathy disliked nudges based on their lack of social connection with others. We also examined attitudes when nudges were made more transparent using an accompanied appeal. Individualists opposed nudges, regardless of the type of appeals. Reactant people disliked nudges when appeals highlighted the personal costs of nudge rejection. Such appeals many have been perceived as undermining their control over behavior. Less empathetic people disliked nudges when appeals targeted society. They may have less desire to deal with societal problems. Our results show that we can reduce individual resistance by using appeals wisely. Policy considerations require a careful consideration of the costs and benefits of informational and behavioral nudges. Behavioral nudges are often more effective but more likely to be resisted.

SOCIAL ASPECTS OF JUDGMENT AND DECISION MAKING 2

Asymmetric impact of competitive and cooperative environments on decisions involving ambiguity

Sule Guney & Ben Newell

This study aims to explore how different strategic environments influence people's decisions under ambiguity. We changed the structure of the classic Ellsberg task into a two-player interactive game where the decision-making environment was explicitly made Cooperative (i.e., players' financial interests were aligned), Competitive (players' financial interests were opposite), or Non-Competitive (players' financial interests were independent). In the study, two players were presented with a risky box (50 black and 50 yellow balls), and an ambiguous box (100 black and yellows balls in an unknown proportion); and asked to bet on a colour to be drawn from their chosen box. To make the Ellsberg task interactive, one of the players was allowed to arrange the ambiguous box before the box/colour choice stage, even though the exact proportion of coloured balls remained unknown to both players. The highest level of ambiguity aversion was obtained in the Competitive condition, and the lowest in the Cooperative condition, with the Non-Competitive condition in between. Also, ambiguity attitudes were sensitive to who was in charge of box arrangement in the Competitive condition, but not in the Cooperative condition. Overall our findings indicate that the perceived competitiveness and cooperativeness of the decision-making environment alter attitudes toward ambiguity in opposing directions.

The psychology of self-interested decisions: How (in)sensitive are we to the costs borne by others?

Meir Barneron, Ilan Yaniv, Shoham Choshen-Hillel & Hen Pundak

Social decision-makers often face choices that could produce a favorable outcome for the self at the expense of producing a suboptimal outcome for several other individuals. We hypothesized that when making the trade-off between self and multiple others, decision-makers represent the benefit to the self, and the cost to the prototypical other. By concentrating on a typical (single) individual, they neglect the cumulative impact on all others.

In two studies, participants had to judge the severity of a self-interested decision that inflicted significant cumulative losses to several recipients. In a third study, advisors had to recommend to anonymous recipients which of two cards to play. Here advisors had an incentive to recommend an inferior card. In a fourth study, advice-recipients who had suffered a financial loss, due to the receipt of an inferior recommendation, judged the severity of the advisor's behavior. In all studies, participants were sensitive to the cost borne by the typical recipient, but insensitive to the number of recipients affected. Participants sought to reap personal gains at the expense of others, when the cumulative loss was "thinly spread" across numerous recipients, more so than when the same losses were borne by fewer recipients who each suffered a larger loss.

Our findings bear important implications for real-life settings where individuals (politicians, policy makers, experts) make decisions or give recommendations that affect many others. For example, a banker may take very lightly a decision to make a self-serving, risky investment of one million euros when the effect on each of the 100,000 savers is merely 10 euros. The findings are discussed in relation to theories of social preferences, conflict of interest, and ethical behavior.

Efficiency isn't always Bayesian: the case of perceptual decision making in groups

Rebecca Floyd, Roland Baddeley, Simon Farrell & David Leslie

People who work together often perform better than those that work alone, but why is this so? Recently, Bahrami et al. (2010) suggested that, at least for the case of simple binary perceptual judgements, people are able to combine their individual information in an optimal (Bayesian) manner. This was based on the observation that, averaged over many trials, participants combined judgement accuracy in a manner that approached that of the optimal Bayesian combination rule. Complicating this interpretation is the fact that subjects only gave a binary response, meaning that only aggregate behaviour could be analysed. We know little about the judgement combination process other than on, average, that it appears efficient. A large number of more ad hoc combination rules could also result in the observed efficiency. We therefore investigated a similar but continuous perceptual task where subjects provided a continuous estimate of the direction of movement of a random dot display. This allowed us to investigate both aggregate behaviour (which was indeed efficient) with behaviour on individual trials. We found that people did not combine their estimates in a Bayesian manner, but used much simpler rules (e.g., returning one person's judgement as the joint answer). Removing visual feedback and incentivising accurate performance did not make joint judgements any more Bayesian. We conclude that simply observing high efficiency in a task is very different from showing subjects are behaving "optimally". Sometimes simple rules of thumb are both simpler, and good enough. We believe similar caution should be shown when interpreting other demonstrations of Bayesian-like behaviour.

How envy among team members impacts their helping decisions?

Ronit Montal Rosenberg & Simone Moran

Upward social comparisons (SCs) often trigger feelings of envy and consequently lead to destructive interpersonal intentions and behaviors. In this research, we test these destructive effects in teams, a fundamental unit in modern organizations in which social comparisons are prevalent, and we primarily focus on the understudied effects of envy on helping behaviors: help giving (HG) and help seeking (HS). Consistent with a cost-benefit model, we hypothesize that envy toward upward SC teammates has detrimental effects on helping decisions, and that these are moderated by task interdependence. In three studies, we manipulate envy by providing participants with SC information about two virtual teammates (one superior and one neutral). We then measure participants' decisions to seek help from (study 1) and provide help to (studies 2 & 3) these virtual teammates, during a simulated team task, varying the extent to which participants needed information from their teammates to be either large or small (i.e., high vs. low task interdependence). Supporting the proposed cost-benefit account, we find that people are less likely to seek help from and provide help (particularly autonomous help) to their envied teammates, and that these destructive effects of envy on helping behaviors are less apparent when task interdependence is high compared to low. Moreover, we find that schadenfraude (i.e., enjoying the envied person's helplessness), mediates the effect of envy on the decision to provide help.

Status&Empathy: Modulating Factors of Cooperation

Jieyu LV, Michael Proulx & Magda Osman

Three experiments were conducted to examine the role of empathy and status on cooperation with strangers in the computer-based linear Public Goods Game (PGG) with one real participant and three virtual players.

Experiment 1, a 2 × 2 (empathy [high empathy, no empathy]) × (endowed status [high status, low status]) experiment (N=94) was conducted and found that empathy manipulation was not effective in promoting behaviours in the current PGG task. More interesting, those in high status conditions behaved less cooperatively than those in the low status condition, which showed that people in the high status were less likely to show their prosociality.

Experiment 2, a 2 × 2 (empathy [high empathy, no empathy]) × (earned status [high status, low status]) (N=104) also found that the main effect of empathy was not significant. In addition, the low status group contribute significantly more proportion of endowments than those in the high status group. Combined experiment 1 and experiment 2 for analysis, we found that those in the endowed status group are more prosocial than those in the earned status group.

Experiment 3, a high-empathy (HE), low-empathy (LE) and no-empathy (NE) (N=52) indicated that the induction of empathy did not increase contribution in the first round, and throughout of the PGG.

Overall, all these three empirical studies showed that the status is a salient effect on the cooperative behaviours in the PGG regardless of the source of status (endowed or earned status); yet empathy is not an effective modulator of cooperation, which could be the role of ambiguous identification in the current PGG paradigm. These present studies provide a novel perspective for association between empathy and cooperation research field.

Social Learning in Categorization

Marin Puskaric, Bettina von Helversen & Jörg Rieskamp

Imitation is an important source of learning. To investigate whether other people's behavior influences how people learn to solve a probabilistic categorization task, we conducted an experiment in which on one group performed the task individually. A second group received additional information about the decisions another (well-performing) participant had made in half of the trials. Participants in the social group followed the observed behavior increasing performance when the social information was correct. When no social information was provided however, they performed worse than the individual learners. This suggests that even trustworthy social information can harm performance by impairing individual learning.

CONSUMER CHOICE 1

Quality inferences about universities and consumer brands from memory

Yvetta Simonyan & Daniel Goldstein

Cervantes famously said "a good name is better than riches" and, accordingly, institutions such as universities and producers of consumer products, invest great sums to attain positive brand associations. However, recent research endorses a maxim suggesting "there is no such thing as bad publicity." To shed light on this polarizing issue, we used a novel ranking task to test how brands in five domains (universities and consumer products) associated with mostly negative information were ranked in comparison to unfamiliar objects. Not only did the chosen method provide more insight about recognized and unrecognized objects than the two-alternative forced-choice questions (typically used in the field) did, but it also generated a rich set of brand attribute data for each object studied, including familiarity with the brand and the amount and valence of the knowledge about it. We find that brands with bad reputations are indeed ranked higher than unrecognized ones and that the predictions of people's inferences, modeled as a function of brand familiarity, were not improved by taking people's deeper knowledge into account. To test ecological rationality, we used published rankings (Consumer Reports for products and U.S. News and World Report for universities) and found that known brands associated with mostly negative information were, in fact, of higher quality than unknown ones.

How bookies make your money

Philip Newall

UK bookies from competing chains herd geographically in areas of social deprivation. The present work shows that UK bookies also herd with the special bets that they advertise to consumers, both on the high street and on TV adverts as shown to millions of viewers. Bet types vary in terms of their complexity, with complex bet types having the highest expected losses. Bookies herd on a common strategy of advertising special bets on two levels. Bookies herd by almost exclusively advertising complex bet types with high expected losses. Bookies also herd by advertising bets with common characteristics within a given complex bet type. An explanation based on conjunction bias, potentially relevant given the complex characteristics of these bets, is proposed for both levels of bookies' herding. Bookies may know how to nudge bettors toward larger losses.

Absinthe + Brandy = Champagne: How Dyads Overcome Choice Overload

Elena Reutskaja, Nuno Jose Lopes & Mario Capizzani

Choosing from a large set of alternatives can negatively affect individual's purchase motivation and her overall satisfaction with the chosen product, a phenomenon referred to as choice overload. Despite the increasing attention to this phenomenon, previous research has focused exclusively on individual decisions. Our paper is the first to investigate this phenomenon in a group setting. We conducted a series of studies consisting of a laboratory experiment that explored choice overload for groups vs individuals, a field study in a wine store, which aimed at validating and testing the generalizability of our results and relevance for a real business situation, and a final laboratory experiment which aimed at revealing the reasons behind the group's capacity of suffering less choice overload than individuals. Our result show that the phenomenon of choice-overload occurs at a significantly smaller magnitude in groups than in individuals. Our findings suggest that groups can shield themselves from increases in the number of alternatives in the choice-set more effectively than individuals do. This is reflected both in objective outcomes (purchase rates) and in subjective post-choice reports (difficulty and enjoyment). Groups' ability to better cope with large choice sets is based on cooperation rather than on self-interest of its group members. We showed that instead of pursuing their most favourite alternatives, group members preferred to converge their discussion to mutually liked alternatives which decreased difficulty and increased enjoyment of the decision making process. As a result, consideration sets of groups were smaller than those of individuals, and groups suffered less than individuals from choice overload.

Do consumers know how much electricity is used by their appliances?

Vedran Lesic, Ines Azevedo, Tamar Krishnamurti, Wandi Bruine de Bruin & Matthew Davis

Policy makers are increasingly encouraging households to save electricity, so as to reduce greenhouse gas emissions and improve the reliability of the electricity grid. However, such encouragements may be ineffective if consumers are unaware of how much electricity is used by different appliances (such as their air conditioner, refrigerator, and others). We therefore examined the difference between consumers' perceived and actual residential electricity use for specific appliances. Consumers were recruited from Texas households with appliance-specific electricity meters. We measured their electricity use for a set of appliances, over the course of three summer months. Participants were randomly assigned to assess their appliance-specific electricity use in terms of dollars or kilowatt-hours, for an average summer month. Participants who assessed their use in dollars overestimated their electricity use for all appliances and were less accurate in perceiving their electricity consumption. Their open-ended responses revealed salient memories of high electricity bills due to blasting air conditioners during hot Texas summers, following the availability heuristic. By contrast, participants who assessed their use in kilowatt-hours underestimated their electricity use for high electricity consuming appliances (such as their air conditioner) and overestimated their electricity use for lower energy consuming appliances (such as their refrigerator). Their open-ended responses suggested a more reasoned approach. We discuss implications for the design of effective electricity feedback for consumers.

Muscular Male Employees Increase Men's Conspicuous Consumption

Tobias Otterbring

Previous research has found that exposure to a provocatively dressed woman increases single men's likelihood of recalling status products in a visual display. Studies also show that scenarios eliciting male sexual arousal motivate men to "show off" and engage in flashy displays such as spending money on expensive cars. Merely touching lingerie is sufficient to make men more impatient in choices between smaller-sooner and larger-later monetary rewards. However, to the best of my knowledge, no study has examined whether exposure to a muscular man can have a similar influence on men's conspicuous consumption (consumption of products associated with wealth and status, aimed to impress others).

In four studies, I investigate whether a muscular male employee motivates men to buy more conspicuous products. Using consumer receipt data from an initial field experiment, I show that male customers spend more money and purchase more expensive products in the presence (versus absence) of a muscular male employee. In a second lab-based experiment, I then demonstrate that this effect is contingent on the employee's physical appearance, and therefore applies only if the employee is viewed as muscular (versus non-muscular). In a third lab-based experiment, I show that the effect is restricted to products associated with status, and hence does not generalize to all types of products. Last, in a final controlled lab experiment, I illustrate that the effect is moderated by men's levels of social dominance orientation (SDO; an individual's preference for maintaining social hierarchy). Specifically, I show that men scoring low (versus high) on SDO are significantly more willing to spend money on conspicuous products after exposure to a muscular, but not a non-muscular, male employee.

The Effect of Peer Observation on the Consumption of Temptation Goods: Experimental Evidence

Antonia Grohmann & Sahra Sakha

This paper uses an experiment to investigate the impact of peer observation on the consumption decisions of rural households in Thailand. We find that those groups that observe each other show lower within group standard deviation in their decisions. At the same time, we also find that individual choice is influenced by group choice. We find that unfamiliarity with product is counteracted by peer effects. Looking at treatment heterogeneity, we find that those in a group that have higher cognitive ability are less influenced by peer observation.

METHODS

Measuring (Higher Order) Correlation Aversion

Gijs van de Kuilen & Sebastain Ebert

Many important decisions involve tradeoffs between multiple, potentially non-monetary, outcomes. Classic economic theory suggest that the cross-derivatives of the utility function play an important role in these settings. This paper reports the results of an experiment with N=303 student subjects designed to measure the (cross-) derivatives of the utility function for different attributes, not only for the second order (risk aversion), but also for the higher order risk preferences prudence and temperance. In particular, our experimental design exploits recent theoretical advances made in the theory of multivariate (higher-order) risk preferences to obtain theory-free tests of these traits in in three important domains (social preferences, time preferences, and preferences for leisure time). The results indicate that previous laboratory results obtained in the monetary domain extend to other domains; people are risk averse, prudent and temperate not only for their own money, but also for the money of others, for waiting time, and for money accruing in the future. Our results concerning the cross-derivatives in the different domains yield plausible results, such as the fact that we observe correlation seeking and cross-intemperance in the social condition, which is in line with models predicting that people are inequality averse.

Co-variation Estimation in Danger: Unknown Singular Behavior of Pearson's Correlation Coefficient

Kenpei Shiina

We found that Pearson's r cannot be -1 or 1 when 1) variable X has $m \geq 2$ ordered categories and variable Y $n \geq 2$ ordered categories, 2) $n \neq m$, and 3) the categories are used at least once. The proof is simple: if all the data are on an oblique line then r=1 and vice versa. If all the data are on a line then the number of orthogonal images of the data on X and Y axes should be identical. Therefore r=1 implies that the number of such images should be identical. By contrapositive, we can conclude that if the number of orthogonal images on both axes are not the same, then r cannot be 1. To put it simply, this proof says that correct estimation of r calls for the same number of categories for both scales. This as-yet-unrecognized property gives a decreasing bias for r. Karl Pearson (1913) noticed that when the categories are "broad," r is biased. But this bias is a different problem because, in Pearson's coarse case, r can be 1 or -1 if m = n, irrespective of the broadness of categories.

An empirical issue is in what situation and how much is the bias on r. We found clear biases when categories are less than 10 and $m \neq n$. In particular, the plunge when n, m.

Multi-attribute utility models as cognitive search engines

Pantelis P. Analytis, Amit Kothiyal & Konstantinos Katsikopoulos

In optimal stopping problems, decision makers are assumed to search randomly to learn the utility of alternatives; in contrast, in one-shot multi-attribute utility optimization, decision makers are assumed to have perfect knowledge of utilities. We point out that these two contexts represent the boundaries of a continuum, of which the middle remains uncharted: How should people search intelligently when they possess imperfect information about the alternatives? We assume that decision makers first estimate the utility of each available alternative and then search the alternatives in order of their estimated utility until expected benefits are outweighed by search costs. We considered three well-known models for estimating utility: (i) a linear multi-attribute model, (ii) equal weighting of attributes, and (iii) a single-attribute heuristic. We used 12 real-world decision problems, ranging from consumer choice to industrial experimentation, to measure the performance of the three models. The full model (i) performed best on average but its simplifications (ii and iii) also had regions of superior performance. We explain the results by analyzing the impact of the models' utility order and estimation error.

How not to measure overconfidence

Ferdinand Langnickel & Stefan Zeisberger

Calibration-based overconfidence was found to be a major bias in behavioral finance and is assumed to be a driver for investors' excessive risk-taking and trading. Behavioral models in finance claim that miscalibrated investors underperform in financial markets due to excessive trading activities (Daniel et al., 1998; Gervais and Odean, 2001; Odean, 1998). In fact, various empirical studies find supporting evidence for this prediction (Barber and Odean, 2000, 2001; Statman et al., 2006). Yet, experiments with individual investors fail to confirm the link between miscalibration and trading volume (Biais et al., 2005; Glaser and Weber, 2007; Kirchler, 2002).

One explanation for these contradicting results lies in the elicitation technique of overconfidence. All the above studies make use of the confidence interval production task (CIPT) to elicit individual miscalibration. In the CIPT decision makers provide range estimates for unknown values according to an assigned confidence level. Individual miscalibration is commonly measured by comparing the assigned confidence level to the realized ratio of true values that fall within the provided ranges.

In this study, we systematically test the ability of the CIPT to capture individual differences in miscalibration. In two online experiments in Switzerland and the U.S. with 300 participants we find strong evidence that the widely used CIPT overconfidence measure is inappropriate to measure overconfidence in the form of miscalibration. In particular, we find that people do not respond to their assigned confidence level and that cognitive and behavioral factors that are unrelated to overconfidence affect miscalibration.

Development and Validation of the Scientific Reasoning Scale

Caitlin Drummond & Baruch Fischhoff

Scientific findings and innovations play an important role in a range of decisions faced by nonscientists, yet little is known about the skills that nonscientists need in order to read and evaluate scientific evidence. Drawing on research in public understanding of science, cognitive developmental psychology, and behavioral decision research, we develop an individual difference measure of scientific reasoning skills, defined as the skills needed to evaluate scientific findings in terms of the factors that determine their quality. We present the results of three studies assessing the psychometric validity of the Scientific Reasoning Scale (SRS). Our results indicate that the SRS is internally consistent and possesses good construct validity. Scores on the SRS predict the possession of beliefs consistent with the scientific consensus, above and beyond education, political and religious beliefs, and existing measures of scientific literacy. SRS scores also predict performance on a task requiring the analysis of scientific information. Our results suggest that the Scientific Reasoning Scale provides a theoretically informed contribution to decoding lay responses to scientific results and controversies.

Measuring Subjective Graph Literacy in Diverse Samples and Cultures

Rocio Garcia-Retamero, Edward Cokely, Saima Ghazal & Alexander Joeris

Background. Visual aids confer important benefits when communicating health risks. Visual aids are most helpful for people who have some basic understanding of graphs (i.e., graph literacy). Measures of objective graph literacy (OGL) can effectively identify individuals with limited skills, enabling custom-tailored risk communication. However, these tests can be time consuming and sometimes evoke negative reactions (e.g., they can be stressful).

Objectives. To validate a brief and easy-to-use assessment of subjective graph literacy (SGL) that measures people's beliefs about their ability to process and use graphically presented information. To investigate the robustness of the SGL scale and compare it with the leading OGL scale across diverse samples from different cultures.

Participants. Demographically diverse residents of the United States (n=470), young adults (n=116) and patients (n=175) from Spain, and surgeons from 48 countries (n=175).

Design. A focus group and four studies for test development and initial validation (focus group, Study 1), reliability evaluation (Study 2), and predictive validity testing (Studies 3 and 4).

Measures. Psychometric properties of the scale (basic properties; reliability; convergent, predictive, and discriminant validity).

Results. In about one minute, the SGL scale provides a reliable, robust, and valid assessment of graph literacy and risk communication preferences, and evokes fewer negative reactions than the OGL scale.

Conclusions. The SGL scale is suitable for use in clinical research and may be useful as a communication aid in clinical practice. Theoretical mechanisms involved in SGL, emerging applications, and open questions are discussed.

HEURISTICS AND BIASES 1

Priming logical intuitions can reduce heuristic thinking in conjunction fallacies

Gaëlle Vallée-Tourangeau & Jennifer Faure-Bloom

This study aimed to explore whether it is possible to improve judgments of conjunctive probabilities by priming fast and intuitive logical considerations of class inclusion. We conducted two experiments where naïve participants were required to complete a series of 12 comparative conjunctive probability judgment (CCPJ) tasks asking them to judge whether probability statements varying in terms of their logicality and in terms of their compatibility with heuristic considerations were correct or incorrect. This allowed us to compare rates of heuristic responding when heuristic and logical considerations were aligned (non-conflict trials) and when they were in conflict (conflict trials). Assuming intuitions about logic arise from experience, Experiment 1 asked participants to judge a series of general statements (e.g., 'I am more likely to meet a bank teller than a bank teller who is also a feminist') before completing a series of CCPJ tasks. Experiment 2 involved two phases. First, participants directly experienced events and their conjunctions before completing 8 related CCPJ tasks. To see whether contingency learning would transfer to new tasks, participants then completed 8 new CCPJ tasks in a second phase. Results from Experiment 1 show that participants were less likely to provide a heuristic answer when heuristic considerations conflicted with logic. Priming reduced the rate of heuristic judgments and conflict detection, measured by the difference in heuristic responding between no-conflict trials and conflict trials, was more marked after priming although not significantly so. Results from Experiment 2 replicated the finding that participants are sensitive to the conflict between heuristic and logical consideration. Implicit learning had a dramatic effect on conflict detection, and this effect was even more pronounced in the second phase. These results provide further support to the logical intuitionist account according to which conjunction fallacies are the product of deliberate but heuristic thinking whereas accurate judgments of conjunctive probabilities arise from people's intuitive thinking.

Increasing cognitive load reduces the impact of heuristic thinking in conjunctive probability judgments

Jennifer Faure-Bloom & Gaëlle Vallée-Tourangeau

We explored the possibility of improving judgments of conjunctive probabilities through impeding deliberative thinking. Two experiments were conducted to test this aim using a series of 16 comparative conjunctive probability judgment (CCPJ) tasks, which entailed judging whether probability statements varying in terms of logicality and compatibility with heuristic considerations were correct or incorrect. The first experiment required naïve participants to complete working memory load (3-dot vs 4-dot memory tasks) before completing the 16 CCPJ tasks. The second experiment used an ego-depletion manipulation. Overloading working memory decreased the impact of heuristic thinking in trials where the logical answer conflicted with the heuristic answer. Moreover, evidence for conflict sensitivity was present with participants taking longer to answer conflict statements. Contrary to what is commonly assumed, but in line with the logical intuitionist account, the 4-dot memory task did not lead to an increase in heuristic thinking, instead it resulted in fewer heuristic considerations in judgments.

Overlap of Accessible Information Undermines the Anchoring Effect

Štěpán Bahník & Fritz Strack

According to the Selective Accessibility Model of anchoring, the comparison question in the standard anchoring paradigm activates information that is congruent with an anchor. As a consequence, this information will be more likely to become the basis for the absolute judgment. However, if the activated information overlaps with information that is elicited by the absolute judgment, the preceding comparative judgment should not exert an incremental effect. The present study shows that this is the case if the comparative judgment refers to a general category and the absolute judgment refers to a subset of the general category that is activated by the comparison question. For example, participants comparing the average annual temperature in New York City to 102 °F judged the average winter, but not summer temperature to be higher than participants making no comparison. On the other hand, participants comparing the annual temperature to -4 °F judged the average summer, but not winter temperature to be lower than participants making no comparison. This pattern of results provides further support for the Selective Accessibility Model and is difficult to reconcile with alternative explanations of the anchoring effect.

Exploring decision-confidence in the conjunction fallacy tasks

Aba Szollosi, Bence Bago & Balazs Aczel

Recent research on the conjunction fallacy task found that decision-confidence ratings are higher on a newly constructed 'no-conflict' version of the task (where the first answer that comes to mind and the correct answer are the same) than on the original 'conflict' version (where they are different). Based on a Sensory Sampling Model of confidence, in three experiments we studied how the perceived difference between the probabilities of the answer options affects decision-confidence. We found that a simple model, where the perceived difference between the probabilities predicts decision-confidence explains current empirical data best. We propose that further research explore whether perceptual models of confidence holds true for other reasoning and decision-making tasks.

Optimism Bias in The Context of Project Planning: A Study of Subjective Probability Distribution of the Maximum of Multiple Durations

Ivan Liu & Chung-Hsing Huang

Across industries, projects both large and small often fall behind schedule. Identifying contributors to this problem has long occupied researchers. Many studies have cited the research of optimism bias in their explanations of schedule overruns but have failed to notice a difference between the format of the psychological studies and duration estimation in practice. Most studies of optimism bias do not divide a task into parts while subdivision is an essential procedure in project planning. It is, therefore, questionable to apply the results to explain the duration underestimation. This study was an attempt to address the threat to the validity of previous research by investigating optimism bias in the context of project management. Inspired by the research of merge event bias in critical path method, this paper focused on the parallel structure. Estimating the completion time is thus equivalent to identifying the subjective distribution of the maximum, largest order statistic, of multiple random variables.

One hundred and two working professionals participated in the experiment, in which the participants were asked to estimate the completion time of a bivariate parallel structure based on the given historical durations of the subtasks. The results confirmed our hypothesis that people underestimate the length of time when they base it on subtask information. The findings, therefore, fortify the bridge between psychology and project planning, and support the use of optimism bias in explaining the project schedule overruns. The insights provided by these time prediction experiments also offer potential contributions to understanding the subjective probability distribution of order statistics, which warrant further study.

An Integrative Model of Anchoring Effects (IMAE) for the Prediction of Quantitative Judgments

Dan Schley & Brandon Turner

Research on the anchoring effect has primarily utilized numeric anchors with participants providing numeric responses. We provide, to the best of our knowledge, the first quantitative model to predict anchoring effects. The Integrative Model of Anchoring Effects (IMAE) assumes that before being presented an anchor, individuals have some prior information, when presented an anchor, the anchor provides information, and that information is integrated into some new representation of the target item. We developed an initial between-participant version of IMAE which allows for predictions at the group level (e.g., if the distribution of responses without an anchor is x then the distribution of responses after the presentation of an anchor would be y). To extend the model, we developed a within-participant version of IMAE that can make predictions of judgments at the individual level. To test IMAE we conducted two experiments. Model fits found that the distribution of IMAE's predicted judgments greatly overlapped with participants' actual judgments.

SAMPLING

A Decision-by-Sampling Account of Risk Preferences Regarding Frequent Small-Scale Deadly Events

Christopher Olivola

Risk regulations in many countries emphasize the number of potential victims in accidents over the frequencies of such events. However, there is growing empirical evidence that people are risk-seeking when it comes to preventing large-scale human fatalities: faced with a situation involving 2n lives at risk, they prefer a risky strategy that could prevent all 2n deaths but has a 50:50 chance of complete failure over a strategy that leads to n deaths for certain. While this tendency to be risk-seeking for losses has been well established empirically, the reasons for it are not well understood. Moreover, while much work has been focused on large-scale, but rare, events (such as disease epidemics), much less work has examined frequent, small-scale events (such as auto accidents). We propose a theoretical explanation for people's preferences regarding frequent, small-scale life-or-death events using Decision-by-Sampling (DbS) theory. Using data on the distributions of actual, reported, and estimated deaths from auto accidents and avalanches, we show that DbS predicts that people will exhibit risk-seeking preferences regarding these events. We test these predictions using decision scenarios that we administered in three European countries (France, Switzerland, and the U.K.). As predicted by the DbS, we find that people in all three countries are systematically risk-seeking when it comes to preventing auto accident and avalanche deaths.

Decision by Sampling and Better/Worse-than-Average Effects

John Han & Christopher Olivola

People have a tendency to believe that their ability to perform a certain task is better than average (BTA) on easy tasks and worse than average (WTA) on hard tasks. One of the popular explanations for these phenomena has been anchoring-and-insufficient adjustment. Here, we offer a new account, based on a process-level theory called Decision by Sampling (DbS), to yield an alternative understanding of the psychology underlying people's comparative judgments. In support of our proposed account, we find that the BTA [WTA] effect seems to occur for easy [hard] tasks because examples of low [high] performers are more accessible than examples of high [low] performers during comparative judgments. Moreover, in further support of our account, explicitly asking people to consider high [low] performers before they provide comparative judgments significantly reduces the BTA [WTA] effect in easy [hard] tasks, but not in hard [easy] tasks. For example, people are less likely to rate themselves as BTA drivers [WTA tightrope walkers] if they first think about individuals who are very skilled at driving (e.g., F-1 racers) [very unskilled at tightrope walking (e.g., babies)], whereas thinking about low-skilled drivers [high-skilled tightrope walkers] does not influence the BTA [WTA] effect. We present three experiments in support for the DbS account as an explanation for BTA and WTA effects.

Investigating the adaptivity of advice taking: Results from a sampling paradigm

Fabian Ache & Mandy Hütter

Taking advice is expected to add greatly to the adaptivity of human decision making. Yet, studies on advice weighting consistently show that people do not weigh advice from others equally to their own judgments when revising. This so-called egocentric discounting is particularly pronounced for advice diverging from one's own estimate or inconsistent advice, precluding optimal gains. However, advice taking does not only consist of the weighting but also of the seeking of advice, the latter of which has hardly been studied. To cover this gap, we introduce a new advice taking paradigm, expanding the classical research approach by a sampling phase. We introduce an ecological model of advice taking. Drawing on recent theorizing for subjective confidence assessments, we assume that any factor decreasing consistency or breadth of information increases participants' propensity to sample further pieces of advice. When integrating information for a final judgment, response alternatives will be weighted with regard to the breadth and consistency of the according information.

We tested these assumptions in three experiments, in which participants received advice that was either close to or distant from their initial estimate and either consistent or inconsistent among advisors. Participants revealed extensive advice seeking. Moreover, participants sampled more pieces of advice after receiving advice distant from their initial estimate and inconsistent advice. Participants also revealed a substantially increased tendency to average their own estimate and all advice obtained after receiving distant advice. Implications and avenues of future research will be discussed.

Reliance on Small Samples, the Wavy Recency Effect, and Similarity-based Learning

Ori Plonsky, Kinneret Teodorescu & Ido Erev

Many behavioral phenomena, including underweighting of rare events and probability matching, can be the product of a tendency to rely on small samples of experiences. Why would small samples be used, and which experiences are likely to be included in these samples? Previous studies suggest that cognitively efficient mechanisms, such as reliance on the most recent experiences, can be very effective. We explore a very different and more cognitively demanding process explaining the tendency to rely on small samples: exploitation of environmental regularities. The first part of our study analyzes wide classes of dynamic binary choice environments, which generalize previous studies in decisions from experience. It shows that focusing only on experiences that followed the same sequence of outcomes preceding the current task is more effective than focusing on the most recent experiences. The second part of our study examines the psychological significance of these sequence-based rules. It shows that these tractable rules reproduce well-known indications of sensitivity to sequences and predict a non-trivial wavy recency effect of rare events. Analysis of published data supports this wavy recency prediction, but suggests an even wavier effect than these sequence-based rules predict. This pattern, and the main behavioral phenomena documented in basic decisions from experience and probability learning tasks, can be captured with a similarity-based model assuming that people follow sequences of outcomes most of the time but sometimes respond to trends. We conclude with theoretical notes on similarity-based learning.

Ownership History and Experience-Based Decision Making

Xiao-Tian Wang, Lay See Ong & Jolene Tan

The aim of this research study is to go beyond the gain–loss dichotomy and explore the effects of ownership experience on valuation of goods, loss-aversion, and diminishing sensitivity. The concept of ownership is a key design feature of the capitalist socio-economic system. However, little is known about how different types of ownership experience affect judgment and decision making. Unlike description-based decisions, experience-based decisions should provide a stronger sense of ownership. We hypothesized that the ownership experience would bestow additional value on a good. We predict a valuation order of constant ownership or no-ownership or from gains to a final loss, followed by alternating ownership, and was lowest following a stable (patrimonial) ownership or constant no-ownership (a proletarian state). The results suggest that wins and losses are not created equal in different ownership contexts. Instead, the valuation of an object depends on the unique ownership experience with the object. Some key decision phenomena such as loss aversion are better understood as results of specific ownership experience.

Acting fast vs. biding time: Effects of competitive pressure on information sampling

Doug Markant

Competition often forces a decision maker to weigh the benefits of learning (during which a choice is deferred in order to collect information about available options) against the risk that a competitor will act first and claim the best options for themselves. A recent study examining the effects of competition in the sampling paradigm (in which people sample outcomes from potential options before selecting one to generate a payoff) found that competitors drastically curtailed the amount of information collected relative to solitary players. Despite learning little about the available options (often relying on a single outcome), people who “acted fast” nevertheless earned greater rewards than those who deferred, suggesting that choosing first was an adaptive strategy. In the present study we examined whether this strategy emerges as a result of experiencing the effects of competitors’ decisions. For example, a participant may lower the amount of information they aim to collect in response to experiencing a competitor stop and choose first. We hypothesized that this process would lead to a decrease in sample size over the course of repeated games, with opponents converging on a strategy of acting quickly on the basis of little information. The results confirmed this prediction, with sample size decreasing over the course of repeated competitive play (in contrast, there was no change in a non-competitive condition in which players’ decision had no impact on their opponent). Our findings illustrate the dynamic nature of learning under competition, and highlight the need to consider how behavior during pre-decisional exploration is shaped by social information about competitors as well as experience-driven observation of their actions.

INDIVIDUAL DIFFERENCES 1

"Thinking about numbers is not my idea of fun": Need for cognition mediates age differences in numeracy performance

Wandi Bruine de Bruin, Simon McNair, Andrea Taylor, Barbara Summers, JoNell Strough

Aim: Numeracy refers to the ability to understand risks and probabilities. Lower numeracy is related to limited understanding of risk-benefit information, committing decision errors, and worse disease management. Despite the practical relevance of numeracy measures, their theoretical underpinnings remain unclear. Here, we draw on research about intelligence test performance to understand the role of motivation in numeracy test performance. Indeed, one potential concern that has received limited attention is that poor numeracy test performance partly reflects low motivation to solve numerical problems. Research on aging has suggested that older adults especially lack motivation to work hard on seemingly irrelevant and demanding tasks. We therefore test (1) whether limited motivation to think hard about complex problems (as measured by need for cognition) may undermine performance on numeracy tests and (2) whether age differences in numeracy performance are mediated by a reduced motivation to think hard about complex problems.

Method: We recruited an age-diverse UK-wide sample of 306 adults. They completed measures of numeracy, need for cognition, educational attainment, and other demographics.

Results: As expected, worse numeracy performance was related to lower need for cognition. Moreover, older people had lower numeracy and lower need for cognition. The negative relationship between age and numeracy was mediated by need for cognition – even after controlling for educational attainment and other demographic factors.

Conclusion: Low motivation may undermine performance on numeracy tests, especially in older adults. We discuss strategies for improving people's motivation to complete numeracy measures and other challenging tasks relevant to decision making.

What Were They Thinking? Understanding Decisions to Discontinue Failing Plans

JoNell Strough

Aim: According to economic theories, decision makers should ignore 'sunk costs' or irrecoverable prior investments and focus instead on the likelihood of a project's success. However, people often keep investing in failing plans when there are 'sunk costs'. Some suggest that positive feelings about the future lead people to disregard objective information about failure. Others suggest that hypothetical scenarios used in sunk cost research lack realistic detail, which invites participants to imagine augmentations. As such, seemingly biased decisions could reflect logical reasoning. However, little is known about how people reason about sunk cost problems, because few studies ask people to explain their choices. Here, we investigate people's reasoning about a 'sunk cost' problem. Specifically, we examine whether decisions depend on positive feelings about the future, or augmentations that 'go beyond' the presented information.

Method: Participants (N=397) were from RAND'S American Life Panel. A failing plan was presented in a hypothetical decision scenario. Participants were randomly assigned to write about thoughts and feelings, or how to improve the situation.

Results: Qualitative coding showed about one-third of participants generated future-oriented thoughts of success; this was associated with continuing to invest in the failing plan. Almost half augmented the scenario by adding details that made continuing the failing plan more attractive. When taking augmentations into account, some decisions to continue investing in the 'sunk cost' option were shown to be based on logical reasoning.

Conclusion: Our findings suggest that people 'think beyond' presented scenarios. We discuss the importance of understanding people's reasoning when judging the quality of decisions.

Multiple numeric competencies and their relation to financial outcomes over time

Mary Kate Tompkins, Ellen Peters & Dan Schley

In a longitudinal study using undergraduate participants (N=749), we examined the power of objective numeracy (ONS; Weller et al., 2013) and subjective numeracy (SNS; Fagerlin et al., 2007) to predict financial decision outcomes. Data collection points were the beginning and end of a semester, as well as a one-year follow-up. We hypothesized that being more proficient in ONS and/or SNS would be associated with better financial outcomes at baseline due to ONS's relation to performing number comparisons and calculations and SNS's motivational and emotional associations with numbers. Additionally, we attempted to manipulate numeracy (taking a statistics course vs. not) to investigate possible improvements in ONS, SNS, and financial outcomes. We hypothesized that taking a statistics course (vs not) would lead to positive changes in ONS and SNS from the beginning to end of the semester, and these ONS/SNS changes would predict financial outcome changes during that time. Lastly, we hypothesized that taking a statistics course would improve financial outcomes over a year later. Results indicated that greater SNS (but not ONS) predicted financial outcomes at baseline and changes in financial outcomes from the beginning to end of the semester. Additionally, taking the statistics course protected students from detrimental changes in SNS over the semester and from detrimental changes in financial outcomes over a year later. The present findings should be taken into consideration when developing strategies to improve financial outcomes.

Resistance to anchoring depends on crystallized ability: An individual-differences study

Fabio Del Missier, Cristina Tomarchio, Wandi Bruine de Bruin, Andrew Parker & Timo Mantyla

Traditionally, research on judgment and decision making has examined situational pressures on decision biases and the processes underling such biases. More recently, individual-differences research has been aiming to understand the skills that underlie the ability to avoid common decision biases. Yet, individual differences in resistance to the anchoring bias (or the ability to provide estimates without being influenced by irrelevant numeric anchors) have not received much attention and the results of existing studies are rather inconsistent. Here, we therefore examine which cognitive skills may underlie the ability to resist the anchoring bias. Building on the neurocognitive literature on estimation, we examined whether having more knowledge, being more numerate, and being more able in estimation may increase resistance to anchoring. In Study 1 (N = 212), we validated a 24-item resistance to anchoring measure, with items taken from the literature. The measure showed good reliability and nomological validity in terms of correlations with potential predictors. In Study 2 (N = 101), participants completed the resistance to anchoring measure, tests of fluid and crystallized abilities, and cognitive estimation skills. Structural equation modeling showed that 24% of the variance in resistance to anchoring was predicted by individual differences in crystallized ability, while the other predictors did not have a significant direct effect. Theoretically, the results support the view that knowledge helps resisting the influence of anchors, possibly by constraining the set of reasonable estimates. Our findings also suggest the promise of knowledge-based interventions for improving resistance to the anchoring bias.

The impact of cognitive reflection versus calculation in decision making

Aleksandr Sinayev & Ellen Peters

Scores on the three-item Cognitive Reflection Test (CRT) have been linked with dual-system theory and normative decision making (Frederick, 2005). In particular, the CRT is thought to measure monitoring of System 1 intuitions such that, if cognitive reflection is high enough, intuitive errors will be detected and the problem will be solved. However, CRT items also require numeric ability to be answered correctly and it is unclear how much numeric ability vs. cognitive reflection contributes to better decision making. In two studies, CRT responses were used to calculate Cognitive Reflection and numeric ability; a standard numeracy scale was also administered. Numeric ability, whether measured on the CRT or the standard numeracy scale, accounted for the CRT's ability to predict more normative decisions (including a subscale of decision-making competence, incentivized measures of impatient and risk-averse choice, and self-reported financial outcomes); Cognitive Reflection contributed no independent predictive power. Results were similar whether the two abilities were modeled (Study 1) or calculated using proportions (Studies 1 and 2). These findings demonstrate numeric ability as a robust predictor of superior decision making across multiple tasks and outcomes. In these studies, correlations of decision performance with the CRT provided insufficient evidence that overriding intuitions in decision making reduced biases. Numeric ability was the key mechanism instead.

Developmental trajectories of psychological regulation predict later decision-making competence: A nine-year longitudinal study

Joshua Weller, Andrew Parker, Maureen Reynolds & Levent Kirisci

Normative psychological growth from adolescence into early adulthood reflects increases in traits related to psychological regulation (e.g., greater emotional stability and less impulsivity). However, individuals often vary greatly in these developmental trajectories. The current research examines the degree to which differences in developmental trajectories of psychological regulation are associated with the tendency to respond rationally across different decision domains. In this study, self-regulatory capacities were measured at age 10-12, with follow-up assessments at 14, 16, and 19 years. At age 19, we administered the Youth-Decision-Making Competence (DMC) scale. Correlational analyses revealed that lower psychological regulation was associated with worse DMC scores, as early as age 10. Further, we fit a 3-class growth mixture model representing three distinct developmental trajectories of psychological regulation: (a) Regulated group (55% of sample), which showed higher regulative tendencies which were maintained throughout adolescence, (b) a Low-Persistent group (35%), who demonstrated greater lower self-regulation throughout childhood, and a (c) Peaked dysregulation group (10%), who demonstrated low self-regulative tendencies at age 10, which became increasingly impaired throughout adolescence. Individuals in the Peaked and the Low-Persistent groups demonstrated lower DMC performance than those in the Regulated group. Our results suggest that early patterns of psychological dysregulation can impact later decision-making tendencies. Our findings also reinforce past work that indicates considerable individual differences in intra-individual change across adolescence, and these differences may matter when predicting later decision making performance.

MORAL ISSUES 2

How does your attitude towards ethical issues affect your reasoning?

Vladimira Cavojova, Robert Hanak & Marek Jurkovic

Extensive research provides a basis for an assertion that human reasoning tends to be undermined by their previous beliefs and emotions associated with such beliefs. People generally tend toward motivated reasoning about issues that concern their values and ethical attitudes. This makes them unable to objectively evaluate evidence and arguments and come to sound conclusions about certain topics in which they are personally interested, making debate on controversial issues matter of emotions and prejudices instead of a reasonable discussion. We were interested in examining people's reasoning about one such controversial issue – right of woman to have an abortion vs. right of an unborn child. People tend to be divided on this topic according to their religious or political affiliation and we were interested, how these affiliations affect attitudes toward abortions and subsequent reasoning about validity of several arguments regarding the rights of women vs. rights of unborn children. Participants were expected to evaluate arguments solely on the basis of their logical validity, but arguments were formulated like syllogisms either endorsing right to have and abortion or rights of a fetus with additional neutral syllogisms used as a base measure. The results suggested that the pro-choice vs. pro-life participants differ mainly in reasoning about valid syllogisms with conclusion favouring pro-choice orientation (right of a woman for abortion), where pro-choice participants correctly evaluated syllogisms as valid in about 69.52 % of cases [CI 95% 0.66, 0.71], while pro-life participants correctly evaluated syllogisms as valid only in 60.83 % of cases [CI 95% 0.59, 0.63].

Why Enough is Never Enough: Greed and Overearning

Terri Seuntjens, Marcel Zeelenberg & Niels Van de Ven

In 2001, the Enron Scandal led to the bankruptcy of the Enron Corporation, the biggest bankruptcy case ever. A few years later, the Madoff Scandal was discovered. In the media greed is often mentioned as a cause of these scandals. The assumption that greed elicits unethical behavior is widespread, but has to the best of our knowledge never been tested. In 5 studies tested the idea that greedy people are more unethical. In Studies 1, 2, and 3 we found that dispositional greed is associated with more favorable attitudes towards various transgressions (e.g., cheating on tax, lying in own interest, cheating on spouse, dishonestly calling in sick for work). Study 4 revealed that greedy individuals are also more likely to engage in such transgressions in their daily life. In Study 5 we further established this relationship by relating dispositional greed to actual behavior in a corruption game. We found that greedy individuals were more likely to accept a bribe. In conclusion, 5 studies reveal that dispositional greed is associated with more unethical behavior.

The winner takes it all

Amos Schurr & Ilana Ritov

We examine the effect of winning a competition on people's ethicality. In Studies 1 and 2 competitors that won or recalled winning a match were significantly more likely to over-claim money from their counterparts in a subsequent experiment. This tendency reversed when winning happened by chance (Study 3) or when winning required meeting a threshold rather than beating a counterpart (Study 4). In these two experiments, losers were significantly more likely to over-claim money from their counterparts. Finally, Study 5 indicates that a possible mechanism underlying this effect is heightened sense of entitlement among winners.

Unethical Behavior under Different Modes of Competition

Konstantina Tzini & Kriti Jain

Do competitive reward systems promote efficiency or give rise to unethical practices, ironically incurring costs to organizations2? We hereby examine whether specific modes of competition exacerbate competitors' unethical behaviors1, comparing relative competition -grading over bell curve, rankings, stacking systems in firms- to competition over absolute performance.

We hypothesize that i) under relative competition, competitors will behave more unethically and ii) the magnitude of their unethical behavior will be greater than under absolute competition.

This, we suggest, is due to narrowed focus to the rival instead of the goal and due to malicious expectations forcing a destructive spiral, where every competitor is expected to behave in ethically questionable ways while trying to preempt the rest.

We manipulated competitive compensation in a quiz to reflect 3 conditions: control, absolute performance (max correct answers) and Gauss curve (being in 5% top performers). Giving 206 participants the opportunity to be compensated on their self-reported answers, we compared self-reported and actual scores as an indication of cheating. Gauss curve participants self-reported more correct answers [$F(4, 198)=26.63$, $p=0.00$, $\eta 2=0.35$] and overinflated their scores -Cheat Index- to a greater extent [$F(4, 198)=57.70$, $p=0.00$, $\eta 2=0.54$] than participants in the absolute performance condition did.

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May the best man lose: When moral emotions reduce competitive behavior

Uriel Haran

Moral emotions are regarded as powerful motivators of goal-directed behavior. This view is based on the assertion that goal achievement provides self-affirmation, which attenuates these self-conscious negative emotions. Research has found that moral emotions positively affect pro-social behavior, cooperation, and individual goal achievement. However, it is unclear whether the same effects will occur when the goal is competitive. Competitions contrast one's goals with those of others, such that achieving positive outcomes typically entail denying others of the same outcomes. The effect of winning a competition on one's moral self-perception, then, remains unclear. This work includes two studies, designed to clarify this relationship. In Study 1, participants completed a task with either an individual performance or a competitive goal. One group had undergone a guilt induction manipulation prior to the task whereas the other group did not. Results show that for individual goal achievement, guilt was associated with greater effort and performance. However, among competitors, guilt reduced task effort, leading to poorer performance. Study 2 allowed participants to use competitive goal-achievement for self-affirmation. Participants in both the high and low moral emotion conditions engaged in dyadic competition. One group of participants competed for a monetary prize the winner would keep, whereas for the other group, half of the prize was to be donated to charity. The opportunity to do good by winning the competition led to increased performance among emotion-induced participants, relative to when the winner kept the entire prize. These results shed light on the moral meaning of competition and the role of goal-achievement in shaping one's moral self-views.

The self-other discrepancy in moral judgment

Li-Lin Rao

Many moral and political controversies involve a tension between individual rights and the greater good. Do people make different moral judgments for others than they do for themselves? A default hypothesis in the extant literature is that people use their own preferences to make suggestions what for others should or should not do. To examine whether this hypothesis is valid, we conducted two experiments to explore the potential for a self-other discrepancy in moral judgment. Experiment 1 showed that the participants made significantly different judgments for others than they did for themselves. Specifically, people made more utilitarian judgments for others than they did for themselves in an impersonal condition, but made more deontological judgments for others in a personal condition. However, they were less willing to make friends with people who made utilitarian decisions in either personal or impersonal conditions (Experiment 2). Taken together, these differential findings suggest that the self-other discrepancy may affect moral processing more than previously thought.

SOCIAL ASPECTS OF JUDGMENT AND DECISION MAKING 3

When Do People Prefer Carrots to Sticks? A "Matching Effect" in Policy Evaluation

Ellen Evers

A good policy does not only need to change behavior in the desired way, it also needs to be accepted by the public to increase the chance of actual implementation. In this paper, we provide evidence for a "matching effect" in policy-acceptance. People favor policies targeting behavior that is seen as optional but desirable when this policy is framed as providing an advantage to those who act desirably, as compared to a policy which is framed as disadvantaging those not acting desirably, even when the outcomes of both policies are identical. We find the opposite pattern for behavior that is seen as compulsory. In this case, policies that provide a reward for adhering to compulsory rules are not perceived to be acceptable, but policies disadvantaging those who violate these rules are. These effects are not the result of participants failing to understand the equivalence between the two policies. Instead, participants seem to interpret disadvantaging as a form of punishment and advantaging as a form of reward and respond to that; it feels unfair to punish someone for not acting out an optional behavior. Alternative explanations are excluded. We conclude with a field-experiment, showing that the framing of a policy can greatly affect acceptance of a policy in a real situation with important outcomes at stake.

A Multi-national Investigation of Cross-societal Cooperation and Discrimination

Angela Dorrough & Andreas Glöckner

In a globalized world, establishing successful cooperation between persons from different nations becomes increasingly important. We present results from a first comprehensive investigation of cross-societal cooperation in one-shot prisoner's dilemmas involving population-representative samples from ten countries around the world and identify crucial facilitators and obstacles for cooperation. Besides, we observe systematic discrimination towards some nations. In interactions involving mutual knowledge about the other players' nationality only, we demonstrate that people hold strong and transnationally shared expectations (i.e. stereotypes) concerning the cooperation level of interaction partners from other countries. These expectations are the strongest determinants of own cooperation behavior but ironically turn out to be incorrect stereotypes that correlate even negatively with reality. On top of these erroneous expectations, people demonstrate systematic positive and negative discrimination against specific nations driven for example by differences in wealth as well as ingroup favoritism but not by spatial distance between nations. These results indicate that people hold highly differentiated social preferences that vary dependent on the nationality of the interaction partner.

The more we are, the less we care: A new paradigm for intergenerational dilemma decision making

Pascal Kieslich & Benjamin Hilbig

Many challenges in modern society, such as the overexploitation of common resources and climate change, have far reaching implications for future generations. While traditional research on social dilemmas has solely focused on a conflict of interest within the present generation, a growing body of research starts to investigate situations with a conflict of interest between the present and future generations. To study these intergenerational dilemmas, different paradigms have been developed. Whereas these paradigms vary on whether the decisions of single individuals or groups (jointly) affect future generations, the effect of this key difference between the paradigms has not been explored. Therefore, we introduce a comprehensive paradigm for studying intergenerational decisions with varying group sizes. In an incentivized experiment played across multiple actual "generations", individuals vs. groups of individuals sequentially extracted from a monetary resource. As hypothesized, we find less cooperative behavior in groups as compared to individuals, with participants in the group condition extracting more from the resource than participants in the individual condition. Moreover, participants in the group condition exhibited free riding intentions, expecting their peers to extract less from the resource than they were actually extracting themselves. We conclude that the size of a generation is an important determinant of cooperation in intergenerational dilemmas, and that this factor should be incorporated in future studies on cooperation across generations.

When do I do what others do? Social feedback, factual knowledge, and their impact on pro-environmental behavior

Astrid Kause, Wolfgang Gaissmaier & Mirta Galesic

Climate change is an acknowledged politically, economically and socially pressing issue – but people's behavior is clearly still not guided by such knowledge. Social feedback has been demonstrated as a means for motivating pro-environmental behavior, in particular descriptive social feedback that indicates what the majority of other people does. But how and when is social feedback effective? We firstly investigate how providing population frequencies of two daily behaviors, influences norms and behavioral change, compared to factual information about environmental consequences of these behaviors. Secondly, we account for inter-individual differences, namely pro-environmental attitudes in order to find out when and how these different kinds of information affect behavioral change. In three waves of a panel study we assessed (i) people's own behaviors and their estimates of frequencies of these behaviors in the population (ii) gave feedback about true frequencies of these behaviors in the sample as well as factual information and (iii) explored how social norms, intentions, and behaviors change. We find that overall, both social and factual information led to changes in behavior. The impact of social information differed depending on own previous behavior: In particular, participants who learned that they consumed more than the average other decreased their consumption. Factual information had a weaker impact but still led to a decrease. Attitudes partially mediated behavioral change with participants being more inclined to change when their pro-environmental attitudes were high. In light of our results and previous research, I will discuss how and when social feedback or factual information can be a motivator for behavioral change.

Spontaneous cooperation for prosocials, but not for proselfs: Social value orientation moderates spontaneous cooperation behavior

Dorothee Mischkowski

Rand, Greene and Nowak (2012) presented findings supporting their hypothesis concerning the intuitive nature of cooperation by showing that cooperative behavior is related to shorter decision times. Elaborating on their work, we tested the generality of their findings by investigating a potential interaction between response time and social value orientation. We conducted three experiments in which participants' played one-shot public goods game in groups of four (N total = 743). Data was gathered in one lab study and two online experiments, one involving two samples that were representative concerning age and gender for the US and German population.

Overall three studies we replicate the main effect of decision time on cooperation observed by Rand et al. in that cooperative behavior was conducted quicker than non-cooperative behavior. In all three studies we furthermore find a main effect of social value orientation on cooperation. Most importantly, we also find the predicted interaction between decision time and social value orientation. For proselfs, there is no influence of decision time on cooperation behavior. Independent of decision time, they stick to low contributions. In contrast, the contribution of prosocials decreases with increasing decision time. As expected their intuitive response seems to be to cooperate but this spontaneous response can be overruled by longer deliberation. Overall, these findings qualify the findings by Rand et al. by showing that cooperative behavior is not intuitive per se. It is the intuitive response for prosocial but not for proself persons.

The role of recipients' identifiability in allocation decisions among individuals and groups

Ilana Ritov

Allocation decisions necessarily involve tradeoff between the interests of different recipients. Decision makers who have to allot goods may face the need to impose burdens on some while benefitting others. In that context we examine whether people are particularly reluctant to choose an overall efficient option when harm to identifiable recipients is an unavoidable side effect. Using allocation tasks with real monetary outcomes we show that participants playing the allocator role are less likely to switch from a default allocation to a more efficient one if an identifiable recipient, as opposed to an unidentifiable one, will lose by the change.

Allocation decisions requiring similar tradeoff are at the core of diverse public policies. Unless resources are unlimited, giving more to some recipients entails giving less to others. Affirmative Action programs are instances of group-tradeoff policies, whereby improving the lot of the underprivileged comes at the expense of the more affluent. Such group-tradeoffs are often resented. However, resentment is mitigated when those who stand to lose cannot be pinpointed (Ritov & Zamir, 2014). Comparing hypothetical Affirmative Action programs that are equivalent in terms of overall harm but differ in the identifiability of those who would be adversely affected, we find lower support for programs harming identifiable individuals. We conclude that both in choice of individual allocations and in evaluation of public tradeoff policies, identifiability of those harmed plays an important role.

RISK 3

The Malleability of Revealed Risk Preferences

Joachim Vosgerau & Eyal Peer

We show that people can be risk averse and risk seeking for the same risky prospect, depending on the mode of risk preferences elicitation method. When participants were asked for their willingness-to-pay (WTP), they were generally risk-seeking (for positive expectancy gambles), but when participants were asked for their willingness-to-accept (WTA) a similar gamble, they were mostly risk-averse. Such opposing risk preferences were observed for both hypothetical and real money gambles, with low, medium or high stakes, and even in within-subjects designs. The accumulated evidence from six different experiments provide strong evidence that risk preferences are construed at the point of elicitation and are highly malleable and contingent on the method of elicitation.

Comparing Risk Aversion When Beliefs Differ

Aurélien Baillon, Ning Liu & Dennie van Dolder

Under risk (known probabilities), person A being more risk averse than person B can be defined as person A rejecting all bets that person B rejects. Under expected utility, this is equivalent with A having more concave utility than B. Yaari (1969) showed that under uncertainty (unknown probabilities), A rejecting all bets that person B rejects is equivalent to more concave utility and A and B sharing the same beliefs. We propose definitions of comparative risk aversion for people who hold different beliefs. Under subjective expected utility, our definitions by themselves no longer imply any constraints on beliefs. They are all necessary for A to have a more concave utility function than B, and they are sufficient under additional belief assumptions. The most general definitions we develop require so weak belief assumptions that they can also be used to compare risk aversion (possibly of a single person) towards different sources of uncertainty.

A scanpath analysis of the risky decision-making process

Zhu-Yuan Liang, Shu Li & Xinshan Li

In the field of eye tracking, scanpath analysis can reflect the sequential and temporal properties of the cognitive process. The advantages of scanpath analysis, however, have not yet been utilized in risky decision-making to date. We explored the methodological applicability of scanpath analysis to model the examination of risky decision-making by analyzing published data in the eye-tracking studies. These studies used a proportion task, an outcome-matched presentation condition, and a multiple-play condition as the baseline to compare with the information search and processing in the risky decision-making condition. In line with the findings of the three original studies, our results revealed that the cognitive patterns generated by scanpath differed between each pair of conditions, indicating that scanpath analysis is reliable and valid in examining the process of risky decision-making. The analysis of the similarity score and the inspection of the typical trial suggested that risky decision-making is unlikely to be based on a weighting and summing process, as hypothesized by the family of expectation models. Our research highlighted a new methodological direction for research on decision-making.

Regret theory and risk attitudes

Jeeva Somasundaram & Enrico Diecidue

The role of regret in decision-making has been extensively studied in psychology (Zeelenberg et al, 1996 and Connolly et al, 2002) and behavioral economics (Loomes & Sugden, 1982 and Bell, 1982). Regret theory is a nonexpected utility theory that accommodates some of the commonly observed violations of expected utility. In addition, regret theory captures the psychological processes of a decision maker (DM) through a convex, strictly increasing regret function Q and a strictly increasing utility function U.

Though regret theory has been used in a number of applications, the risk attitudes under regret theory have not been explored very much in the literature. In this paper, we introduce a technique to measure risk premium under regret theory. Under regret theory, the risk premium consists of two components: the regret premium- the amount a DM is willing to pay to avoid the feeling of regret - and the resolution premium – the amount a DM is willing to pay to avoid resolution of foregone option. The analytical expressions for regret and resolution premium are developed and a new theoretical prediction is made: regret averse DMs are risk seeking for small probabilities (p 0.5).

We empirically validate the theoretical prediction by an online experiment. The experiment identifies regret averse DMs and tests their risk attitudes using a choice task between gambles. The results show that regret aversion is a dominant phenomenon in decision under uncertainty. In addition we find conclusive evidence in favor of our theoretical prediction (at both aggregate and individual level) especially when regret was made more salient through feedback.

Informing affects framing effect

Kaja Damnjanović

In risky choice tasks (RCT) subjects are offered with two options - equal in respect to their (expected) values, but different in respect to level of risk and typical result is relatively robust: framing effect (FE) or preference reversal due to different descriptions of the same outcome. Options also differ in a number of complements: risky option has both complements (R1 and R2) and sure option has one complement (S1). Present study was aimed to examine effect of completeness of information in options of RCT on the size of FE in three domains: lives, money, health.

Six plausible RCT types that differed in respect to structure of options and number of complements were used to operationally define information completeness. Each of 36 tasks (6 types x 3 domains x 2 frames) was administrated to group of 50 participants ($N = 1800$) with the instruction to opt for sure or risky option.

Results show that decisions are moderated by domain: none of the 6 pairs of task types yielded FE in all three domains. Results of binary logistic regression show that domain and completeness are significant predictors of the FE ($\chi2(3)=8.995$, $p= .029$), with significant interaction ($B=0.206$, $\chi2(1)=5.852$, $p=.016$). In monetary domain, by adding a single complement in the options, chances for registering FE drops by 30%. In other two domains number of complements was not a significant predictor of FE. Complement S2 is predictor of FE in domains of lives and money, and in the latter one, predictor is also R2.

Ambiguity of information about possible outcomes determines susceptibility to FE. If presented information are complete and explicit, frame will not affect the decision and when they are incomplete, frame will have more space to influence the decision. Positive and negative descriptions of the (formally) single outcome represent two different outcomes for DM.

Difference in perception of active vs. passive risk taking: the role of accountability

Yoella Bereby-Meyer

The research on risk taking behavior generally focuses on action people take that put them at risk, such as drug and alcohol abuse, promiscuous sexual activity, or smoking. Little attention has been paid to risks that are brought on by inaction such as not having a medical screen test or not purchasing travel insurance. The current line of research introduces the concept of "passive risk" – risk brought on or magnified by inaction. We define "passive risk taking" as foregoing an opportunity to act in order to reduce outcome variance. We constructed the Passive Risk Taking scale (PRT) in order to measure personal tendency for passive risk taking. The PRT shows divergent validity from classic risk taking construct such as sensation seeking, and convergent validity with tendencies previously not linked to risk taking, such as procrastination and avoidance. Furthermore, in a series of 4 experiments, using 2 different sets of hypothetical scenarios, we demonstrate that passive risks are evaluated as less risky compared to identical, but actively taken risks. This effect was found in both a within and a between subject design. A reduced sense of accountability may be partly responsible for this effect, as results show that people are held less accountable for damages caused by passive risk taking, and that accountability mediates the "passive is less risky" effect.

THEORY 2

Simulating human decision making about frequency and duration with artificial neural networks

Johannes Titz & Peter Sedlmeier

Every psychologist knows, at least intuitively, that frequency and time are fundamental characteristics of our reality. Everything humans experience has a temporal dimension, and most of the things we experience occur more than once. People base a lot of actions and attitudes on their estimations of frequencies and durations. Although this is well known, we still know little about how these decisions unfold. Our aim is to close this gap by developing a cognitively-plausible computer simulation, based on artificial neural networks, that captures the essential characteristics of human frequency and time processing. In this way, we want to integrate research on frequency and research on time into one framework. We use an artificial neural network to model the process of perceiving simple objects in the environment and building memory representations of them, which can later be used for decision making. To validate our simulation, we use experimental data where duration (2s, 4s, and 8s) and frequency (2, 4, and 8 times) of different stimuli (pictures and words) were manipulated to study the effects on decisions about frequency and time. Our simulation can reproduce previous empirical findings on decisions about the frequency and duration of stimuli. The model has the advantage of being formal and simple, but still versatile enough to model both frequency and time processing. Furthermore, it fits well with existing theories of perception and memory, which are based on artificial neural networks. In this sense, the model can be integrated into a coherent theoretical framework of human behavior and experience: connectionism.

Modeling the effect of stereotypes on the decision to use deadly force

Timothy Pleskac & Joseph Cesario

The decision to use deadly force by police officers is a critical decision made under uncertainty. But, how do individuals make these decisions and what information do they use to cut this uncertainty? The first person shooter task has been used to investigate the possible biases people have in choosing to shoot an individual. During the task, participants are shown an image of an individual who is holding either a gun or some other small item. Participants are instructed to shoot the person (via a button press) if the individual is holding a gun; otherwise they indicate a decision to not shoot (via a different button press). Researchers have found that American participants tend to shoot black individuals (armed and unarmed) more frequently than white individuals. Participants are also faster to shoot armed black individuals, but slower to not shoot unarmed black individuals. Typically, stereotypes have been argued to act as a cue in a heuristic process during this task that systematically biases the decision to shoot or not. I will show that drift diffusion models provide a more cohesive and richer account of the decision to shoot or not shoot. In particular, when the models are fit using Bayesian estimation techniques they show not only how stereotypes impact the information that is used to make the decision, but how a motivation to control the appearance of prejudice also simultaneously impacts the same decision. More broadly, the talk should illustrate the broader role cognitive models can play in understanding complex behaviors in and out of the lab.

Modelling the effect of attribute conflict in pairwise comparisons through random multiattribute utility

Stéphane Deparis & Debarun Bhattacharjya

In random multiattribute utility models, a person's response to a preference elicitation question is deemed probabilistic. For instance, the randMAU model is an extension of multiattribute utility theory where the weights and marginal utility functions follow probability distributions. These models are well-suited to capture descriptive effects such as judgement error: answers to occurrences of the same question differ. In particular, consider the effect of attribute conflict in an evaluation task. Attribute conflict is a characteristic of a single option and is defined as the standard deviation of its marginal evaluations. It has been shown that judgment error increases with attribute conflict, and that the randMAU model successfully predicts this effect.

We aim at extending this research to pairwise comparison of options and to between-alternative attribute conflict. In the comparison between two non-dominated options, each option outperforms the other one on some attribute. In this context, attribute conflict refers to the magnitude of these respective advantages. We propose an extension of the randMAU model to account for two previously observed effects of attribute conflict during pairwise comparisons:

(i) when incomparability is allowed, higher attribute conflict increases the expression of incomparability.

(ii) when available answers are indifference and strict preference only, higher attribute conflict increases the expression of indifference.

We fit our model to experimental data associated with comparisons between apartments with varying attribute conflict. Finally, we present a hierarchical Bayesian random utility model and observe how well it learns preferences, taking uncertainty into account.

When Optimal Experimental Design Models are not Optimal: Sequential Search, Optimality, and Heuristics

Jonathan Nelson, Bjoern Meder & Matt Jones

Much recent work in psychology has considered which of several optimal experimental design (OED) models, like information gain or probability gain, are best suited to selection of information to acquire. Typically, these models are implemented in a stepwise manner; that is, they only consider the next time step when evaluating the usefulness of different queries. We discuss the applicability and performance of several OED models in sequential search tasks, in which the goal is to determine the category of an object by conducting a sequence of queries. We prove analytically that stepwise probability gain, a prominent normative and descriptive model of human information search behavior in a variety of tasks, assigns all potentially informative questions equal usefulness on the "20 questions" game. Stepwise information gain and stepwise impact are applicable but do not always identify the most efficient sequence of questions in tasks allowing multiple queries. We explore the mathematical relationships between stepwise OED strategies for question selection and behavioral heuristic strategies. Our analyses characterize the circumstances under which the split-half heuristic identifies the highest information gain question and the highest impact question, and we show that the split-half heuristic is a special case of the maximum-entropy question heuristic. We conclude by discussing prospects for bringing together a variety of statistical and heuristic models in order to develop a descriptive and empirically grounded theory of human information acquisition.

A Triple-Stopping Threshold System For Decision Making: A Cast-Net Stopping Rule Model

Mario Fific & Marcus Buckmann

In this study compared single stopping rules models to the Cast-Net stopping rule model. The Cast-Net model assumes that several stopping rules can be used simultaneously to determine the stopping point to stop information search and to proceed to making a final decision. We analyzed whether the Cast-net model would pay the price for being more complex when compare to single stopping rule models (critical difference, fixed-sample size and runs). The models were compared under different decision making conditions (time pressure and validity of recommendations). The model fitting was conducted on the full data stopping-value distributions, by simultaneously fitting the correct and incorrect responses. Across variety of experimental conditions, the general results supported the validity of the Cast-Net model. These results challenge many decision making models that utilize only one type of a stopping rule, and may provide a new direction in the exploration of cognitive computational models.

HEURISTICS AND BIASES 2

An Importance Heuristic in Decision Deferral

Job Krijnen, Marcel Zeelenberg & Seger Breugelmans

We examined and found in a series of experiments that people defer important decisions more than unimportant decisions, also in situations where deferral is sub-optimal, has potential disadvantages, and even in situations where deferral has no material benefits and is financially costly. In a second series of experiments, we examined and found that the deferral of important decisions occurs regardless of whether the choice set consists of a single alternative, or of two conflicting alternatives. Decision importance does not affect the likelihood of deferral when one alternative is clearly dominant. We propose that people use an importance heuristic when deciding to defer or not: the time and effort that should be invested in making a decision is inferred from the importance of the decision, hence important decisions take longer.

Calling an action stupid: a reflection of people's rationalistic expectations

Balazs Aczel, Bence Palfi & Zoltan Kekecs

We claim that calling an action stupid is a robust behavioral reflection of the rationalistic expectations to which people adjust their own behavior and expect others to do so. The aim of the present research was to understand what people mean when they call an action stupid, what behavioral expectations need to be violated to elicit the use of this attribute. For that aim, a questionnaire was constituted where we asked the participants to rate and categorize stories in which an action or a decision was called 'stupid'. The 154 stories were collected from popular online sources and from daily personal reports. After reading the stories, the participants (N = 154) had to indicate which psychological factors might have played role in causing or leading to the particular action they read in the story. A Latent Profile Analysis was conducted to find the latent cluster structure in which the stories are organized. A three cluster model was retained: 1. Obsessive, compulsive or addictive behavior; 2. Risk-taking and lack of abilities; 3. Absentmindedness or Inexperience. Our results indicate that people use the label 'stupid' for three different categories of actions. These categories could be regarded as Inhibition, Lack of knowledge and Monitoring problems, showing similarities with previous speculations in the literature (e.g., Stanovich & West, 2008). As a conclusion, our results seem to reflect that people differentiate the actions bases on the cause of the violation of an expectation. The results should help us understand people's naïve rationality, what behavioral expectations they have when evaluating the action of others and themselves.

The Role of Psychological Ownership in Sunk Cost Effects

Stephan Dickert, Bernadette Kamleitner, Erdem Geveze & Sophie Süssenbach

Our research examines the role of psychological ownership as an underlying mechanism in sunk cost effects. We conducted two studies in which we varied the amount of money invested in a business project and found, next to robust sunk cost effects, support for the notion that psychological ownership is an antecedent to feelings associated with loss aversion and sunk costs. Thus, we expand the loss aversion account by including the psychological step of ownership (and the feelings that it entails) to explain how shifts in reference points lead to sunk cost effects. Our results also provide novel insights into the properties of psychological ownership, suggesting that it may be more sensitive to absolute (i.e., categorical) rather than relative changes.

A Magnitude Effect in Judgments of Subjective Closeness

Alf Børre Kanten & Karl Halvor Teigen

Events can be far away from or near an observer in several respects: they can be distant or close in a spatial, temporal, social, or probabilistic sense. They can also vary in magnitude, physically or in terms of impact and importance. We examine the existence of a general effect of perceived magnitude on judgments of subjective closeness, of any type. Studies 1 and 2 show that judgments of spatial and temporal proximity are affected by the severity of an event, so that a highly severe event will be described as closer than a less severe one. In Studies 3 and 4, severity is shown to influence probability estimates and judgments of social closeness, in a similar fashion. Studies 5 and 6 extend the Magnitude Effect to positive events. This effect may derive from a basic association between perceived size and distance, suggesting that large events must be close.

The Power of the Representativeness Heuristic

Sudeep Bhatia

We present a computational model of the representativeness heuristic. Our model is trained on the entire English language Wikipedia corpus, and is able to use representativeness to answer unstructured judgment problems spanning an almost universal domain of knowledge. We first show that our model mimics human behavior by generating the probabilistic fallacies associated with the representativeness heuristic. We then test our model's ability to accurately answer more general judgment problems, by applying it to multiple-choice questions generated by experimental participants, and multiple-choice questions obtained from online quizzes, standardized school examinations, and the popular game show Who Wants to be a Millionaire?. We find that our model achieves an accuracy rate of 40% to 50%, across these diverse domains, significantly outperforming the chance rate of 25%. Finally, we obtain responses from human participants for these judgment problems, and find that these responses are successfully predicted by our model. Overall we show that the representativeness heuristic is not only a good theory of human error, but also of human accuracy and intelligence. In doing so, we provide a new way of formally studying this heuristic, and ultimately a new way of building powerful, flexible, domain-general models of everyday judgment.

Motivated reasoning in the prediction of sports outcomes and the belief in the "hot hand"

Joao Braga

Past research has shown that whether a streak of binary outcomes is predicted to continue – hot hand (e.g., Gilovich, Vallone & Tversky, 1985) – or to reverse – gambler's fallacy – depends on several variables such as the perceived intention of the generating mechanism (Caruso, Waytz & Epley, 2010). The present paper explores how motivation to observe a certain outcome after a streak affects participants' predictions, beliefs and causal attributions. In the context of basketball game throws, we found that positive streaks (sequence of points scored by the participants' favorite team) lead participants to predict the streak's continuation. However, negative streaks (sequence of points scored against the participants' favorite team) lead to predictions of its end. Results also suggest that positive (vs. negative) streaks lead to stronger beliefs in the hot-hand, but that beliefs in the gambler's fallacy are unaffected by streak's valence. Moreover, predictions, regardless of streak's valence, tend to be attributed to participants' favorite team ability. The effect of motivation on predictions of the next outcome seems to be mediated by a serial path via the belief in the hot hand and the causal attributions to the teams at play.

EXPERIENCE

Incorporating descriptions into decisions from experience

Leonardo Weiss-Cohen, Emmanouil Konstantinidis, Maarten Speekenbrink & Nigel Harvey

Decisions in everyday life are commonly made using a combination of descriptive and experiential information. However, decision-making research has mostly focused on description-only or experience-only tasks. We aim to explore the combined effects of description and experience being presented concurrently. Initial experiments show that participants exposed to description and experience simultaneously are influenced by both, particularly in situations in which descriptions are in conflict with experience. These are representative of real life situations (e.g. as warning labels). We examined cognitive models of how individuals integrate their experience with descriptions, with different weights given to each source of information. Contrary to previous research, models that included the descriptive information fitted the human data more accurately than models that did not. Descriptions however were highly discounted, and experience was the dominant source of information. The influence of descriptions, albeit low, remained even after many trials. Follow-up experiments sought to identify what influenced the level of discount applied to descriptions. We analysed the effects of when descriptions are first presented and how frequently they are displayed. Results show that warnings that are provided very early and are displayed only periodically have greater impact on behaviour. Little experience is required to undermine the influence of descriptions, and ever present conflicting information might increase the saliency of the conflict. This stream of research has important implications in understanding decision-making biases in real world settings and in creating warning labels and alarms that are effective in having desired influences on behaviour.

Cross Cultural Differences in Decisions from Experience: Evidence from Denmark, Israel, and Taiwan

Sibilla Di Guida, Ido Erev & Davide Marchiori

Three studies are presented that compare decisions from experience in Denmark, Israel, and Taiwan. They focus on two change-related cultural differences suggested by previous research on dialectical vs. analytic approach to thinking. The first leads to the hypothesis that East Asians are more likely to change their behavior over time, whereas the second that they expect more changes in the environment. We show that the "less consistency in the East" hypothesis has high predictive value: It is consistent with the comparatively lower inertia rate observed in Taiwan in all three studies, and with the non-trivial effect of limited feedback on risk taking behavior described in Study 3. Analysis of the "expecting more changes in the East" hypothesis reveals mixed results. This hypothesis was supported in Study 2, which examined relatively complex multi-alternative multi-outcome tasks, but not in Studies 1 and 2, which examined simple binary choice tasks. A possible explanation for the psychological processes underlying the "less consistency in the East" hypothesis is discussed.

Modeling Probability Weighting in Decisions from Experience

Thorsten Pachur & Ralph Hertwig

Patterns in probability weighting have been central for comparisons between experience-based and description-based decision making under risk. Given that in experience-based decision making probabilities are not directly presented, however, a crucial question is which probabilities should be used to estimate the shape of the probability weighting function. Recently, Jarvstad, Hahn, Rushton, and Warren (2013) proposed to use subjective probabilities, measured independently from the decisions, as subjective probabilities might deviate from the objectively experienced ones. In fact, it was shown that using subjective probabilities can lead to opposite conclusions regarding the pattern of probability weighting than using experienced probabilities. We highlight, however, that conclusions about the probability weighting pattern in experience-based decisions can critically depend on the type of analysis and elicitation of subjective probabilities. Using computer simulations, we show that the direction of analysis (i.e., analyzing subjective probabilities as a function of a measure of objective probability or the other way round) as well as the elicitation direction (i.e., eliciting the probability distribution on a variable for fixed probability levels vs. eliciting probabilities for fixed values of the variable) can lead to the appearance of simultaneous over- and underweighting of rare events. We also illustrate the critical impact of the direction of analysis on the obtained shape of the probability weighting function in a reanalysis of previous studies. Moreover, a model comparison analysis shows that using experienced probabilities to model probability weighting captures empirical decisions from experience consistently better than using subjective probabilities.

The Reversed Description-Experience Gap: Disentangling Sources of Presentation Format Effects in Risky Choice

Andreas Glöckner, Benjamin Hilbig, Felix Henninger & Susann Fiedler

Previous literature has suggested that risky choice patterns in general – and probability weighting in particular – are strikingly different in experience-based as compared to description-based formats. In two reanalyzes and three new experiments, we investigate differences between experience-based and description-based decisions using a parametric approach based on Cumulative Prospect Theory (CPT). Once controlling for sampling biases, we consistently find a reversal of the classic Description-Experience gap, that is, a reduced sensitivity to probabilities and increased overweighting of small probabilities in decisions from experience as compared to decisions from descriptions. This finding supports the hypothesis that regression to the mean effects in probability estimation are a crucial source of differences between both presentation formats. Further comparison with previously published data identified information asymmetry prevalent in gambles involving certainty as a third source of differences. We discuss methodological implications of this finding and suggest a multiple-source conceptualization of the Description-Experience gap based on independent contributions of sampling biases and information asymmetry on the one hand, and regression to the mean effects in probability estimation on the other hand.

Modeling Peoples' Risk-Return Belief Helps to Understand Preference from Experience

Janine Hoffart, Jörg Rieskamp & Gilles Dutilh

Many situations in real life involve making valuations from experience. Valuations have been studied in the lab by measuring peoples selling prizes for gambles. Selling prizes can be understood as a measure of strength of preference. Relative preference can also be derived from choices. Recent choice literature suggests a systematic difference between description and experience. To give inside in why this gap might occur, we study how people form preferences from experience by measuring their valuations of gambles.

Risk and the return of prospects are generally correlated (Pleskac & Hertwig, 2014). When people make valuations from experience, information is scarce in the beginning and only accumulates over time.

Arguably, in meager environments, people rely on knowledge about statistical probabilities, learned in the past. Such knowledge represents the negative correlation between probability and return.

We propose the risk-reward value updating model that assumes people have a prior belief about how likely a gain is. This belief depends on the gain amount they could possibly win. While sampling, people update their belief about the gamble's outcome distribution. This updated belief comprises of a relative weighting of the prior and the new piece of information.

We show that the risk-reward value updating model better captures how people make valuations from experience than a number of models that have been established in the D-E gap literature.

Our study gives further inside in the ongoing debate on how people form preferences from experience. The finding that people apply their belief about the risk-return relationship when forming valuations from experience can help to understand observed differences between description and experience based paradigms.

The description-experience gap in the sampling paradigm: a meta-analytic review

Dirk Wulff

About a decade after the discovery of the description-experience gap, we have collated the data from 21 independent published articles—all employing the sampling paradigm. The data are currently being analyzed with the aim of uncovering the underpinnings of the gap and illuminating the processes involved in experienced based choice. Preliminary analyses support the frequent criticism of sampling error being the most important contributor to the gap. But the data also indicate a stable recency effect. Thus, although the description-experience-gap is largely a result of statistical differences in the experienced and objective environments, different psychological processes need be assumed for decisions from experience and decisions from description.

INDIVIDUAL DIFFERENCES 2

Signal detection in the wild: How to quantify the error tradeoffs of decision makers who are unable or reluctant to reveal them

Stefan Herzog

Individual and institutional decision makers make influential yes/no decisions about important, uncertain, and typically infrequent events and are—knowingly or unknowingly—faced with an inevitable tradeoff between setting a lenient decision threshold to avoid misses or setting a conservative one to avoid false alarms. Often it is unclear whether the tradeoff adopted is aligned with the values of the many stakeholders affected. For example, in medical screening, how many more false-positive diagnoses are acceptable to ensure one fewer miss? Furthermore, decision makers may be unable or reluctant to reveal—or simply unaware of—the tradeoff they have de facto adopted. Signal detection theory (SDT) prescribes that, when choosing a threshold, one should consider both one's preferences for the two types of errors (i.e., lenient to avoid misses vs. conservative to avoid false alarms) and the base rate (i.e., lenient for likely events vs. conservative for unlikely events). An underappreciated aspect of SDT is that its prescriptive calculus can be reversed to quantify the apparent error tradeoff between misses and false alarms that is implied by observed decisions (by partialing out the base rate's contribution to the threshold). I show how to quantify this error tradeoff using standard SDT measures and the base rate and illustrate the methodology using archival data (from meteorology, emergency medicine, and other fields). I also present a Bayesian model, which describes the uncertainty about the quantified tradeoff. The proposed approach connects prescriptive and descriptive uses of SDT in decision analysis and psychology, respectively, and represents a powerful, but under-appreciated tool for conducting policy analyses.

Relating decision-making styles to social orientation and time approach

Martin Geisler

Research on decision-making styles has demonstrated effects of stylistic differences, but less research has explored how styles relate to personal characteristics. This has led to a call for a more systematic approach to, and theoretically sound understanding of, decision-making styles. Heading this call, we investigated the correlational and predictive relationships between individual differences in social orientation and time approach and decision-making styles. These relations were explored in two samples (Study 1 - students, n = 118, and Study 2 - police investigators, n = 90). Additionally, we explored if and how perceptions of decision-making demands were related to stylistic differences among professionals (Study 2). Overall, the results demonstrated that decision-making styles are related to, and to some extent can be predicted by, individual differences in social orientation and time approach. Moreover, reports of perceived decision-making demands were found to be related to decision-making styles, but in a more complex way than expected. In general, our results support the recently suggested two factor model of decision-making styles by showing that social orientation and time approach are more clearly related to the regulating processes than the core processes by which people make decisions (Dewberry, Juanchich & Narendran, 2013).

The Seller's Sense: Buying-Selling Perspective Affects the Sensitivity to Expected-Value Differences

Taher Abofol, Eldad Yechiam & Thorsten Pachur

Previous work comparing pricing decisions by buyers and sellers has primarily focused on discrepancies in valuation between the two perspectives (i.e., the endowment effect). In four studies, we examine whether this phenomenon is also accompanied by differences in the sensitivity of pricing decisions to expected value. If, as has been proposed, sellers stand to accrue a more substantial loss than buyers, then their pricing decisions should be more sensitive to expected-value differences between objects. In Study 1 and 2 we reanalyzed two published datasets in which participants priced monetary lotteries as sellers or buyers. It emerged that sellers indicated prices that were better aligned with the ranking of the lotteries' expected value in 6 out of 7 studied conditions. The discrepancy in sensitivity disappeared in a condition with an extended deliberation time of 15 seconds. In Study 3 the difference between buyers and sellers' expected-value sensitivity was replicated in repeated task presentations. In Study 4 this difference was eliminated when buying and selling trials were randomly mixed. The results are consistent with an attentional resource-based account of the differences between the two perspectives.

Utilize experimental games as objective personality measures - stability, reliability, validity

Thomas Schlösser, Baumert Anna, Maltese Simona & Schmitt Manfred

In economic and psychological research, experimental games are commonly used as standardized situations to investigate incentivized decisions. However, a systematic investigation of the psychometric properties of behavior in the described games as indicators for fairness and altruism is still lacking. Whereas economic researchers have presupposed the validity of behavior because of its financial relevance, psychologists have predominantly relied on self-report and possibly underestimated the potential of the games to measure fairness and altruism. To fill this gap we provide a systematic test of the psychometric properties of the dictator, ultimatum and 3-person-games as assessment methods for fairness and altruism.

Study 1 examined stability, reliability and validity of behavior in experimental games as indicators of dispositional preferences for fairness and altruism. 615 participants indicated incentiviced decisions in a dictator and ultimatum game in 3 independent rounds, additionally in a 3-person-game in one round. In the latter situation participants decided as an observer of a dictator game about the amount of own endowment used to sanction Person A and/or to compensate Person B, dependent on the amount sent by A. 6 weeks later the experiment was replicated and measures of stable preferences (traits) were recorded. Latent-state-trait-models showed a high reliability and stability of the behavioral measures. In a second study the behavior of 320 participants as a dictator and stable traits measures were measured repeatedly three times (with 4 and 8 weeks in between). This design informs about the relationship between changes in behavior with those of the traits measures over time.

Genetic correlations between risk-taking propensity and resting-state functional connectivity

Dang Zheng, Yu Luo, Shu Li & Yuan Zhou

Propensity of risk taking has been linked with behaviors with adverse consequences such as substance abuse, accidents, and gambling. Clarifying genetic influence on the neural basis underlying this risk-taking propensity can be helpful to prevent or ameliorate potential adverse consequences associated with risk taking. Using a Balloon Analogue Risk Task (BART), a computerized, laboratory-based tool measuring actual risk taking behavior, heritability of risk-taking propensity has been found. Functional magnetic resonance imaging (fMRI) paired with the BART has identified multiple regions, including insula and prefrontal cortex, are correlated with the risk-taking propensity measured by the BART. However, it is still unknown whether genetic factors influence the neural basis of this risk-taking propensity and their genetic correlates. In this paper, we present evidence that the neural correlates of the risk-taking propensity measured by the BART can be identified using resting-state functional connectivity (RSFC), which assess temporal correlations of spontaneous regional activity when participants are at rest. And the RSFCs of the right anterior insula (aINS) related to the risk-taking propensity were significantly heritable. In addition, genes influencing the BART also influenced the functional connectivities between the right aINS and the right lateral prefrontal cortices. This study provides evidence for the RSFC to be considered as an endophenotype for genetic studies of risky behaviors with adverse consequences, and these findings should facilitate discovery of gene variants influencing the risk-taking propensity, potentially opening up new avenues in the prevention or amelioration of potential adverse consequences associated with risk taking.

Genetic and environmental influences on gambling: A meta-analysis of twin studies

Rui Zheng, Yan-Hua Xuan, Xiao-Tian Wang & Shu Li

Developing a better understanding of the genetic and environmental infulences on gambling is important for the development of prevention and treatment interventions for problem gambling, but previous studies have reached different conclusions in how genetic and environmental factors shape the gambling behavior. The current meta-analysis of 15 twin studies on gambling sought to estimate the magnitude of genetic and environmental influences on gambling. First, we compare the relative influences of additive genetic (a^2), shared environmental (c^2) and non-shared environmental (e^2) influences on gambling; Second, we tested the possible moderators, including research characteristic and participants' characteristics to clarify the influence of genetic and environmental effects on gambling.The results found that: 1) Gambling was moderately heritable and the individual differences were due to genetic (a^2=0.51) and unique environmental (e^2= 0.49) influences, with little role for the shared environment (c^2). 2) Gambling disposition and age were significant moderators for the magnitude of genetic and environmental influences on gambling. The magnitude of genetic influence was higher for addictive gambling (a^2=0.58) than for non-addictive gambling (a^2=0.31). Besides, the magnitude of genetic influences was higher in adults (a^2=0.53) than adolescents (a^2=0.35). But there were no differences in the relative contribution of genetic and environmental effects for genders on gambling. These results represented a structured synthesis of the existing behavior genetic studies on gambling and explained the identified differences in level of heritability, which provided a better understanding of the genetic and environmental infulences on gambling.

Symposium 8

From Anomalies to Forecasts: The toll-free critique and the Choice Prediction Competitions solution

Convenor: Eyal Ert

Discussant: Klaus Fiedler

Behavioral decision research is often criticized on the grounds that it highlights interesting choice anomalies, but rarely supports clear forecasts. An extreme version of this critique says that behavioral modelers should add a toll-free phone number to their models and be ready to answer questions concerning the exact predictions in different settings. Our symposium evaluates recent attempts to address this critique with choice prediction competitions (CPC). The CPC method encourages researchers to fit their models on published data of an "estimation" study, and submit the fitted models to compete on predicting behavioral data of a second "competition" study. The talks of this symposium present the problem, previous attempts to address it, and the results of a new CPC on decisions under risk and ambiguity (http://departments.agri.huji.ac.il/cpc2015). This latest CPC made an effort to clarify the relations between 14 classical anomalies (including St. Petersburg, Allais, and Ellsberg patterns) and their explanations. The winning model, which captures these 14 anomalies, is presented. In addition, the talks discuss pros and cons of the competition method.

The toll-free critique of behavioral decision research

Ido Erev

The toll-free critique is one of the most important challenges to the hope of using laboratory research to predict economic behavior in natural settings. It captures the fact that different experiments reveal different behavioral regularities and it is typically difficult to know which of the different regularities is more important in a particular application. Mainstream research in behavioral economics tries to address this critique with a focus on choice anomalies that imply counter-examples to rational decision theory, and refinements of the rational model (i.e. additional parameters) capturing the results. The hope is that the usage of rational model is a benchmark will produce a general descriptive model. Bernoulli's (1738) expected utility theory started this influential line of research. It generalizes the most basic rational model, the expected value rule, by adding one psychological parameter: risk aversion or diminishing returns. The current paper questions the value of this solution. It shows that the leading models cannot be easily applied without a support call center. Moreover, in certain settings, reasonable attempts to apply these models lead to incorrect predictions. The observed behavior deviates from maximization in the opposite direction of the predictions of the most popular explanations of the classical counter-examples. The paper concludes with a discussion of one possible solution to this problem: A focus on choice prediction competitions.

Observations from previous choice prediction competitions

Eyal Ert

The current paper explores the value of addressing the toll-free critique with "choice prediction competitions (CPC)". The models' evaluation, under this approach, starts with an explicit description of a space of situations where the models are expected to be useful. The organizers run two studies with a large set of randomly selected problems from this space. They publish the results of the first study with the best

"baseline" models they can find, and challenge other researchers to predict the results of the second (unpublished) study (trying to improve/outperform the best baseline model). The current paper summarizes three main observations from the previous competitions: experience vs. description based-choice competition (Erev, et al., 2010), repeated market entry games (Erev, Ert & Roth, 2010), and extensive form games (Ert, Erev, & Roth, 2011). First, in decisions from experience, models that assumed reliance on small samples had better predictive power than models that assumed step by step updating of propensities. Second, in decisions from description, utility-based models had lower predictive power than strategy/heuristics based models. Third, the most successful models relied on surprisingly simple estimation methods (mostly grid-search).

Choice prediction competition for decisions under risk and ambiguity (CPC2015)

Ido Erev, Eyal Ert & Ori Plonsky

A new choice prediction competition (CPC2015, http://departments.agri.huji.ac.il/cpc2015) addresses choice behavior in a space that generalizes spaces of experiments that document 14 classical choice anomalies (including Allais, Ellsberg, and St. Petersburg paradoxes). This space was used to develop a single paradigm to evaluate the robustness and potential relations between these choice anomalies. In this paradigm, participants faced 30 independent choice problems for 25 trials each. They received description of the payoff distributions, and realized their choices (i.e., received feedback) starting at the sixth trial. The results confirmed the robustness of the choice anomalies. The organizers then ran two additional studies on randomly selected problems from this wide space. The participants in the competition (other researchers) could estimate their models on the first (estimation) study, and these models were evaluated based on their predictions of the second (competition) study.

My toll-free Number: the model that won CPC2015

Doron Cohen

The fourth talk is given by the winner of the competition (CPC2015). The winner (which cannot be one of the organizers) is invited to present the main results and best model of the competition.

What can we learn from Choice Prediction Competitions?

Leonidas Spiliopoulos & Andreas Ortmann

We examine the state-of-the-art in Choice Prediction Competitions as a methodological tool. In choice prediction competitions (CPCs), the organizer(s) solicit mathematical models or coded programs from third parties to participate in a tournament with explicit rules and goals. Models are ranked according to a predefined performance criterion evaluated on their predictive performance on out-of-sample (or cross-validated) data. We have previously discussed extensively the advantages and disadvantages of CPCs compared to other model comparison techniques (Spiliopoulos & Ortmann 2014). Our conclusion was that tournaments are a useful addition to our arsenal of methods for the comparison of behavioral models. Like any methodology, CPCs are not without limitations and we identified current limitations, proposed solutions to overcome some of them, and identified a research agenda to address the remaining.In this talk, we summarize our most important prior arguments, discuss the success of the most recent CPC in addressing prior concerns (Erev et al. 2015), and highlight the areas where progress can still be made.

SOCIAL ASPECTS OF JUDGMENT AND DECISION MAKING 4

The Legitimacy of Power influences Sharing in the Dictator Game

Bettina von Helversen & Markus Schöbel

Power comes with responsibility. In a position of power people are not only able to influence their own welfare, but also the welfare of others. Research on the dictator game suggests that prosocial behavior (e.g. sharing) depends on whether the person in the position of power feels she deserves her role. For instance, in the dictator game proposers that reached the position because they outperformed another person share less than proposers that were randomly assigned to the position. This suggests that whether one reached a position of power legitimately or not may influence how people make prosocial decisions such as sharing with others. We tested this in an experimental study in which we manipulated whether a person was assigned to a position of power for a legitimate or illegitimate reason. Then we measured different aspects of social decision making using social games. Our results show that participants in an illegitimate high power position shared more than participants in a legitimate high power position. These results suggest that the legitimacy of a power position is an important moderator of how power influences prosocial decision-making.

When less is better than more: Preferring equity over efficiency in allocation decisions

Tom Gordon-Hecker, Shaul Shalvi & Yoella Bereby-Meyer

In many situations in life, equity conflicts with efficiency. When resources cannot be distributed equally, one might choose to destroy some resources and reduce overall welfare, in order to maintain equity. We examined whether people are averse to inequity, or alternatively averse to being responsible for deciding how this inequity will take form – that is: inequity responsibility aversion.

Participants had to choose whether to allocate a reward to one of two equally deserving recipients, or to discard it. Participants in the "human allocation condition" had to specifically determine who should get the reward, while participants in the "random allocation condition" could choose a random device to randomly allocate it. Results revealed that participants were indeed inequity responsibility averse- they discarded the reward to avoid inequity more when they had to specifically determine who should get what. Inequity responsibility aversion seem to depend more on the intuitive system (system 1). Surprisingly, selfish people seem to care more about maintaining society's resources than pro-social people.

Lastly, people are inequity responsibility averse only when allocating rewards. When participants had to allocate punishments, they cared for equity to a greater extent, and even having a random allocation option did not alleviate this tendency.

Taken together, our findings suggest that it is personal responsibility to determine the form of inequity that drives the internal conflict between equity and efficiency rather than inequity per se. The conflict seems to be amplified for (1) people who trust their intuitions, (2) those who care mostly about others, and (3) when punishment rather than reward is at stake.

When Almost Fair Isn't Good Enough: Fairness Thresholds in the Ultimatum Game

Christina Boyce-Jacino, Mary Rigdon & Gretchen Chapman

Using a restricted choice Ultimatum Game we investigate how the menu of available options affects propensity for fairness. Specifically, we consider how behavior changes when exactly equal splits are replaced in the menu of choice options with degrees of nearly equal splits and when exactly equal splits are supplemented with nearly equal splits. In each game, proposers are faced with a predetermined menu that contains unfair allocations and either an even split, a nearly even split, or both. In two experiments, one hypothetical and one with real outcomes, we show that the frequency of fair allocations increases when the available menu contains both near and exactly even splits. Furthermore, we find that offers that are just short of equal are seen as less reasonable than an offer that is slightly further from equal. Our findings suggest a significant role for inferred intentionality in fairness perceptions.

The role of personal values and empathy in cooperative game with strangers

Jieyu LV, Michael Proulx & Magda Osman

Are the personal values of others a relevant cue when thinking about cooperating, and do values matter more than empathising with others? To address these questions, the present study presented participants (N = 92) with the details of personal values (non-materialistic values [e.g., healthy, family, friends] and materialistic values [e.g., phone, bike, pet] held by fictitious players of a linear public goods game. In addition, half those tested were induced to empathise with the other players, and the other half were not. For those that believed they were interacting with real players in a cooperative game (n=48), values did indeed matter. Participants cooperated more when the players held non-materialistic values as compared to materialistic values. While empathy made little difference for cooperation, it did reduce the use of the tit-for-tat strategy in the game. These findings present some challenges to recent work promoting the role of empathy in pro-social behaviors.

Spatial preferences in competitive and co-operative hide-and-seek games

Stian Reimers & Peter Ayton

We examine preferences in a set of competitive and cooperative games using 5x5 spatial arrays. In a within-subjects design (n = 663, run on Amazon Mechanical Turk), consisting of 8 games, participants placed an 'X' in one of the 25 cells in the array, or chose to reveal the contents of one of the cells after the placer had taken their turn. The consequences of placer and chooser selecting the same cell were manipulated systematically. They could be win-win (a co-ordination game), lose-lose (a discoordination game), placer loses and chooser wins (a traditional hide-and-seek game), or placer wins and chooser loses (placing a bomb or setting a trap). Small incentives for good performance were given.

In all cases choices showed systematic location preferences, which varied by game. In the win-win coordination game, over half of placers and choosers selected the centre square. In the lose-lose discoordination game, participants were relatively uniform in their choices. In both competitive versions of the game, choices made by placers and choosers were significantly correlated, indicating suboptimal deviation from randomness.

Additionally, there was weak evidence that experience appeared to affect choice. For example, in the setting-a-trap game, participants who first set a trap then later chose a location tended to avoid the location where they had previously set their trap, whereas participants who first chose a location to attempt to avoid the trap were later more likely to choose the location they had selected as the place they set their trap. Thus participants appear to some degree to use their own behaviour as a guide to what others might do.

Preference and Belief Imprecision in Games

David Butler, Andrea Isoni, Graham Loomes & Daniel Navarro-Martinez

Extensive experimental research in decision-making under risk has questioned the descriptive validity of Expected Utility Theory (EUT). Over the years, this line of research had highlighted a fundamental aspect of decision-making behaviour: its probabilistic nature.

In spite of EUT being at the core of game theory, the implications of these findings for strategic games are largely unexplored. There have been no attempts at directly obtain empirical measures of the noisiness in player's preferences and beliefs in games. This is the task we tackle in our paper.

We study a series of twelve simple 2x2 games in which we elicit self-reported measures of preference and belief imprecision. We test whether our measures respond to the features of different games in predictable and sensible ways. We then investigate how far our measures of imprecision correlate with best response behaviour.

With respect to belief imprecision, we find that: a) there is substantial imprecision in players' beliefs about the strategy choice of their opponent; b) stated beliefs and belief imprecision respond predictably to changes in payoffs; and c) belief imprecision depends on the game type.

In relation to preference imprecision, our results show that: d) strategy choices respond predictably to changes in payoffs; e) players express their preference imprecision by making substantial use of our confidence instrument; and f) stated confidence depends on the game type.

Our study of best response behaviour reveals that: g) players are more likely to best respond to their beliefs when they make their strategy choices soon after having reported their beliefs; h) best response rates are negatively correlated with belief imprecision; and i) best response rates are positively correlated with confidence.

DATA & INFORMATION

Judgment accuracy: Do more data help?

Nigel Harvey & Zoe Theocharis

If people are intuitive statisticians or naïve intuitive statisticians, their statistical judgments should be better when based on more data. Previous studies testing this prediction have produced conflicting results. Here we examine it in the context of forecasting judgments. Two experiments revealed a U-shaped relation between forecast accuracy and sample size. Accuracy was lowest for series of intermediate length (e.g., five items) but increased as series were made both longer (up to 40 items) and shorter (down to one item). We argue that, with very short series, people use a pattern-independent heuristic, such as the mean or the naïve forecast (i.e. the last data point). With longer series they use pattern-based heuristics but extraction of pattern parameters is poorer when there are fewer items in the series. Consequently, pattern-based forecasting from intermediate length series is worse than pattern-independent forecasting from short series. More data do not always improve judgment accuracy.

Knowing the other's mind: Using process data to test process predictions of 'mind-reading' models

Thomas Scherndl, Michael Schulte-Mecklenbeck & Anton Kühberger

How do we predict others' choices? Three possible models have been put forward to explain this human capacity: (1) social projection, i.e., predictions are based on one's own preferences and only projected onto the other; (2) stereotyping, i.e., predictions are based on stereotypical theories about preferences, or (3) anchoring-and-adjustment, i.e., predictions are anchored in one's own preferences and adjusted for differences between self and others. Empirically differentiating these prediction strategies based on outcomes alone is difficult. Hence we suggest using process data for testing process predictions derived from these models. We propose a social projection index (SPI), which takes into account the number and the duration of information acquisitions for predictions and decisions for oneself. In two studies we found that (i) based on choice alone social projection seems to be a prevalent strategy, but (ii) prediction processes are not compatible with the assumptions of social projection. We discuss the limitations of data from the choice level alone and argue that process data should be used to gain deeper insights of how we predict others' decisions and distinguish between different 'mind reading' models.

Eliciting and Aggregating Forecasts When Information is Shared

Asa Palley & Jack Soll

Using the wisdom of crowds---combining many individual forecasts to obtain an aggregate estimate---can be an effective technique for improving forecast accuracy. When individual forecasts are drawn from independent information sources, a simple average provides the optimal crowd forecast. However, correlated forecast errors greatly limit the ability of the wisdom of crowds to recover the truth. In practice, this dependence often emerges because information is shared: forecasters may to a large extent draw on the same data when formulating their responses.

To address this problem, we propose augmenting the standard elicitation procedure so that in addition to providing forecasts, individuals also guess how others will respond. We study optimal responses in this setting and develop a behavioral model that explains how individuals will use their private and shared information to respond to both of these questions. Based on these results, we develop an aggregation method called pivoting, which removes the shared-information bias from the crowd forecast.

We discuss the results of several studies that test the assumptions of the method and examine the accuracy of the aggregate forecasts. In the first experiment, we vary the shared and private information in a controlled setting, which allows us to observe how individuals use their information to respond to the elicitation procedure. The latter studies examine responses and crowd forecasts in real-world settings. Our experimental results are generally consistent with the theoretical predictions of the model. Overall, the data suggest that the pivoting method can identify the extent to which information is shared and provides an effective forecast aggregation procedure that significantly outperforms the simple crowd average.

The decision to collect information, and the coexistence of insufficient and over-checking

Yefim Roth, Michaela Wänke & Ido Erev

Many decisions are affected by prior “checking” decisions. For example, the decision whether to accept an online license agreement depends on the prior decision whether to click on the "learn more" key, and the decision whether to response to a particular email offer depends on the prior decision to press the “check email” key. Abundant evidence shows that people do not check enough; for example, most consumer do not read contracts before signing them. In other situations people exhibit the opposite bias – check too much; for instance 24% of US drivers admit that they check their Email while driving. Most previous explanations for insufficient and over checking suggest situational dependent explanations. The main goal of the current paper is to propose sufficient conditions to the co-existence of under- and over-checking. We propose that the "reliance on small samples hypothesis" can predict the direction of the deviation from optimal checking. We evaluate this hypothesis in six laboratory experiments. The results demonstrate that insufficient checking emerge when the typical outcome of checking is negative (even when checking maximize the average outcome), and too much checking when the typical outcome of checking is positive. Three additional experiments clarify one of the practical implications of this pattern: They show that changing the typical outcome of checking (making checking the best action most of the time) is more effective than reducing the cost of checking, if it does not change the typical outcome.

The dynamics of evidence accumulation and choice

Takao Noguchi & Bradley Love

Sequential sampling models have been providing a way to understand both speed and accuracy of judgment (e.g., Bogacz, Wagenmakers, Forstmann, & Nieuwenhuis, 2010; Ratcliff & Smith, 2004; Teodorescu & Usher, 2013). These models assume that people accumulate evidence supporting a judgment, and when the accumulated evidence reaches a response boundary, people make a judgment. In these models, accumulation rate is typically fixed until an accumulation reaches a boundary. In this study, however, we show that accumulation rate is dynamic in classification judgments --- accumulation is based on a subset of dimensions at first, and gradually, more dimensions become incorporated. This dynamic accumulation predicts that when people first attend to a dimension that provides misleading information, these people accumulate evidence for an incorrect judgment at first. As a result, people are slower to make a correct judgment, as people have to override initially accumulated evidence, and also people are less likely to make a correct judgment. These predictions were empirically supported.

Managing Consumers' Brand Judgments When Things Go Wrong: Order-Seeking as a Response to Goal Failure

Jamel Khenfer

A passenger who misses an appointment because of unexpected delays on train services. An online shopper unable to wear the outfit s/he ordered specifically for a long-awaited date because it does not fit. Anecdotal observations of consumers unable to carry their goals because of uncontrollable events raise the question of their persistence to purchase the brand involved in goal failure. In this research, we examine to what extent reminding people of the notion of order can moderate the negative effect of goal failure on judgments toward brands implicated in a failed attempt at goal attainment. Overall, four studies show that "forcing" order into the consumer environment allowed to maintain brand purchase intention in the context of goal failure, even when attributional judgments lead to blaming the firm. Our findings contribute to a better understanding of decision making in the aftermath of negative experiences, using an amalgamation between attribution theory and compensatory control research.

CONSUMER CHOICE 2

Individual differences in competent consumer choice: the role of impulsivity and numeracy

Michele Graffeo, Luca Polonio & Nicolao Bonini

The paper investigates how two cognitive skills (numeracy and the ability to inhibit intuitive responses) affect the decision process and the quality of commercial choice. In the experiment 1 scenario a product is on sale in two shops, with different initial prices and discounts. One of the two deals is better than the other and the consumers were asked to choose one, then they completed the numeracy scale (Lipkus et al., 2001). Findings indicate that higher numeracy is associated with in-depth processing of the numeric information. In turn, this in-depth decision process is positively associated with the quality of choice, i.e. the selection of the best deal. We also found that highly numerate consumers who used a partial decision process chose as poorly as the low numerate onsumers who used the same partial decision process. This finding suggests that some skills, other than numeracy, affect the capacity to select the best option. We argue that the ability to inhibit intuitive decisions is associated with the propensity to use an in-depth decision process. In experiment 2, participants were presented with similar decision problems as in experiment 1, and eye movements were recorded to determine their information search patterns. They also completed the Lipkus scale and the Cognitive Reflection Test, CRT (Frederick, 2005). High CRT participants chose more frequently the best deal, and showed a more detailed processing of the available commercial information, compared to low CRT participants. Overall, results indicate that the higher levels of cognitive skills predict the use of a more thorough decision process, which is in turn positively associated to the quality of choices.

A Lens Model Analysis of Individual Nutrition Judgments Using the Nutrition Fact Panel

Claudia Gonzalez-Vallejo & Kristina Carter

Consumer judgment of the nutritional value of food products is increasingly pertinent as obesity and nutritionally-related illnesses remain at record levels in developed nations. The U.S. 1990 Nutritional Labeling and Education Act standardized a nutrition label but the degree to which consumers use this Nutrition Fact Panel label to judge the nutritional quality of food is not fully understood. Previous research in this area is largely self-report and has not utilized judgment analysis methodology. In this study, Lens Model Analysis was used to examine what nutrient information influenced participants nutritional judgments and how well participant nutritional judgment corresponded to a gold standard criterion for nutritional quality. The gold standard used in this study was the product's NuVal® score, an algorithmically computed measure of nutritional quality ranging from 1-100. One hundred ninety-six, 18+ individuals living in the United States rated the nutritional quality of either cereals or snacks on a scale of 0 (not at all nutritious) to 100 (extremely nutritious) based on an image of the front of the product as well as its ingredient list and Nutrition Fact Panel. Differences in judgment accuracy according to demographic differences such as gender, age, race, BMI, educational level, health status, dieting status, nutritional knowledge, health beliefs and behaviors, and Need for Cognition were also examined, but few were found to have an impact. Although participants varied in consistency, overall consistency in information use was high. Participants who used NFP information consistently tended to focus on nutrients important to nutritional quality and consistency itself was significantly correlated with judgment accuracy.

Modern foraging: exploration and exploitation in supermarkets

Peter Riefer & Bradley Love

Decision making often involves choosing between the exploitation of currently preferred options and the exploration of alternatives in order to gain new information. One might say that modern humans forage in supermarkets, where we search for products in order to satisfy our needs. Similarly to our foraging ancestors, we exploit preferred choices and explore alternatives in order to find the best option. Balancing exploration and exploitation optimally is crucial in order to make efficient decisions. Exploiting options that are falsely believed to be best can entail costs as much as exploring options that turn out to be inferior. Therefore, it is more efficient to explore in situations where gathering new information is more promising than relying on present information. Our study examines people's product choices in supermarkets over several years and provides insights into long-term exploratory behavior and decisions with subjective outcomes. We are able to test general predictions that have been discussed in the literature and find that people engage in systematic exploration that appears reversed in comparison to previous findings. Although overall exploration does not decrease over time, people change their exploratory behavior temporarily and become less likely to explore the further their last exploration lies back in the past. Individuals also appear to be consistent regarding this behavior across several product categories.

MEDICAL & HEALTH

"The Median Isn't the Message" (1982) – thirty years later: How to communicate expected survival time to patients?

Geir Kirkebøen

As part of the informed consent process, physicians are legally obligated to communicate prognostic information to patients. Most patients with serious diagnoses also want to know their prognosis, in particular their expected survival time. Patients typically get (or find in medical literature) their prognosis as a median value, sometimes together with a statement that survival time may vary (a lot).

Survival curves for serious diseases are usually strongly right skewed. The median value "hides" this right skewedness, and thereby it also hides the hope for patients that they can be one of the lucky "positive outliers." Patients need hope. However patients also need, and wish, realistic prognostic information for practical planning etc. The question then is, how to communicate prognosis about expected survival time in a way that is both realistic and provides hope?

Data from three scenario studies show that also when it is explicitly communicated that the survival curve is strongly right skewed, even educated people (students) have a strong tendency to assume that median and mean survival time are about equal. Further, our data clearly indicate that people prefer to receive expected survival time as a median value together with explicit information about the survival curve's right skewedness (e.g., concrete examples of «positive outliers»), and that this way to communicate the prognosis not only provide patients with hope, but also give them a more realistic understanding of the prognosis compared to the typical way the prognosis is communicated. Our findings, which to a large extent confirm the assumptions in Stephen Jay Gould's classic essay «The Median isn't the message» (1982), are discussed in light of psychological research.

What factors shape informed decision making about screening with benefits and harms?

Dafina Petrova, Rocio Garcia-Retamero, Edward Cokely & Joop van der Pligt

Decisions about cancer screenings often involve consideration of complex and counter-intuitive evidence. We investigated factors that promote comprehension of benefits and harms associated with common cancer screenings and their influence on intentions to get screened and share decision making.

In Experiment 1, 256 men received information about PSA-based prostate cancer screening. In Experiment 2, 355 women received information about mammography-based breast cancer screening. In Experiment 3, 347 young adults received information about screening for a fictitious disease. In all studies, numerical information about potential benefits and harms was provided (e.g., mortality with and without screening, rate of overdiagnosis). We assessed the effects of information format, numeracy, science literacy, emotions, and screening beliefs on comprehension, intentions to participate in screening, and shared decision making.

Use of pictographs, as well as higher numeracy and science literacy were associated with better comprehension. Improved comprehension was associated with better decision making (e.g., fewer intentions to participate in screening when it offered no benefit) and more desire to share decision making. Positive beliefs about screening were associated with stronger intentions to get screened, regardless of the evidence. Strong emotional reactions to the disease had both beneficial and detrimental effects on informed decision making.

In the context of cancer screening with harms, better comprehension may reduce screening rates but promote shared decision making. However, previous beliefs about the effectiveness of screening and strong fears about specific cancers may interfere with informed decision making even when transparent information is provided.

Partnering or persuading? Decision making during consultations between breast cancer patients and medical oncologists

Ellen Engelhardt

Importance: Shared decision-making (SDM) is widely advocated as a good model for the doctor-patient relationship. For example, there often is no clear-cut 'best' option when it comes to adjuvant systemic treatment for early-stage breast cancer. Especially, in such instances patient values and preferences can provide valuable guidance for decision-making. If oncologists intend to involve patients in decision-making, they might be subverting their efforts to implement SDM by employing implicit persuasion to ensure patients' agreement with treatment recommendations. Little is known about the use of these techniques during consultations and their influence on decision-making.

Objective: We assessed how often implicit persuasion was used during consultations, if use was associated with expected treatment benefits, and its influence on decision-making.

Design: Multi-center observational study, in which consecutive chemotherapy and endocrine therapy decision consultations were audiotaped at oncology outpatient clinics. Tapes were transcribed and independently coded by two researchers. Discrepancies in coding were resolved in consensus meetings. Descriptive analyses were performed, as well as comparisons between the number of implicit persuasion techniques used and patient, disease, consultation and oncologist characteristics.

Attention in Health Judgements

Timothy Mullett & Rebecca McDonald

We use eye tracking and other process data to examine how individuals use a common method of rating elicitation used in health economics and policy making. The EQ-5D-5L is a standardized method of presenting health states which provides ratings on 5 dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. We use eye tracking to examine how individuals direct their attention during deliberation and providing a rating using an analogue scale. The study also examines how ratings are affected presenting or omitting the diseases name from the information. This is generally considered to be a minor change in presentation as the EQ-5D-5L is assumed to represent all facets of the disease's severity. We show that including disease labels has a very large effect upon ratings for diseases which are highly dreaded. Cancer, Heart Attack and Femoral Neck Fracture all receive much higher severity ratings when they are explicitly named. Eye-tracking analysis also shows that the label captures attention away from nearby information. Visual attention is also found to correlate with a dimension's subsequent impact upon ratings. The results show that even minor changes in presentation can potentially have very large effects upon judgements. We discuss the importance of considering these issues when using such measures in policy making.

INTERTEMPORAL CHOICE 2

Look forward or think back? An examination of reference-dependent intertemporal preferences

Zhihua Li & Songfa Zhong

This study examines reference-dependent intertemporal preferences in the laboratory setting by using Multiple Price List (MPL). In the experiment, each MPL consists of a number of rows, and each row represents a binary choice between two outcome sequences. Option on one side of MPL is fixed and option on the other side varies across rows. We hypothesize that subjects view the fixed option in MPL as a reference point. A reference-dependent intertemporal utility model is proposed on top of discounted utility model by incorporating an additional gain-loss utility of outcomes actualized at the same time point, which predicts that MPL elicitation in our experiment could result in preference intransitivity, and subjects tend to be more patient if the fixed option is future-oriented, and less so if present-oriented. The observed behavioral patterns are consistent with these predictions. We further conduct structural estimations of our reference-dependent model and find that the estimated loss aversion parameter is significantly larger than one, suggesting that loss looms larger than gain in the intertemporal setting.

Dynamic cognitive models of intertemporal choice

Junyi Dai, Timothy Pleskac & Thorsten Pachur

Recent empirical results show that intertemporal choice is probabilistic, dynamic, and attribute-based, challenging traditional models such as the discounted utility model. In this paper, we develop and test three classes of cognitive models that embody these three properties of intertemporal choice. The first model class involves diffusion models built upon decision field theory (Dai & Busemeyer, 2014); the second class is newly developed from principles of lexicographic and limited search; and the third class incorporates traditional concepts of random utility and just-noticeable-difference (JND) to provide novel accounts for the cognitive mechanisms underlying intertemporal choice. We showed that all three model classes provide reasonable predictions on distributions of choice responses and response times, although they differ substantially in underlying assumptions (e.g., compensatory versus noncompensatory strategies and accumulative versus non-accumulative samplings). Qualitatively, these model classes can account for distinct sets of major phenomena in intertemporal choice. Quantitatively, a model built upon the concepts of random utility and JND performs best overall. Yet, different classes provide best fits for different groups of participants, suggesting individual difference in the underlying process dynamics.

Inconsistent planning in the allocation of time across enjoyable and boring tasks

Rebecca McDonald, Daniel Read & Megan Grime

When allocating time to work and leisure, choosing when to perform onerous tasks, and committing to long term goals, individuals engage in planning. We often plan multiple periods into the future, trade-off utility “right now” against long-term goals, and judge our ability to resist temptation. Deviation from planned behaviour is ubiquitous, yet little is understood about how plans are made, kept and overridden. Typically, researchers explain inconsistent planning with non-exponential discounting, and elicit evidence through immediate choices about future behaviour. In contrast, the study reported in this paper allowed individuals to make plans and then adhere or deviate to their plan over multiple periods by re-arranging the order of the tasks they had yet to perform, in real time. Respondents allocated 40 minutes of laboratory time between tasks that are enjoyable (an online game) and boring (a peg-turning task), expressed their preference for a commitment device, and played out their schedules. The majority of respondents had the opportunity to change their schedules as they went along. Respondents tended to schedule the boring tasks early and the enjoyable tasks later and express a preference for commitment, but those who had the opportunity to change their schedules tended not to make many alterations. Changes that consolidated the tasks into longer unbroken sequences were the most frequent. There was little evidence of respondents expediating enjoyable tasks, as would be predicted by most theoretical models of inconsistent planning. We conclude that impatience and additive separability - key features of theoretical accounts of inconsistent planning - are absent in this study.

Unpacking manipulation increases perceived temporal distance

Yan Sun, Yang Liu & Shu Li

In daily life, people often feel they have more time when thinking of the same time period in a smaller unit. But there is no scientific evidence for that feeling so that we cannot say it is true or not. Actually, previous research has proved that temporal distance perception is not equal to objective time, and time perception is highly subjective to plenty of factors relating both to stimulus and to observer's states. Thus, it seems possible that subjective temporal distance judgment could change with the description way of time. Researchers also found that in quantity estimation, people often perceive that the whole is less than the sum of its parts, which refers as unpacking effect in Support Theory. Tversky and Koehler took the issue of unpacking as a basic principle of human judgment. Therefore, we speculated that such an unpacking effect could also be detected in temporal distance judgment. The current study used between-subject design to directly test it. Our results showed that participants in the unpacked condition judged a given time interval longer than those in the packed condition, even the time interval was kept constant between the two conditions. Furthermore, this unpacking effect persists regardless of the unpacking ways—the unit-unpacked way or the holiday-unpacked way—we employed. Our unpacking effect in the temporal distance judgment can be explained under the frame of support theory. Besides, the present finding has significant implication to a multitude of decision making and suggests that unpacking a time interval may be a good strategy to lengthen its perceived temporal distance.

Distinct role of approach-avoidance motivation: Toward a new understanding of gain-loss asymmetry in temporal discounting

Zhu-Yuan Liang

The sign effect of discounting, i.e., the fact that people discount gains more than losses, has been reported consistently in previous research and implicated in many problematic behaviors in healthy-normal, developing, and clinical populations, leading to substantial individual and societal costs. However, the underlying neural mechanism of the asymmetric discounting of gains and losses remains unidentified. In order to investigate the possibility that the effect can be better accounted for by approach-avoidance motivation and functional neuroanatomy model, we investigated the asymmetric discounting by applying functional connectivity analysis. The results revealed that the functional connectivities for loss and gain were associated with different trait motivations: medial prefrontal cortex (MPFC) and medial orbitofrontal cortex

(MOFC) was the critical region of valuation network for the loss and gain respectively; in particular, avoidance motivation positively correlated with the functional connectivity between MPFC and emotion regions in loss, but both approach and avoidance motivation negatively correlated with the functional connectivity between MOFC and cognitive control regions in gain. Our findings suggested that motivation system imposed asymmetrical modulating effect on brain networks between valuation and emotion/cognitive control system in temporal discounting of loss/gain. This study provided a new insight to further our understanding of the neural mechanisms underlying the difference between temporal discounting of loss and gain.

INDIVIDUAL DIFFERENCES 3

Unfolding anchoring effect: Individual difference approach

Predrag Teovanović

Research was aimed to explore: (1) how direction and distance of anchor contribute to the size of anchoring effect, (2) whether their contributions moderated by measures of personality and cognitive abilities, (3) if individual differences in anchoring effect can be reliably measured, and (4) can they be predicted by traditional psychometric constructs. The anchoring experiment extended standard measurement procedure by introducing the anchor-free estimates prior. It employed 2x4 within-subject design, with anchor direction (positive and negative) and relative anchor distance (20%, 40%, 60%, and 80%) as independent variables. All subjects (N=236) were also administered a Raven's Progressive Matrices (RPM), Cognitive Reflection Test (CRT), and Openness scale. Two-way ANOVA revealed main effects of direction ($\eta 2$ = .25) and distance of anchor ($\eta 2$ = .53). HMLM disclose effects of RPM on parameters of quadratic anchor-distance function. General susceptibility to anchoring effect (α = .71) is found to be weakly associated with Openness (r = .24, p< .001), but strongly with RPM in the high-CRT group (r= -.51, p= .001). Latter suggests that cognitive capacities can suppress effects of anchors only when reflectivity is enhanced, which is in accordance with dual-process theories. Findings confirm experimental robustness of both anchoring effect and anchor-distance function and indicate that individual differences in susceptibility to this cognitive bias can be reliably measured.

Measuring Individual Differences in Social Value Orientation Using the Needleman-Wunsch-Algorithm: An Eye Tracking Study

René Schlegelmilch & Susann Fiedler

The aim of the presented study is to directly disambiguate motives underlying social preferences, which are commonly inferred by the Social Value Ring Measure (Liebrand, & McClintock, 1988). With eye tracking we measure information search during repeated binary allocation tasks (baseline). We designed information displays to capture attention on four outcome dimensions, which are related to egoism, altruism, welfare concerns and inequity aversion. Furthermore, we assume that sequential attentional shifts on these dimensions portray if and when certain aspects are considered within the decision process. Additionally, participants were afterwards instructed to choose in line with 4 strategies: (1) selfish, (2) altruistic, (3) equality maximizing and (4) joint payoff maximizing (focus conditions). In all 5 conditions, the resulting gaze behavior was analyzed for its sequential patterns. To obtain an index of similarity between the baseline tasks and each of the four focus conditions, the Needleman-Wunsch-Algorithm (NWA) was employed. First, we can show that NWA is a highly reliable and valid tool for investigating sequential task related eye movements. Second, we find that the similarity index can be used to identify latent motives during the decision process, without any further assumption other than the similarity of processing on identical information displays in multiple tasks. Interestingly, our data suggest, that especially inequity aversion and welfare concerns seem to evolve after considering more basic information which reflect altruistic or selfish behavior. Our findings indicate that social preferences may possibly be dividable into primary motives (egoism vs. altruism) and secondary altruistic motives (inequity aversion and welfare concerns).

Studying the Processes underlying Cognitive Reflection Test Performance

Barnabas Szaszi, Bence Palfi, Aba Szollosi & Balazs Aczel

The Cognitive Reflection Test was created originally to measure the capacity to suppress the wrong intuitive answer that first comes to mind and substitute it with the correct one. This default interventionist suppression-based explanation is still used by the vast majority of researchers. The purpose of the presentation is twofold. Firstly, it attempts to reveal whether the original explanation can be hold that is whether there are reasoners who solve the tasks but do not show the inhibition of the intuitive incorrect response. Secondly, it aims at identifying how individual differences in numeracy and reflectivity influence whether the correct or incorrect response alternative come first to mind. In order to trace the participants' decision processes, we used concurrent verbal reports and protocol analysis along with several measure of reflectivity and numeracy. The results suggest that there are a substantial number of reasoners who do not show this late correction pattern and inhibition of the intuitive incorrect response but, due to some early selection process, start the thinking process with the right strategy. Our data also imply how the current literature sometimes understates the relevance of investigating subgroups of participants separately when examining how reasoning works. It is also discussed why it is a complex problem to dissociate the role of numeracy and reflectivity in decision making tests moreover how and where the operationalization of numeracy and reflectivity potentially overlap.

Drift from rationality caused by affective processes is moderated by numerical skills

Kamil Fuławka & Jakub Traczyk

Numeracy defined as the ability to understand and process statistical and probability information plays a significant role in superior decision making. However, recent research has demonstrated that numeracy goes beyond simple comprehension of numbers and mathematical operations. Specifically, highly numerate individuals draw more precise affective meaning from numbers and their emotional reactions to probabilities are more differentiated. In this study, we hypothesized that individuals with higher numeracy scores would not be influenced by decision-irrelevant affect resulting in less biased (i.e., closer to linearity) probability weighting. Participants provided the willingness to pay prices (WTP) for the insurance of an envelope containing a 500 PLN voucher, which could be lost with nine probability levels varying between 1% and 99%. Each of nine insurance decisions were preceded by the second task, in which series of pictures (negative vs neutral) were sequentially presented to participants depending on the experimental condition. At the end of the study, participants rated affective reactions to the envelope used in the insurance task and completed the Berlin Numeracy Test (BNT). We found that negative affect increased the curvature of the probability weighting function and led to stronger deviations from linear probability weighting. However, the negative role of affect was not significant in highly numerate individuals. We argue that people with higher numeracy make better decisions not only due their mathematical competencies but also because they are resistant to influences of irrelevant affective reactions.

Numeracy, education and wealth

Catalina Estrada-Mejia & Ellen Peters

In this paper we studied whether the positive effect of education on wealth was mainly driven by the specific skill of numeracy or by more general cognitive skills such as crystalized or fluid intelligence. The data was collected in the Ancash region of the Peruvian Andes (N=237). Participants completed measures of numeracy, fluid and crystallized intelligence, demographic information and years of schooling. A measure of wealth was constructed using different indicators of the quality of the house (e.g., main material of the walls, material of the floor, whether the person has a toilet inside the house) and their durable assets (e.g., whether the person has a fridge, a stove, or a radio). Our results showed a unique effect of numeracy on wealth even after accounting for measures of crystalized and fluid intelligence, and other potential confounding factors. Additionally, a series of SEM models showed that education was a significant predictor of fluid intelligence, crystalized intelligence, and numeracy. Education was also a significant predictor of wealth but the direct effect was partially mediated by numeracy. Finally, a parsimonious model with numeracy as a separate predictor from fluid and crystallized intelligence resulted in better model fit as compared to a model with a single cognitive-ability latent variable. The single cognitive-ability latent variable includes fluid intelligence, crystallized intelligence and numeracy.

NUDGE 2

The Effect of Presentation Formats on Rational Information Search

Charley Wu, Björn Meder, Jonathan Nelson & Flavia Filimon

While a large body of previous work has shown that it is possible to improve Bayesian reasoning by manipulating how information is presented, it has not yet been examined if similar manipulations can also increase the proportion of rational search decisions. We examined (1) whether or not information search strategies are affected by presentation formats, and (2) if this effect is mediated either by the ability to accurately understand the probabilistic structure of the search environment or by numeracy skill.

We conducted an empirical study using a multiple-cue probabilistic environment where subjects were asked to make an information search query with the explicit goal of maximizing classification accuracy. The underlying probabilities of the search environment were designed such that the two possible queries correspond to the optimal strategy for different informational utility functions, namely information gain on one hand, and probability gain on the other. Relative to the goal of maximizing classification accuracy, only the probability gain query can be considered rational.

The 3 main types of information formats we tested were the probability format (numbers expressed as percentages), the natural frequency format (numbers expressed through natural sampling), and visual formats (icon arrays, bar graphs, and dot diagrams). Following the search task, subjects were also asked to estimate the underlying probabilities of the search environment and complete a numeracy test.

The results are twofold, uncovering a strong effect of presentation format on search decisions (rational search decisions ranging from 27% to 86% of subjects), as well as finding no evidence that this effect is mediated either by numeracy or subjects' ability to judge the environmental probabilities.

Determining the theoretical mechanisms behind graphical display effects

Eric Stone, Emily Reeder & LeeAnn Miller

For low-probability situations, graphs that depict the number of people harmed (the foreground) increase risk aversion more than numerical displays and graphs that also depict the number of people at risk of harm (the background). In two studies, we investigated three potential mechanisms for why foreground-only graphical displays increase risk aversion: 1) they call attention to the foreground and away from the background, thus increasing the perceived chance of harm and subsequent risk-averse behavior (foreground:background salience); 2) they focus attention on the chance of harm early in the decision process, increasing its weight in later cognitive analysis (attention priority model); and 3) they make the proportion (part-to-whole) between the foreground and background difficult to detect, inhibiting people's ability to see the probability as being small (proportional reasoning). Study 1 used four displays varying whether the foreground and background were presented graphically or numerically, allowing us to differentiate among these accounts. The results mainly supported proportional reasoning; those displays in the same modality (numerical-numerical or graphical-graphical) produced less risk avoidance than displays in different modalities. Study 2 measured people's tendency to form the proportion and used a cognitive load manipulation to inhibit people's ability to form the proportion. The cognitive load manipulation substantially increased risk aversion in high proportional reasoning participants, but not in low proportional reasoning participants. In sum, our results suggest that a key characteristic of graphical displays is whether they facilitate or inhibit people's ability to reason on the basis of the proportion between the foreground and background.

Fostering informed decisions: How to encourage active processing of risk information using dynamic icon arrays

Yasmina Okan, Rocio Garcia-Retamero, Edward Cokely & Antonio Maldonado

Icon arrays have been found to improve risk understanding and reduce judgment biases across a wide range of studies. Unfortunately, individuals with low graph literacy experience only limited benefits from such displays. To enhance the efficacy and reach of these decision aids, we developed and tested three types of dynamic design features—i.e., computerized display features that unfold over time. Specifically, we manipulated the sequential presentation of the different elements of icon arrays, the presence of explanatory labels indicating what was depicted in the different regions of the arrays, and the use of a reflective question followed by accuracy feedback. The first two features were designed to promote specific cognitive processes involved in graph comprehension, while the third feature was designed to promote a more active, elaborative processing of risk information. Design features were developed taking into account prominent graph comprehension models as well as work on active processing of visualizations. We assessed participants' understanding of treatment risk reduction associated with hypothetical new drugs for heart attack prevention. Explanatory labels were effective to improve risk understanding among less graph literate participants, while reflective questions resulted in large and robust performance benefits among participants with both low and high graph literacy. In contrast, displays designed to direct attention to the different regions in arrays by presenting information sequentially did not contribute to enhance comprehension. These findings show that the benefits of features supporting active, elaborative processing can extend to individuals of different ability levels. Theoretical and prescriptive implications are discussed.

Twenty years of natural frequencies: A systematic review and meta-analysis of the effect of natural frequencies on Bayesian reasoning

Michelle McDowell & Perke Jacobs

There is a general consensus that natural frequency representations facilitate Bayesian reasoning. However, the conditions under which the facilitation effect occurs are still debated and disagreement remains as to when, why, and for whom the format is most effective. The current paper has two broad aims. First, natural frequency formats are clarified and convergent and divergent conceptualisations across theoretical frameworks are highlighted. Second, a quantitative examination of study and sample characteristics (e.g., incentives; expertise), individual differences (e.g., numeracy, cognitive ability), and problem representations (e.g., numerical format, visual representation, task complexity) seeks to address when natural frequencies are most effective, for whom, and why.

A systematic review was conducted (Databases: Ovid(psych), Web of Science, and Pubmed) to identify papers that compared Bayesian reasoning tasks presented using conditional probabilities and natural frequencies. A total of 30 relevant papers were coded yielding approximately 120 distinct effects.

Papers were coded for potential moderators relating to the sample, methodology, and problem representation formats. Preliminary results support the consensus that natural frequencies facilitate Bayesian reasoning in comparison to conditional probability formats and the use of visual aids strengthens this effect.

Few studies explore how people solve problems and for which environments solution strategies are most effective. The results highlight gaps in the evidence, summarises ongoing debates, and proposes future research directions that can further work in this area.

MORAL ISSUES 3

Hearts over heads? Age-related differences in moral decision making

Simon McNair, Yasmina Okan, Constantinos Hadjichristidis & Wändi Bruine de Bruin

Moral issues permeate contexts such as health, management, and politics. Moral decision making is often characterised by a conflict between emotional reactions and a more cognitive awareness of the greater implications. Psychological research has suggested that "deontological" moral decisions (e.g. respecting individual rights) are associated with greater emotional activation, whilst consequentialist decisions (e.g. acting for the greater good) are predicated on cognitive deliberation.

However, much moral decision research has focused on student samples, and has not investigated potential age differences in moral decisions. Yet, it is important to note that older adults tend to shift from deliberation to emotional reasoning (see Hanoch, Wood, & Rice, 2007), which may produce age differences in moral decisions. Here, we address this gap by examining age differences in moral reasoning, as well as their cognitive and emotional underpinnings.

In two experiments, we asked younger (18-25 years) and older (55+ years) adults to indicate how they would act in moral dilemmas characterised by death, emotional distress, and financial loss. We also measured individual differences in cognition and emotion, to understand the psychological basis of any age differences. Our results indicated that older adults produced significantly more deontological decisions (focused on individual rights). These effects were mediated by age differences in emotional reactions.

Our findings suggest that older adults' moral reasoning is more deontological than that of younger adults, in part due to their increased reliance on emotions. Our findings have implications for our understanding of how decisions are made in real-world contexts, which often involve decision makers from different age groups.

Signal Detection Decision Models of Forgiveness

Jolene Tan, Shenghua Luan & Konstantinos Katsikopoulos

Aim. Forgiveness research has focused on identifying antecedents and consequences, neglecting the decision process. We propose that the decision is approached as a signal detection task, where the costs of the two errors (i.e., false positive and false negative) are likely to be different. Individuals estimate the evidence strength that the offender has a high prosocial regard for the individual's welfare, and set the decision criterion by making tradeoffs in the costs of errors. We investigated the descriptiveness of two decision models – fast and frugal trees (FFTs) and Franklin's rule (FR) – representing different approaches to estimating the evidence strength and setting the decision criterion. Method. Participants recalled a hurtful incident, provided details about that incident and the offender, as well as whether they forgave. They also indicated whether they would forgive that offender across multiple hypothetical decisions that varied the evidence strength cues. Decisions were compared with FFTs and FR, which were cross-validated by fitting the models with the hypothetical decisions and predicting with the recalled decisions. Results. Both FFTs and FR were able to fit and predict decisions equally well, and better than a benchmark single-cue model. Across both models, participants were more likely to adopt a liberal criterion when the false negatives are costly, and a conservative criterion when false positives are costly. The same pattern was found when a ratio of the error costs was used. Conclusion. We conclude that individuals shift the decision criterion as expected with signal detection, and both FFTs and FR are plausible decision models. We also discuss how the findings can inform models of how individuals approach other signal-detection decisions.

Decision theory: A vehicle for reflective management?

Alexandra Köves, Judit Gáspár, Réka Matolay, Bálint Esse, Ágnes Wimmer & Zita Zoltay-Paprika

The paper puts forward a conceptual application of decision theory in business management and leadership practices as an approach to enhance reflectivity. Reflectivity is the ability of the decision-maker to relate to the subject of decisions under scrutiny; uncover the implicit assumptions; assess the hunches; and evaluate the influence of the underlying psychological understandings and cultural and ethical stances of various stakeholders. Reflectivity also entails the ability of self-reflection where the subject under scrutiny is the decision-maker itself with his/her own implicit assumptions, cognitive capacities and limitations and perception of knowledge and influence. Some of the recent developments in business models suggest that these skills are bound to gain weight in management practices. Based on their educational experience teaching decision theory and techniques in business higher education, the authors propose that in an economic context decision theory can serve as a vehicle for such reflective management. The theories, principles and methods of decision-making can be used to provide a toolkit for current and future decision-makers to become aware of reflective practices that would otherwise remain in the unconscious realms of the human mind. The aim of the paper is to prepare the grounds for further investigations into how this synergy can be exploited by systematically revise the role of reflectivity in business models; document scientifically the role of decision theory education in developing reflectivity skills; and connect the different decision theory concepts to the issue of reflectivity.

The politeness of donation request does not predict charitable behaviour but charitable behaviour predicts perceived politeness

Marie Juanchich & Miroslav Sirota

Aims. Have you ever donated to an organisation and then regretted it? Getting a donation is not the end of the story: donation requests should be tailored to trigger donation but also to give people a positive perception of the request. We investigated the effect of the request politeness on the donation decision and on the perception of the request after the donation decision. We expected participants to donate more to polite requests, to have a more positive perception of those requests and that the interaction between the politeness manipulation and the donation decision would affect the perception of the request.

Methods. We manipulated politeness in 6 experiments where participants read one of these three requests:

• Blatant: Donate to Unicef now!

• Interrogative: Would you like to donate to UNICEF now?

• Hedged interrogation: Could you perhaps donate to Unicef now?

Participants reported their donation decision (yes/no) and how much they would donate out of a financial bonus (Exp. 1), how much they would donate out of a lottery prize (Exp. 2, 3 and 5) or how much they were willing to donate (Exp. 4 and 6). Participants reported their perception of the request after donating, in terms of level of appreciation and coercion (Exp. 1-6). We also measured levels of intrinsic motivation (Exp.1 and 2), persuasion awareness, and psychological reactance (Exp. 3-6).

Results and conclusion. The politeness of the request did not impact donation. However, the donation decision was related to the perception of the request: participants who donated perceived that the donation was more appreciative and less coercive than participants who did not donate. The politeness of the request did not interact with the donation decision to determine the perception of the request.

Distributive Justice behind the Veil: A Study of Social Preferences under Various Degrees of Ignorance

Jan Woike & Sebastian Hafenbrädl

Allocations of money between recipients might heavily depend on knowledge about one's recipient position. While Rawls argues that decision makers behind a "veil of ignorance" will adhere to the maximin-principle, Harsanyi predicts the maximization of expected value (and total social welfare), instead.

We tested participants in a simplified veil-of-ignorance paradigm. In a series of three-player games, participants had to choose between different monetary distributions for three receivers. Distributions varied systematically in terms of achieved equality, total social welfare, and expected personal profit.

In Study 1 (N=154), participants made choices under different degrees of ignorance concerning their receiver position. With equiprobable positions choices were mostly aligned with those judged as fair: Distributions achieving equality of outcomes were preferred over distributions maximizing payoffs. When participants knew their receiver position, the majority of participants chose to maximize their personal outcome. Finally, when participants were assigned to one out of two of the three positions, choices were split into three clusters (equality-maximizing, maximin, and expected-value-maximizing). Further analyses include reaction-times and demographic data, and behavior in other economic games.

In Study 2 (N=111), we used tasks where the equally distributed option was dominated by all other options. Some participants chose a guaranteed loss over unequal splits of positive outcomes.

Some variants of the veil of ignorance are able to achieve evenly distributed outcomes. A substantial percentage chooses according to the maximin-principle proposed by Rawls, while some participants are willing to incur both personal and social-welfare costs to achieve equality.

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