EGPROC 2018

	Wednesday, 4 July 2018
TIME	**Aarhus BSS**
9:00-9:30	**Early Registration** (2627-H8)
9:30-11:00	**Workshop**: Information processing research in virtual reality delivered **by Dr Thies Pfeiffer, Dr Martin Meissner & Christian Peukert** **Workshop Part 1** (Lab1/Lab2)
11:00-11:30	*Coffee Break (2627-H8)*
11:30-13:00	**Workshop Part 2** (Lab1/Lab2)
13:00-14:00	*Lunch (2627-H8)*
14:00-15:30	**Workshop Part 3** (Lab1/Lab2)
15:30-16:00	*Coffee Break (2627-H8)*
16:00-17:30	**Workshop Part 4** (Lab1/Lab2)
18:00-20:00	*Welcome Reception (2610-Upper Multihall)*

	Thursday, 5 July 2018
TIME	**Aarhus BSS**
9:00-10:00	Official welcome followed by a **keynote lecture by Dr Eran Eldar**, University College London: Focus vs. breadth: pupil size and neural information processing (M2)
10:00-10:30	*Coffee Break (2610-Upper Multihall)*
10:30-12:00	**Session 1: Risk & Uncertainty*** (M2) Presenters: 1. Konstantinidis Emmanouil, 2. Alexander Ritschel & 3. Franziska Sump
12:00-13:00	*Lunch (2610-Upper Multihall)*
13:00-14:30	**Session 2: Business Research*** (M2) Presenters: 1. Nathaniel Ashby, 2. Michal Krol & 3. Qizhang Sun
14:30-15:00	*Coffee Break (2610-Upper Multihall)*
15:00-16:30	**Session 3: Consumer Behavior Part 1*** (M2) Presenters: 1. Daniele Asioli, 2. Marija Banovic & 3. Christian Peukert
16:30-16:45	*Coffee Break (2610-Upper Multihall)*
16:45-18:15	**Poster Session** (lobby in front of M2) Presenters: Anne-Kirstine Laden-Andersen, Valon Buxhovi, Nina Chrobot, Kamil Fulawka, Erik Stoltenberg Lahm, Jacob Lund Orquin, Anine Riege, Ellen J. Van Loo & Nick Zuschke
19:00-22:00	*Conference Dinner (Restaurant Carlton, Rosensgade 23, 8000 Aarhus C)*

	Friday, 6 July 2018
TIME	**Aarhus BSS**
9:30-11:00	**Session 4: Consumer Behavior Part 2*** (M2) Presenters: 1. Alexander Graf, 2. Liu Dawn & 3. Antonia Krefeld-Schwalb
11:00-11:30	*Coffee Break (2610-Upper Multihall)*
11:30-13:00	**Session 5: Methodology*** (M2) Presenters: 1. Stefan Scherbaum, 2. Martin Schoemann & 3. Gaëlle Vallee-Tourangeau
13:00-14:00	*Lunch (2610-Upper Multihall)*
14:00-15:30	**Session 6: Preference Formation*** (M2) Presenters: 1. Arnd Florack, 2. Avril Hand & 3. Hrvoje Stojic
15:30-16:00	*Coffee Break (2610-Upper Multihall)*
16:00-16:30	**Closing remarks and announcing EGPROC 2019** (M2)

* last person in each session will be a session chair

Sponsored by: **Department of Management Aarhus University, Departmet of Economics & Business Economics Aarhus University, EADM & Tobii Pro**

AARHUS BSS SCHOOL OF BUSINESS AND SOCIAL SCIENCES AARHUS UNIVERSITET

eadm The European Association for Decision Making

tobii pro

Conference locations

- The Virtual reality and eye tracking workshop takes place in COBE lab in building 2627. See map below.
- Conference presentations take place in auditorium M2 in building 2628 (also referred to as the M building). See map below.
- The welcome reception and lunches take place in Upper Multihall in building 2610 (also referred to as the S building). See map below.

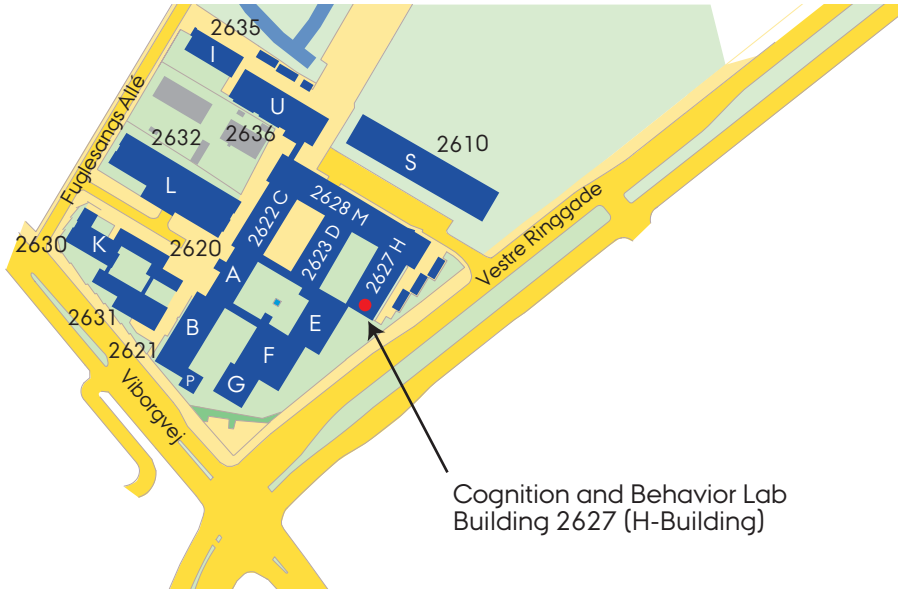
It is possible to walk from Aarhus city center to the Aarhus BSS in about 15-20 minutes. Alternatively, busses 3A, 5A, 19, 111, 112, 114, 116, 117, 118, 400, 914X, 918X, or 925X might take you to Aarhus BSS. The map below shows the location of the conference venue and the restaurant where we will have the conference dinner.

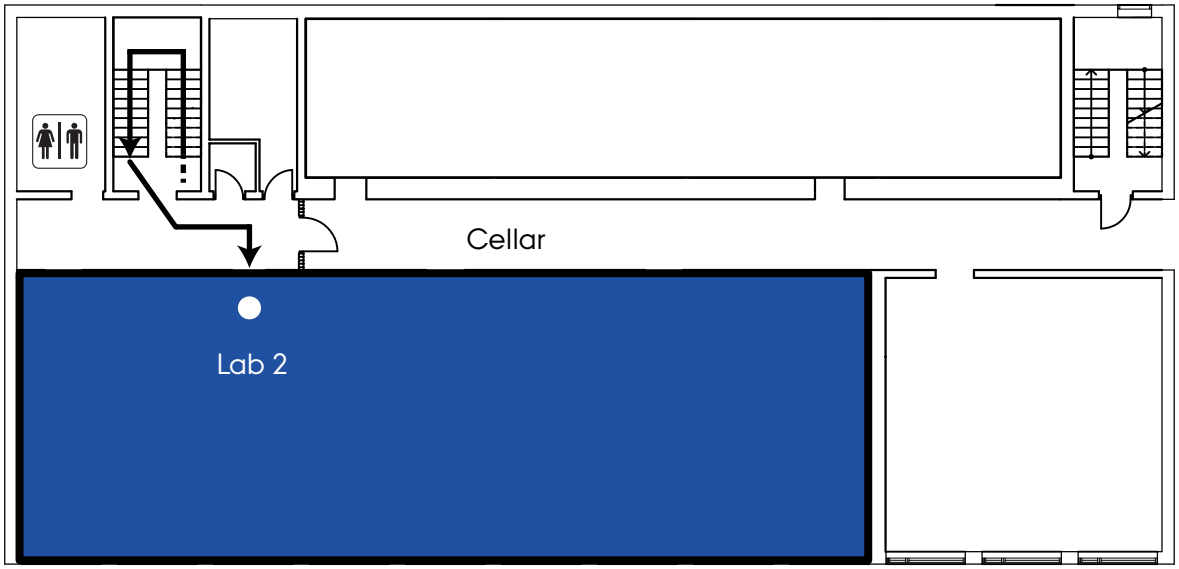
COGNITION AND BEHAVIOR LAB

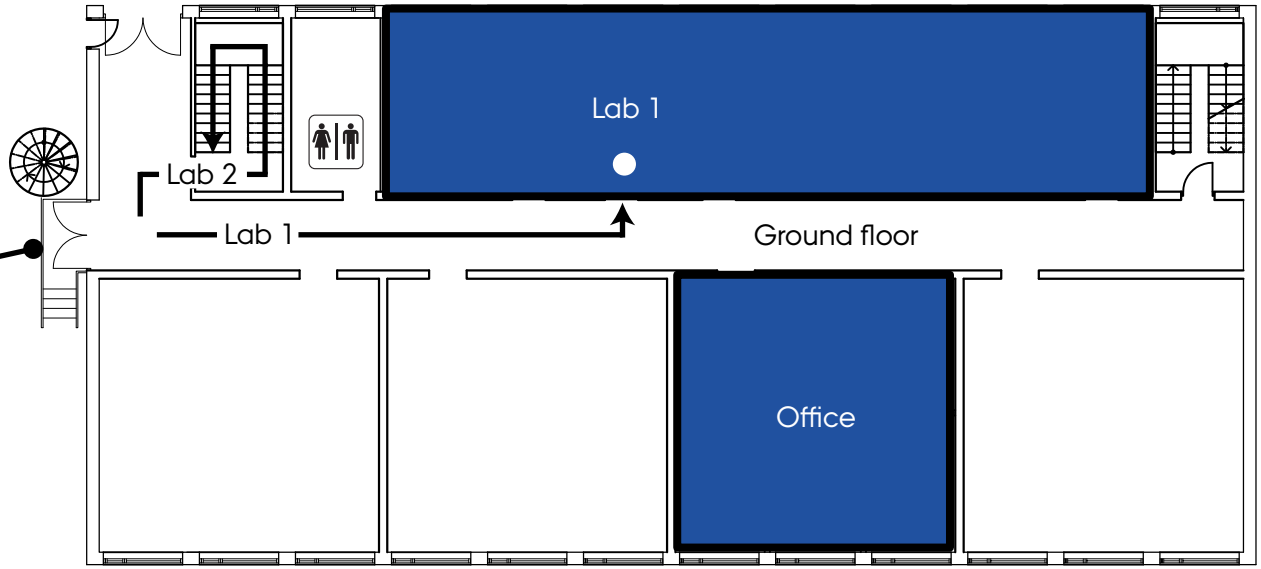
SCHOOL OF BUSINESS AND SOCIAL SCIENCES
AARHUS UNIVERSITY

Cognition and Behavior Lab
Fuglesangs Allé 4
Building 2627
8210 Aarhus V

Email: cobelab@au.dk
Web: http://bss.au.dk/cbl
Phone: 87166152







EGPROC - 4-6 July 2018 - List of Participants

First name	Last name	Email	Affiliation
Nathaniel	Ashby	nathaniel.js.ashby@gmail.com	Harrisburg University of Science and Technology
Daniele	Asioli	d.asioli@reading.ac.uk	University of Reading / Consumer and Sensory Science, NOFIMA / University of Arkansas
Martin	Bagger	bagger@econ.au.dk	Aarhus University, Dept. of Economics and Business Economics
Marija	Banovic	maba@mgmt.au.dk	Aarhus University, Dept. of Management
Valon	Buxhovi	vabu@inspari.dk	Inspari
Jacob Dahl	Christensen	jacobchristensen92@gmail.com	Swedish University of Agricultural Sciences
Nina	Chrobot	ninachrobot@gmail.com	Tobii Pro / SWPS
Eran	Eldar	e.eldar@ucl.ac.uk	University College London, Max Planck UCL Centre for Computational Psychiatry and Ageing Research
Arnd	Florack	arnd.florack@univie.ac.at	University of Vienna
Kamil	Fulawka	kfulawka@swps.edu.pl	SWPS University of Social Sciences and Humanities, Faculty in Wroclaw
Kerstin	Gidlöf	kerstin.gidlof@lucs.lu.se	Lund University
Alexander	Graf	alexander.graf@uni-hamburg.de	University of Hamburg, Chair of Marketing and Innovation
Avril	Hand	a.hand1@nuigalway.ie	National University of Ireland, Galway (NUIG)
Emmanouil	Konstantinidis	e.konstantinidis@leeds.ac.uk	Leeds University Business School
Antonia	Krefeld-Schwalb	antonia.krefeld-schwalb@unige.ch	University of Geneva
Michal	Krol	michal.krol@manchester.ac.uk	The University of Manchester
Anne-Kirstine	Laden-Andersen	annekirstineladen@gmail.com	Cadesign form
Erik Stoltenberg	Lahm	lahm@mgmt.au.dk	Aarhus University, Dept. of Management
Dawn	Liu	dliuxi@essex.ac.uk	University of Essex
Martin	Meißner	meissner@sam.sdu.dk	University of Southern Denmark
Jacob	Orquin	jalo@mgmt.au.dk	Aarhus University, Dept. of Management
Sonja	Perkovic	sp@mgmt.au.dk	Aarhus University, Dept. of Management
Christian	Peukert	christian.peukert@kit.edu	Karlsruhe Institute of Technology, Institute of Information Systems and Marketing
Thies	Pfeiffer	Thies.Pfeiffer@Uni-Bielefeld.de	Bielefeld University
Anine	Riege	a.riege@kingston.ac.uk	Kingston University
Alexander	Ritschel	alexander.ritschel@econ.uzh.ch	University of Zurich
Stefan	Scherbaum	stefan.scherbaum@tu-dresden.de	Technische Universität Dresden
Martin	Schoemann	martin.schoemann@tu-dresden.de	Technische Universität Dresden
Patrycja	Sleboda	patrycja.sleboda@slu.se	Swedish University of Agricultural Sciences
Hrvoje	Stojic	h.stojic@ucl.ac.uk	University College London, Max Planck UCL Centre for Computational Psychiatry and Ageing Research
Franziska	Sump	franziska.sump@uni-hamburg.de	University of Hamburg
Qizhang	Sun	q.sun.2@tue.nl	Eindhoven University of Technology
Gaëlle	Vallée-Tourangeau	g.vallee-tourangeau@kingston.ac.uk	Kingston University
Ellen	Van Loo	ellen.vanloo@ugent.be	Ghent University / Arizona State University
Nick	Zuschke	nick.zuschke@uni-hamburg.de	University of Hamburg

Book of abstracts

37th Meeting of the European Group of Process Tracing Studies (EGPROC)

July 4-6, 2018

The Power of Proximity on Product Packaging

5 July
16:45
lobby in
front of
M2

Anne-Kirstine Laden-Andersen[1] and Erik Stoltenberg Lahm[2]
[1]Cadesign form; [2]Aarhus University

Gestalt psychology helps us understand how humans organize objects into groups. For this study, Gestalt's law of proximity was adopted as it argues that objects that are in close proximity will be perceived as a group. Additionally, vision research has found that people prefer short saccades when scanning their environment. These insights combined led the researchers to test whether the grouping of labels on product packaging could be a way to lead eye movements of decision-makers to certain items on the packaging. We conducted an eye tracking experiment manipulating the proximity of labels (grouped vs. ungrouped). Stimuli consisted of sixteen choice sets. Labels were randomly picked and placed on each product and manipulated twice for each choice set, which resulted in 64 trials. We found that decision-makers were more likely to look at two neighboring labels in a sequence when they were manipulated to be in close proximity, hence appeared as a group. Therefore, there is potential for visual attention to be guided to objects in close proximity. This finding can offer implications for a variety of fields as it serves as a way to make any core argument more readily available to decision-makers.

The Role of Attention in Analytic Decision Making

5 July
13:00
M2

Nathaniel Ashby
Harrisburg University of Science and Technology

With the recent push for the usage and integration of big data in businesses of all sizes analytic ability is fast becoming a critical skill in both the public and private sector and seen as an invaluable skill to potential employers. In the current study we set out to understand whether the distribution of attention can predict the ability to make objectively correct decisions based off analytic information above and beyond traditional measures of analytic ability (e.g., numeric ability, education, experience). In addition, we seek to determine whether attention can predict the ability of decision makers to convince teammates to accept their proposed decision through argumentation. Our experimental design has three stages. In stage one we will collect demographic information (e.g., age, experience, and education) and assess analytic abilities using standard measures such as objective and subjective numeric ability (numeracy) and visual literacy (i.e., the ability to garner information from graphical displays). In stage two, decision makers will come to the lab and have their eye-movements recorded. They will be presented with visual dashboards containing a regression table showing various environmental factors (e.g., population size and age) effects on predicted revenue for a small retail company; scatter-plots showing the relationship between each predictor and actual revenue; a bar graph displaying the levels of each environmental factor for five potential locations for building a new store front; and a filler/distractor graphic of no value. Each decision maker will indicate which location, based solely on the data provided, they would

suggest a new retail location be built. In addition, decision makers will write a paragraph arguing why this is the best location to build the new storefront. In stage three which will take place about a week later, decision makers will read four other decision makers (i.e., their teammates) arguments for where the best location to build is (as well as their own argumentation) and again indicate where they think the company should build its new store; the location with the most votes will be taken as the team's decision. We predict that after controlling for standard measures of analytic ability decision makers who spend more time examining the regression table and bar graphs and less time looking at eye-catching but non-diagnostic features of the display will be more likely to select the objectively better location. In addition, we posit that these decision makers will also sway their teammates decisions more as well through their argumentation.

Can a "Reminder" Reduce Attribute Non-attendance in Choice Experiments? Evidence from a Consumer Study in United States

5 July
15:00
M2

Daniele Asioli[1,2,3], Claudia Bazzani[4], Karl-Heinz T. Bäuml[5] and Rodolfo M. Jr. Nayga[3]

[1]University of Reading; [2]Consumer and Sensory Science, NOFIMA AS; [3]University of Arkansas; [4]University of Verona; [5]Regensburg University

Choice experiments (CEs) have been increasingly implemented to investigate consumers' choices for goods and services. Different alternative products are created using different combinations of attributes and attribute levels of the goods. Respondents are then presented with a series of choice scenarios (i.e. choice tasks) and are asked to choose their most preferred product alternative within each choice scenario. A key challenge in designing CEs is how to frame experimental choice tasks in a way that closely resembles consumers' true purchasing behaviour. A methodological issue raised in the CE literature is the so called "attribute non-attendance" (ANA) – that aims at identifying whether and how much respondents ignore some of the attributes used to describe the product profiles while they are evaluating the set of product alternatives in a choice task. The inherent assumption when using CE frameworks is that respondents attend to all the attributes presented in the various product alternatives. The violation of this assumption is an important issue since it may produce biased estimates. For this reason, recent research have investigated strategies to mitigate respondents' ANA behaviour. This study considers a novel approach by testing the use of a "reminder" given to respondents to consider or attend to all the attributes when making their choices. We conducted an online CE survey in the United States in Fall 2017. In the CE, consumers were presented with twelve hypothetical purchasing scenarios consisting of two product alternatives (i.e. chicken products) and an opt-out alternative. The product alternatives were described by four attributes including production method (conventional and cultured), antibiotics use information (antibiotics free and absence of information), carbon trust label (present and absent) and price ($2.50/lb, $5.50/lb, $8.50/lb, $11.50/lb). We tested the effect of the reminder, using a between-subjects approach

based on the conduction of three treatments (200 consumers for each treatment) differing in terms of the implementation of the reminder: the first treatment is the control (i.e. no reminder), the second treatment is the serial level reminder where a reminder is stated only at the beginning of the series of choice tasks and, the third treatment is the choice task level reminder where a reminder is stated at the beginning of each choice task. In addition, for each treatment we collected data about stated ANA at serial level (i.e. asking consumers if and which attributes that they did not attended). We have currently started to perform data analysis, hence a full set of results is not yet available. Marginal WTPs for the different products will be calculated for each treatment using estimates from Random Parameters Logit (RPL) models, non-accounting and accounting for ANA behaviour. Estimates will inform about the effect of reminder on reducing ANA in CE framework by comparing consumers' preferences and WTP across the different treatments. Results will provide valuable insights on how to reduce ANA and improve the validity and reliability of data collected through CE in order to improve welfare measure estimates.

The Female Connoisseurs: How the Level of Experience Reveals Attentional and Decision-making Processes?

5 July
15:30
M2

Marija Banovic[1] and Pedro J. Rosa[2,3,4]

[1]Aarhus University; [2]EPCV- Universidade Lusófona de Humanidades e Tecnologias; [3]HEI-LAB: Digital Human-Environment Interaction Lab/ULHT; [4]Instituto Universitário de Lisboa (ISCTE-IUL)

Decision-making research points that expertness (developed through experience) can make decision makers more reliant on a limited set of cues for making decision, that is, they are more susceptible to cognitive bias than novices (Crosskerry, 2003; Kahneman, 2011). Accordingly, it is expected that this cognitive bias should also be reflected on attentional and decision-making processes in the sense that experts use visual information (less methodical) than novices and less time to choose the product. Most food is sold to women either directly or indirectly, as women remain the primary household's decision-makers. Female consumers often have difficulties in choosing the "right red meat cut", mainly due to its adverse sensory properties related to visual appearance and health, which may vary with the level of experience (Banovic et al., 2012). An eye tracking experiment was used to examine how ocular behaviour, as a proxy of attentional processes, differs between groups of female consumers with different levels of expertise on read meat. Sixty-five female non-vegetarian consumers were recruited for the experiment (M_{age} = 26.5 years). Tobii T60 eye tracking system was used. Stimuli set was presented on a black background in a 1280 x 1024 pixels resolution with the four pictures 600 x 496 pixels, within the square 640 x 512 pixels. Images did not differ in luminance ${\chi^2}_{KW}(3) = 1.513$, $p = 0.679$, contrast ${\chi^2}_{KW}(3) = 1.923$, $p = 0.589$ or area size ${\chi^2}_{KW}(3) = 1.872$, $p = 0.599$. The experimental design was a within-subjects 2x2 design representing different levels of intramuscular fat (IF) and fat rim (RM) producing different level of meat healthiness (e.g. A – unhealthy to D – healthy). Latin square was used

for counterbalancing of the treatments. The participants had to choose (state) the preferred meat, after which their level of experience was assessed using frequency of purchase (i.e. more/less than once a week). The 60% of the subjects indicated to be more experienced. The results show that females made different choices for the presented meat where healthy cuts presented a higher proportion in comparison to the rest (34.8%, $\chi^2 = 113.74$, $p < 0.001$). Further, it showed that females differed in their choices and made equivocal (clearly chose one type of cut, e.g. D – healthy cut) or unequivocal choices (chose different cuts, e.g. A – unhealthy and D - healthy). This was influenced by their frequency of purchase where frequent buyers had a higher proportion of equivocal choices compared to less frequent buyers ($p = 0.044$, two-tailed Fisher's exact test, $\phi = 0.28$). The females that made unequivocal choices displayed more ocular fixations on the preferred cut ($M_{nf} = 5.24$, $p < 0.001$) and more time on it ($M_{tdf} = 1.72$s, $p < 0.001$). Further, a stratified data analysis was performed to control the effect of age. The Cochran-Mantel-Haenszel method showed that association between frequency of purchased and unequivocal choice is significantly different across age groups. The association between frequency of purchase and equivocal choice is significantly stronger in young women (OR = 0.08; 95% CIs [0.01, 0.72]), further suggesting the importance of experience in buying.

An Adaptive Response to Disfluent Fonts

5 July
16:45
lobby in
front of
M2

Valon Buxhovi[1], Jacob L. Orquin[2,3] and Nina Chrobot[4]
[1]Inspari; [2]Aarhus University; [3]Reykjavik University; [4]Tobii Pro

The relative ease or difficulty with which we process information, also known as perceptual or processing fluency, has been shown to influence decision making in a range of tasks. However, the manner in which processing fluency has exerted influence over human judgment has not always been consistent, whilst in most instances the effect of increased fluency has had a positive effect on choice behaviour, more recent publications have shown that increased processing difficulty ensured customer interest and generated higher choice probabilities (Labroo & Kim, 2009; Labroo & Pocheptsova, 2016; Pocheptsova, Labroo, & Dhar, 2010). In two studies, we examine two possible mechanisms behind fluency effects on decision making. Given the fluency-as-heuristic mechanism we expect that a relatively disfluent option generates an experience of processing difficulty which is interpreted negatively based on a naïve theory and included in decision making. This experience serves as a heuristic cue and consequently decrease the depth and breadth of information search as measured by fixation count and entropy respectively. An alternative explanation within metacognition theory, as proposed by Alter, Oppenheimer, Epley, & Eyre (2007), assumes a fluency-as-analytical processing mechanism where disfluency leads to deeper and broader information processing. The fluency-as-analytical processing mechanism seems to predict that disfluent options should be processed deeper than fluent options and at be chosen with a lower probability. However, this prediction conflicts with observations from eye tracking studies showing that decision makers have more fixations on options they prefer, and are more likely to

choose more frequently fixated choice options. In experiment 1, we set out to isolate the bottom-up effects which arise when manipulating the physical appearance of stimuli in the proposed disfluent conditions, which manifests as relative over and under attendance towards disfluent stimuli. We used these findings to adjust fixation counts in experiment 2, where participants were asked to indicate purchase intention of digital cameras on fluency manipulated e-commerce product pages. Accounting for the relative over and under attendance ensured comparability across conditions. We analysed the effects of fluency on choice through multilevel mediation with two mediators; breadth and depth of information search. The mediation analysis did not support the fluency-as-analytical processing mechanism, as it displayed negative effects of disfluency on breadth and depth of information search as well as negative direct effects on choice. However, the findings do suggest that disfluency effects information processing by reducing the breadth and depth of search, we thereby fixate fewer product attributes and do so less frequently when facing processing difficulty.

Effort and Bayesian Updating: A Pupil-Dilation Study

5 July
11:00
M2

Carlos Alós-Ferrer[1], Alexander Jaudas[1] and Alexander Ritschel[1]
[1]University of Zürich

Performance in economic tasks is commonly used to analyze the effect of higher monetary incentives on behavior. However, the relation between incentives and performance is far from straightforward, due to, e.g., ceiling effects or increased reliance on heuristics with increased incentives. Previous studies on decision making under risk using belief-updating tasks have found that increased incentives did not result in increased performance. There are different possible explanations for this result: either increased incentives simply did not affect the participant's behavior, or the induced behavioral change did result in increased effort, but the latter did not translate into improved performance. To disentangle these candidate explanations, we relied on pupil dilation, which has been often shown to reflect current cognitive effort. We conducted an experiment (N = 60) using a belief-updating task and recorded pupil size at a rate of 250 Hz using a remote eye-tracker. The belief-updating task consisted of 128 trials. Monetary incentives were varied within subject and announced at the beginning of each trial. We measured pupil dilation in each trial allowing us to compare the cognitive effort across incentive conditions. We found that higher incentives induced larger pupil dilations, suggesting that higher cognitive effort was exerted during the belief-updating task. That is, higher incentives led to increased effort, but this effort did not translate into increased performance. Combined with previous behavioral results which contradict possible ceiling effects and previous EEG results which indicate increased reliance on reinforcement-based heuristics, this evidence leads us to conclude that higher incentives in our paradigm resulted in increased but misguided effort.

Reporting Standards in Eye Tracking Research

5 July 16:45 lobby in front of M2

Susann Fiedler[1], Michael Schulte-Mecklenbeck[2,3], Frank Renkewitz[4] and Jacob L. Orquin[5,6]

[1]Max Planck Institute for Research on Collective Goods; [2]University of Bern; [3]Max Planck Institute for Human Development; [4]University of Erfurt; [5]Aarhus University; [6]Reykjavik University

We develop a reporting guideline for eye tracking research in the behavioral sciences. To this end, we code 215 articles on behavioral decision making published between 2009 and 2017 and create an extensive list of reporting items. We then let a panel of eye tracking experts rate the necessity of each item for reproducibility. The resulting guideline contains 31 items that are judged as necessary by the majority of experts for reproducing an eye tracking study. None of the coded articles report all necessary items and approximately 70% of the articles report less than 50% of the necessary items. Furthermore, there is no association between what is important to report and what is actually reported in the articles. Adopting the proposed reporting guideline is an important step towards more transparent and reproducible eye tracking research in the behavioral sciences.

The Effect of Selective Attention on Preferences

6 July 14:00 M2

Arnd Florack[1], Martin Egger[1] and Ronald Hübner[2]

[1]University of Vienna; [2]University of Konstanz

A basic idea in vision research is that selective visual attention does not only determine which information is processed, but also how stimuli are evaluated and chosen. Researchers have provided first evidence in support of this idea already a decade ago, and more recently researchers demonstrated that selectively attending to products during an exposure phase increases the likelihood of choosing them from a choice display after the exposure, whereas selective inattention decreases the likelihood of choice. However, despite these promising studies little is known about the processes that underlie the observed effects. In four experiments, we tested whether or not (a) (motor) responses to the products are learned in the exposure phase and retrieved in the subsequent choice situation, (b) visual attention is learned during the exposure phase and influences attention in the subsequent choice situation, and (c) selective attention causes a difference in perceived fluency. In Experiment 1 and 2, we replicated the basic effect of selective attention on choice observed in previous research and found that this effect could not be explained by response retrieval, time to first fixation, or duration of attention during the choice task. Previous research had not determined whether individuals learn to respond to stimuli they selectively attend to (target stimuli) and not to respond to stimuli they neglect (distractor stimuli) or whether individuals learn to attend more quickly or for longer periods of time to target stimuli in comparison with distractor stimuli. The present research rules out such explanations and supports the idea that selective attention affects preferences independently of any learning that is related to responding or attending.

Experiments 3 and 4 further illustrated how the competition between target and distractor stimuli during exposure might affect preferences in a subsequent choice task. We found that selective attention directed toward target products compared with distractors led to increases in subjective fluency (Experiment 3), recognition accuracy (Experiment 4), and recognition speed (Experiment 4). The results support the notion that selective attention enhances perceived fluency through a biased competition process. We suppose that during the exposure phase, the processing of target stimuli is enhanced, and the processing of distractors is impaired. We further suppose that this biased processing is continued in the choice task, and finally shapes preferences.

Know Your Risks: An Eye Tracking Study of Processing Real Life Statistics Regarding Neoplasms and Circulatory Diseases

5 July
16:45
lobby in
front of
M2

Kamil Fulawka[1] and Dominik Lenda[1]
[1]SWPS University

In 2014 diseases from two most lethal groups, namely neoplasms and circulatory diseases, accounted for nearly 72% of all deaths in Poland. Quick look at WHO data from other countries shows that the percentage for almost all countries is higher than 50%, with Denmark having one of the lowest rate at 56% and Bulgaria having the highest rate, with almost 83% of deaths caused by disease from one of the two categories. Risks of suffering from various circulatory diseases and neoplasms can be significantly decreased with healthy diet, regular exercise and reduction of stress in everyday life. Thus, it is important for people to be able to accurately process various statistics and conditional probabilities regarding diseases, especially when they have to make decisions regarding preventions and interventions. Research about decision making under risk demonstrates that people tend to greatly distort probabilities (i.e. over- and underweight them) when outcomes are highly aversive and affect laden. Taken together, results of these studies suggest that when facing decision problem that involves lethal diseases, people may be especially inclined to poor judgement and suboptimal decision making. Recent work of Pachur and colleagues (2018) showed that people distorted probabilities less when they put more attention into inspection of the information. Earlier, Johnoson and Busemeyer (2016) proposed that affect-rich outcomes have higher probability of being fixated first and that such outcomes fixate attention more, which leads to less transitions between attributes and results in more probability distortion. In our project we aim at understanding how people process numerical information about various diseases and what kind of risk judgement they make about them. In an eye tracking study we plan to present people with diagnostic entities from ICD-10 accompanied by morbidity (MR) and case fatality rates (CFR – probability of death given the disease) taken from the data provided by WHO. In half of the trials, the information provided will be CFR and MR conditional on the participant's gender and sex. In the remaining half of the trials the statistics for overall population will be given. Each presentation will be followed with assessment of subjective risk regarding the

diseases. From earlier, behavioural study conducted in our lab we know that neoplasms are perceived as more frightening than circulatory diseases. Thus, we predict that for neoplasms the processing should consist of less transitions between disease name, MR and CFR than for circulatory diseases. Also, we should observe higher fixation frequency on the disease name for neoplasms (as an indicator of dwelling on the affect-rich outcome) than for circulatory diseases. Additionally, we predict that providing CFRs and MRs conditional on age and sex will increase overall fixation frequency and mean fixation duration – which would indicate that the stimuli is more important and is being processed more deeply. At the time of writing the abstract, the study is in final phase of procedure design. We plan to present initial results at the conference.

Choosing While Losing: Investigating the Effect of Valence and Relative Magnitude on the Dynamical Features of Choice

6 July
14:30
M2

Avril Hand[1], Denis O'Hora[1], Petri Piriioinen[1] and Rick Dale[2]
[1]National University of Ireland; [2]University of California

Previous work in our laboratory investigated the acquisition of learning choice values and the dynamics of behaviour once these values were learned, in both gain and loss decisions (i.e. positive valence and negative valence respectively). Subjects chose between two symbols representing High/Low, High/High, and Low/Low values in gain and loss decisions. As expected, decision number increased performance and choice values were learned faster and more reliably in loss conditions. In addition, differences in the interpretation of choices between the two best and two worst options available were treated differently under gain and loss conditions. Differences in levels of self-reported positive and negative affect were also found, specifically, in loss conditions, higher levels of negative affect coupled with lower levels of positive affect. In a later study the choice requirement was manipulated by removing the 'click' requirement in exchange for a 'mouse-over' requirement. Analyses indicated that accuracy and acquisition of learning was reduced relative to previous work. Response times were shorter and differences in response dynamics across conditions were less robust than previously observed. In follow-up studies, the choice requirement was further manipulated by employing mouse-over choice delay times (MOD; i.e., 0.5, 1.0, 1.5 second delays). Preliminary analyses indicate that increasing the MOD improved the acquisition of values and the MOD affected the dynamics of behaviour differently in gain and loss conditions. These data suggest an interaction between choice requirements and evaluation of gains and losses.

Sequential Evaluation and Path Dependency in Risky Intertemporal Choice

5 July
10:30
M2

Emmanouil Konstantinidis[1,2], Don van Ravenzwaaij[3] and Ben R. Newell[2]
[1]Centre for Decision Research, University of Leeds; [2]University of New South Wales;
[3]University of Groningen

Previous research on the effects of probability and delay on decision-making has focused on examining each dimension separately, and hence little is known about when these dimensions are combined into a single choice option. Importantly, we know little about the psychological processes underlying choice behaviour with rewards that are both delayed and probabilistic. Using a process-tracing experimental design (similar to a MouseLab information board), we monitored information acquisition patterns and processing strategies. The experiment consisted of two parts: a pricing task, where participants were asked to provide the present certainty equivalent of a risky and delayed prospect (68 prospects as in the following form: \$170 with 90% probability in 12 months); and a choice task, where they had to choose between two risky and delayed prospects. The choice dyads were formed using pairs of prospects from the pricing task (34 choices). In both parts, the information for each prospect (payoff, probability, and time) was hidden under labelled boxes and only revealed upon clicking on them. The use of this design allowed us to examine the order in which information was acquired, the time spent on each information item, and the transitions between consecutive information items. We found that probability and delay are processed sequentially and evaluations of risky delayed prospects are dependent on the sequence of information acquisition. Among choice strategies, directly comparing the values of each dimension (i.e., dimension-wise processing) appears to be most favoured by participants (in the choice task). Our results provide insights into the psychological plausibility of existing computational models and make suggestions for the development of process models for risky intertemporal choice.

Retro-cueing in Multi-attribute Choices: Saliency in Memory on Strategy Selection and Attributes Weights

6 July
10:30
M2

Antonia Krefeld-Schwalb[1], Agnes Scholz[2] and Benjamin Scheibehenne[1]
[1]University of Geneva; [2]University of Zürich

Decision making in multi-attribute choices is highly adaptive to the task structure. Recently, it has been proposed that the availability of information in memory is one driving force to adaptive decision making. In this study, we examined the relationship between memory accessibility and decision making more closely. Therefore, we applied the retro-cueing paradigm to a multi-attribute choice task. That is, after each initial encoding of attribute information, the attribute information disappeared and one attribute was highlighted through a retro-cue. In three experiments we found that the observed effect of the retro-cue on choices is two-fold. First, cueing increased the probability to choose the cued option and second, cueing led to an increase of choices in line with a compensatory decision strategy. Recording gaze

data further showed that cueing increased the probability of attribute-wise transitions that have been associated with the use of compensatory decision strategies. We provide a computational Toolbox model to describe the observed effects. Additionally, to a mixing parameter indicating the probability of using a non-compensatory over a compensatory decision strategy, two parameters were added to the original toolbox model to account for the cueing effect on the choices. One parameter that increases the weight of the cued option and another parameter that increases the probability of a compensatory decision strategy in presence of a retro-cue. While providing a better fit than alternative models, the mixing parameter of the Toolbox is also correlated with the observed increase in attribute-wise gaze transitions. Our results provide novel insight into the influence of accessibility of attribute information in memory on decision making. Instead of increasing the weight of the cued information only, our data suggests that all information related to the cued information is recalled and influences the choice subsequently.

Blinded by Sentiment: Transaction Fees Obstruct the Cognitive Processing of Positive Expert Opinions about Stocks

5 July
13:30
M2

Michal Krol[1] and Magdalena Krol[2]
[1]University of Manchester; [2]SWPS University

Recent cognitive psychology studies have demonstrated that disagreeing with a statement makes it harder to identify it as grammatically or orthographically correct, a phenomenon known as the 'epistemic Stroop effect' (Gilead, Sela, & Maril, 2018; see also Richter, Schroeder, & Wöhrmann, 2009). Relatedly, setting one's mind on a decision early on is known to obstruct the processing of new information (Bronfman et al. 2015). To demonstrate the potential role of these phenomena in financial decision making, we conduct a stock trading experiment with eye-tracking. 100 subjects repeatedly decide whether to invest in S&P500 stocks, based on learning each stock's returns over a randomly chosen past period and whether a transaction fee must be paid. Following this, they also see a word cloud of financial expert opinions about the stock published in the same period in a major investment portal, seekingalpha.com. The proportion of positive words (as per the Loughran & Mcdonald, 2011 financial sentiment lexicon) included in such opinions about a stock has been shown to predict its subsequent return (Chen et al. 2014), and these actual stock exchange returns in the subsequent period determine the earnings of our subjects who choose to invest. However, instead of the relationship between opinions and returns, we are interested in the effect the opinions have on the subjects, and specifically in how the presence of the transaction fee influences the cognitive processing of positive vs. negative words. To this end, while subjects were made aware that the presence of the fee was determined at random and independent of the returns and opinions, each investment opportunity appeared twice over the 80 trials of the study: once with and once without the fee, in random order (we verified that the repetition was unnoticed by subjects). We compared the subjects' gaze data while exploring each word cloud under the two scenarios, controlling the head movements, distance

from screen and luminance. Using multilevel mixed modelling, we found that subjects process positive words in the word cloud significantly more slowly (longer eye fixation time) when the transaction fee is present rather than absent (controlling for the word length and placement on the screen and including nested random intercept and slope effects grouped by subject and trial). Similarly, when the fee is present rather than absent, subjects have a larger pupil dilation when viewing positive words. This suggests that a negative initial sentiment towards investment induced by the fee makes it more effortful to process positive expert opinions, just like, in the epistemic Stroop effect, a negative sentiment towards a statement makes it harder to make a correct positive grammaticality judgment. Indeed, we also find that the fee significantly reduces the extent to which the number of positive words in the word cloud increases the subjects' optimism regarding the stock's subsequent return. Thus, readily available information, e.g. on investment transaction fees, could hinder the subsequent processing of more complex, textual opinion data, particularly when its tone is incompatible with one's pre-existing investment sentiment induced by the initial information.

The Effect of Fixation Order on Choice

5 July
16:45
lobby in
front of
M2

Erik Stoltenberg Lahm[1] and Jacob L. Orquin[1,2]
[1]Aarhus University; [2]Reykjavik University

Modern decision makers are regularly faced with ordered information. Consider, for example, how we choose from a list of search results in Google or other search engines. The vast majority of decision makers choose one of the top five listed results and only a small fraction chooses from the bottom of the list. Similar order effects occur in online grocery shopping, where products are listed by category. Decision makers frequently choose products from the first category page and consistently use the default display option chosen by the retailer. These ordered visual environments may influence not only what we see but also when we see it. Following this line of thought, if we consider that the visual environment can influence the order of perception and that order of perception may be equal to the order of integration of information, then it follows that the visual environment may influence not only what we choose but also how we choose it. In order to understand how the order effect influences the choice process, we re-analyzed a subset of the original data presented in Orquin et al. (2018 under review). Thirty-two participants performed a preferential choice task, in which the information complexity was manipulated by increasing the number of available choice alternatives between 3 to 27. We computed the probability of choice given the fixation order across set sizes and found that the order of processing can influence decision makers' choices. This effect arises as a function of how decision makers search for information. As set sizes increases, decision makers become more likely to ignore a growing percentage of available information. Our findings suggest that the importance of order arises as consumers truncate their search as a response to increasing information load.

Eye-tracking Evidence for Attention Differences in the Processing of Quantified Phrases with Verbal or Numerical Quantifiers

6 July
10:00
M2

Dawn Liu[1], Marie Juanchich[1], Tom Foulsham[1] and Miroslav Sirota[1]

[1]University of Essex

Communicators of information can use verbal or numerical terms to present a quantified phrase. According to previous research, the use of a verbal quantifier (e.g. 'low') leads people to make different decisions from the use of a numerical quantifier (e.g. '5%'). Two explanations have been suggested for these differences: a dual-process account, which posits that verbal quantifiers are more intuitively processed than numerical ones, and an attention-based account, which posits that verbal and numerical quantifiers shift attention to different aspects of a quantifier phrase. Current research provides mixed evidence for these accounts, possibly because outcome-based measures are less direct measures of the cognitive mechanisms at play. In a pre-registered eye-tracking experiment, we tested the explanation for differences in decision-making with verbal and numerical quantifiers by tracking participants' attention to two different aspects of quantified information: an attribute (presented as a nutrient on a simplified nutrition label) or a quantity (a value associated with the nutrient). Using a 2 (format: verbal or numerical) x 2 (nutrient valence: positive or negative) x 2 (quantity: low/20%, medium/40%, or high/70%) within-subjects design, we presented to participants ($N = 148$) a single nutrient with a single quantity. Participants' eye movements were tracked while they made a judgement about the healthiness of food with each presented label. In line with the attention-based account, we found that participants looked longer at the attribute (nutrient) information when given verbal compared to numerical quantifiers. Conversely, they looked longer at the quantity information when given numerical as compared to verbal quantifiers. There was mixed evidence for the dual-process account, as participants looked at numerical labels longer overall than verbal ones, however judgement times were similarly quick for both formats. Participants also judged labels with positive nutrient information (e.g. 'high protein') to be healthier for the verbal than the numerical quantifiers, while they judged labels with negative nutrient information (e.g. 'high sugar') to be less healthy with the verbal than the numerical quantifiers. A mediation analysis indicated that the greater attention to the nutrients for the verbal compared to the numerical quantifiers partly explained the variation in healthiness judgements. Overall, results provided greater support for the attention-based than the dual-process model of differences in verbal and numerical quantifier processing. Varying the quantifier format shifts attention to different aspects of a quantified phrase, which in turn affects how people use this information to reach a judgement or decision.

Consumer Behavior in Natural and Virtual Shopping Environments: Differences and Similarities

5 July
16:00
M2

Christian Peukert[1], Jella Pfeiffer[1], Martin Meißner[2] and Thies Pfeiffer[3]
[1]Karlsruhe Institute of Technology; [2]University of Southern Denmark; [3]Bielefeld University

Due to the technological progress in the field of Virtual Reality (VR) technology, it is not only possible to generate entire virtual shopping environments with manageable effort, but also to unobtrusively investigate consumers' eye movements through eye trackers integrated in the head-mounted displays. In natural environments (reality, e.g., in a store), eye tracking data has already been used to describe consumer behavior and, in particular, to detect different stages in consumer decision-making processes. In the corresponding literature, a distinction into three consecutive stages describing the orientation (overview), the evaluation (comparison), and the verification (checking) within a decision-making process has been established. However, consumer behavior and especially the decision-making process in virtual shopping environments are largely unknown and might be different from the ones in natural environments. We therefore make a first attempt to test the applicability of these approaches within virtual shopping environments. To shed light on this topic, we conducted a laboratory study to investigate consumer behavior within highly immersive VR environments. Our participants had to perform several choice tasks within a virtual shopping environment in which they had to pick one product (a muesli) out of a sample of 24 product packages which were displayed on a virtual shelf. Participants could take products from the shelf and turn them to have a closer look on each side of the package. A task ended whenever a participant placed a package in a virtual shopping cart and confirmed the purchase. Overall, the study design aimed at reproducing reality. Hence, in order to compare consumer behavior in VR to behavior in natural environments, half of our participants carried out their last two choice tasks facing real supermarket shelfs in the laboratory. For these two tasks, the products and respective prices were exactly the same for all participants independent whether they remained in the virtual or switched to the natural shopping environment (even the shelf was looking exactly the same as it served as model for the 3D-model used in VR). Throughout the entire study, we collected participants' eye movements using a head-mounted display with integrated eye tracker, participants' body interaction data based on the body tracking system of the applied hardware (HTC Vive) as well as all system inputs that were made using the controllers. To capture the eye movements for the two tasks in the natural environment, we applied mobile eye tracking. For the analysis of the decision-making process, a twofold approach is planned to be conducted: First, we plan to initially analyze basic variables describing the process such as task duration, basic interactions and descriptive eye tracking data (e.g. number of grabbed products, fixations on products and price tags, fixations on different shelf positions, the development of these variables with increased task experience, etc.). Second, based on the observed eye tracking data, we try to identify different stages of the decision-making process applying known approaches from literature from natural environments and compare the findings between participants that have performed the tasks in reality with those in VR.

Impossible Participants or Impossible Instructions? An Eye-tracking Investigation of an Ego depletion Paradigm

5 July 16:45 lobby in front of M2

Anine Riege[1], Emma Henderson[1], Amélie Gourdon-Kanhukamwe[1] and Gaëlle Vallée-Tourangeau[1]

[1]Kingston University London

More than 600 experiments across two decades have tested the idea that exerting self-control temporarily reduces its capacity for subsequent use, also known as ego depletion (Baumeister, Bratslavsky, Muraven, & Tice, 1998). However, several replication studies have found no evidence of ego depletion (e.g., Lurquin et al., 2016). One reason suggested for this discrepancy is that some of the instructions used in ego depletion research are ambiguous, and though adherence to the task instructions is assumed it is not tested. As such, some participants in the control group may exert self-control without being asked to do so; while some participants in the depletion condition may not follow task instructions and thus not exert self-control. The present work uses eye-tracking to investigate a commonly used dual-task design, namely the video-viewing task followed by the GRE. The video-viewing task requires participants in the ego depletion condition to avoid looking at words that appear on the screen, while the control participants are given no information about the words. We replicated the original study (Schmeichel et al., 2003) and added covert eye-tracking to determine whether participants were following instructions. If the instructions are indeed ambiguous, some participants in both conditions will fail to adhere to task instructions and concomitantly there would be no difference in performance in the outcome task. Seventy-one participants were recruited (M_{age} = 24.66, SD_{age} = 7.74, 53.5% women). All participants watched a 6-min silent video and were asked to judge the woman's body language, while their eye movements were covertly tracked. Half of the participants were told to avoid attending to words appearing at the bottom of the screen (ego depletion condition). The remainder of the participants were given no such instructions (control condition). Participants then completed 13 problem solving questions from the GRE (a test where successful performance requires self-regulated thinking). The ego depletion model predicts that ego depleted participants will show impaired performance on the GRE. The eye-tracking data showed that overall participants followed the task instructions, as participants in the ego depletion condition had significantly less fixations in the Word AOI compared to the control participants. Control participants also had significantly more revisits to both the Word AOI and the Woman AOI. In contrast to the ego depletion model, there was no significant difference between the ego depletion and the control group in GRE performance.

From Static Psychometrics to Psychometrics of the Continuous Mind via Mouse Tracking Multiple Regression

6 July
11:30
M2

Stefan Scherbaum[1] and Maja Dshemuchadse[2]

[1]Technische Universität Dresden; [2]Hochschule Zittau/Görlitz

Psychometrics usually relies on static measures, e.g. answers in questionnaires or responses in tasks. This focus on static and discrete measures neglects the information that is present in the process leading to an answer or a response. Mouse tracking promises to open a continuous window on such processes, but most mouse tracking studies do not exploit the full potential of the method, that is, the extraction of dynamic, psychometrically valid markers for the different sub-processes which are intertwined on the way to the final response. I will present an approach that builds on our established method for the dissection of sub-process dynamics from mouse movements, time continuous multiple regression (TCMR), and extracts dynamic markers for the different sub-processes leading to a response. These dynamic markers provide information about the timing, the duration, and the strength of the influence of the different sub-processes. I will present first results on the psychometric properties of these dynamic markers, i.e. reliability and validity. Furthermore, I will illustrate how these dynamic markers can further be applied in group-level studies, e.g. on differences between the Flanker and the Simon task. All analyses presented can be performed with the TCMR Matlab toolbox that is provided for download (osf.io/5e3vn).

Validate Mouse Tracking: How Design Factors of the Mouse Tracking Procedure Influence Action Dynamics

6 July
12:00
M2

Martin Schoemann[1], Tobias Grage[1], Malte Lüken[1], Pascal Kieslich[2] and Stefan Scherbaum[1]

[1]Technische Universität Dresden; [2]University of Mannheim

Mouse-tracking as a process-tracing method builds on the assumption that the continuity of mind leaks into the continuity of movements. Given this assumption, it is an important question whether the assumed interaction between mind and movement might be influenced by the measurement itself, that is, design factors of the mouse-tracking procedure. We conducted two mouse-tracking studies (each $N = 40$) in which we systematically investigated the influence of two commonly occurring design factors on the continuity of mouse movements, and hence, the reported effects as given by discrete and continuous mouse-tracking measures. In the first study, we used a mouse-tracking version of an intertemporal choice task that had previously been used to examine the dynamics of temporal discounting and the date-delay effect (Dshemuchadse, Scherbaum, & Goschke, 2013). In the second study, we used a mouse-tracking version of a Simon task that had previously been used to examine the temporal dynamics of action selection (Scherbaum, Dshemuchadse, Fischer, & Goschke, 2010). The data from each previous study also served as one condition in the respective experimental design in order to investigate the influence of the starting procedure (dynamic vs. static; cf. Scherbaum & Kieslich, 2017). Additionally,

within both new studies we varied the response procedure (hover vs. click). We found that the variation of the starting procedure crucially influences the continuity of mouse movements; the variation of the response procedure introduces additional variance. Consequently, in both tasks, those systematic variations led to differences in the cognitive effects. In the most extreme case, in the intertemporal choice task, the cognitive effects vanished when a static starting procedure was applied. In sum, our results reveal that design factors in mouse-tracking procedure indeed influence the interaction between mind and (mouse) movements and therefore have impact on cognitive effects as given by discrete and continuous mouse-tracking measures (e.g., date-delay effect and Simon effect). Furthermore, our findings support the supposition that at least some commonly used design factors jeopardize the continuous leaking of mind into movements, and hence the validity of mouse-tracking as a process-tracing method.

Rewards and Uncertainty Jointly Drive the Attention Dynamics in Reinforcement Learning

6 July
15:00
M2

Hrvoje Stojic[1], Jacob L. Orquin[2,3], Maarten Speekenbrink[1], Peter Dayan[1] and Raymond Dolan[1]

[1]University College London; [2]Aarhus University; [3]Reykjavik University

One of the central facets of reinforcement learning (RL) is the trade-off between exploration and exploitation. When choosing between something familiar and something new, agents must balance gathering rewards (exploitation) against acquiring information (exploration) that can be used to gather greater rewards in the future. However, how humans navigate this trade-off is poorly understood. Possible strategies range from the simple: e.g., choosing based on the relative rewards of options and exploring randomly, to the sophisticated: e.g., also including the informativeness of options. However, it is challenging to distinguish which strategies people use from just their choices. To try to tease them apart, we recorded eye movements while participants were making choices in multi-armed bandit tasks, which are paradigm cases of the trade-off. We interpreted fixations on options in terms of attentional allocation, and thereby acquired fine-grained information about learning and decision-making. Computational modelling of the combined processes of choice and attention showed that estimated rewards and uncertainty about those rewards both drove attention. The uncertainty about how rewarding are the options serves as a proxy for the informativeness of picking them; the impact of this over choice provides evidence that people use sophisticated exploration strategies. In contrast, most studies using just choice data have not been able to discern such exploration strategies. In addition, we found that the data on attention improved our ability to predict individuals' choices. Our study illustrates how joint computational modelling of multiple data sources allows us to evaluate competing accounts of the behaviour.

How Cost Shape Attention and Search: An Experimental Study

5 July
11:30
M2

Franziska Sump[1] and Stephan Billinger[2]
[1]University of Hamburg; [2]University of Southern Denmark

The importance of search and trial-and-error learning to organizations has been emphasized in the literature for a long time (e.g. Cyert & March, 1963; March & Simon, 1958). Balancing exploration and exploitation is of major importance for competitive advantage (Tushman & O'Reilly, 1996); it can be described as search for new alternatives that unfold through the (re)combination of choice variables (Levinthal, 1997; Rivkin, 2000). Interestingly, large parts of the actual search process are still black-boxed (Posen et al., 2018); a gap we wish to address. The concept of attention has a long history in organizational research as it plays a decisive role for decision-makers that face bounded rationality (March and Simon, 1958; Simon, 1947). Decisions are affected by how decision makers attend to choices that are available to them and by the performance of choices they made in the past (March, 1994). Different areas of strategy research (e.g. Thornton and Ocasio, 1999; Zollo & Winter, 2002), emphasize the attention-based view (Ocasio, 1997) as a behavioral perspective that offers insights into how attention shapes the development, implementation, and elaboration of good ideas (Ocasio and Joseph, 2018). Strategies are based on how attention shapes actual search behavior in organizations and decision-makers typically face several choices, which may or may not be costly. Existing literature in management, have convincingly shown that costs can structurally guide decision-making and search behavior on the organizational and individual level (e.g. Siggelkow and Levinthal, 2003). This paper examines how cost shape individual attention and search by means of a laboratory eye-tracking experiment with 117 subjects. We use a rugged landscape (Levinthal, 1997) to study search behavior under uncertainty with a combinatorial multi-attribute decision task (Billinger et al., 2014). The task consists of six binary choices which jointly create a performance outcome. One of the six choice variables is associated with cost that have to be borne by the decision maker (treatment T2), one other random person (treatment T3), or cost are shared among all participants (treatment T4). Our results show that individuals, when compared to a control group without cost (T1), pay less visual attention to the costly choice attribute and do not consider costly alternatives for their decision. Further, we analyze individuals' search distance - the amount of variables that were changed compared to the most successful combination. We find that for individuals that have to bear cost, either themselves (T2) or jointly (T4), and that pay more attention to performance, use a lower search distance and, thus, less explorative search. By contrast, paying more attention on the choices, rather than performance, is associated with a higher search distance and more explorative search. These findings show that the focus of attention changes as 'who has to bear the cost' alters. Search behavior is therefore a result of attention focus and organization design that purposefully assigns search cost.

Unpacking the Privacy Paradox for the Internet of Things (IoT) by Tracing Mental Decision Processes

5 July
14:00
M2

Qizhang Sun[1], Martijn C. Willemsen[1] and Bart P. Knijnenburg[2]
[1]Eindhoven University of Technology; [2]Clemson University

Similar to many other domains in psychology, there is an intention-behavior gap in privacy: The privacy paradox shows that people actually disclose a lot of personal information (behavior) even though they report high concerns about privacy (intention) (Norberg et al., 2007). Research on the privacy paradox mostly concentrates on the existence of the phenomenon, influencing factors, and broad descriptions of the underlying decision approach (e.g., privacy calculus). According to Barth and de Jong (2017), one branch of the theories concerns the risk-benefit calculation. Individuals make a privacy decision depending on the outcomes of a 'privacy calculus', in which they calculate the privacy risks and benefits that they get in return for sharing information. Whichever being larger in this risk-benefit analysis drives the decision. The other branch of the theories involves little or no risk assessment. As the existing privacy decision approaches explaining the privacy paradox in different ways, there is a need to better understand the underlying decision process. Beyond a few exceptions (cf. Adjerid et al., 2016; Hann et al., 2007; Knijnenburg et al., 2013), it is has not been investigated what mental processes occur, and how risks and benefits are evaluated (if at all) when individuals make privacy decisions, which is critical to better understand what theories have a higher validity. In two experiments, we aim to explore and manipulate these mental processes. Aspect listing is a verbal protocol method that traces the mental decision process by requiring participants to list all the aspects regarding their decisions. The order and the number of aspects illustrate the mental decision processes. Similar to earlier research that shows for example how aspect listing can explain (and revert) the endowment effect (Johnson et al., 2007), we aim to get insights into the mental decision processes of privacy decisions. In Experiment 1, we measure whether participants consider benefits or risks more in intention versus behavior tasks in IoT privacy decisions, using aspect listing before or after the decision. Surprisingly, we found a reverse privacy paradox, in which people were more reluctant actually disclose personal information in a mockup interface of an IoT device then what they intended to share in a survey. In addition, those who thought of benefit first in the aspect listing task were more likely to disclose personal information in actual behavior, but the difference was not significant in intention. However, it is unknown if this difference in aspect listing is because mental process and decisions are simply correlated. Hence, in experiment 2 (that will run in May) we will manipulate the mental processes by manipulating to order of queries, forcing participants to think about one site of the aspects (e.g., risk or benefit of personal information disclosure) before the other. We expect those who are restricted to come up with benefit aspects first are more likely to disclose personal information, but the question is whether this effect will occur more strongly for behavior than intention, which will help to distinguish between the different theoretical accounts of the privacy paradox.

Process Tracing in Online Discrete Choice Experiments: A gamified Simulation of Consumer Decision Making

6 July
09:30
M2

Thorsten Teichert[1] and Alexander Graf[1]

[1]University of Hamburg

Recent studies on consumer decision making show revitalized interest in process tracing to better understand market-place choices. While Information Display Matrices served traditionally as instrument to uncover basic principles of consumer decision making, as e.g. attribute-based versus alternative-based decision rules, newer methods primarily rely on eye-tracking to uncover viewing sequences. Both approaches have limitations in terms of ease-of-application and are not (yet) suited for remote survey settings. This might explain why process tracing is seldom integrated into discrete choice experiments (DCE) which are widely implemented in market research applications. The ongoing research introduces a novel methodological approach to capture process data within DCEs so as to integrate key process data in preference estimation studies. A research software is developed to enable researchers to execute process tracing studies online without needing technical expertise. The process of information retrieval is simulated in two alternative playful settings in order to engage participants while aiming to closely resemble "natural' information acquisition behaviour. Two experimental settings are provided: 1) The setup of a "scratching" experiment adapts the traditional Information Display Matrices to the online environment in a gamified setting, enriched by several novel options available to researchers. Respondents are presented choice options (product offerings) online with disguised features which can be revealed by scratching (swiping with the mouse) the areas of interest. The researcher can decide how fast the information can be revealed by respondents, i.e. how much effort is needed to uncover the information, and whether the revealed information should remain visible or whether it should evaporate after a pre-specified time span. Latter case allows researchers to analyse revisit patterns of information search, whereas former case focuses on the initial search behavior; 2) The setup of a Point-of-Sale simulation resembles real purchase decisions more closely. Within this setting, three stages of information retrieval are differentiated: A shelf view is simulated whereby only selected key features of alternative product offerings are clearly recognizable. The second stage resembles a situation whereby a shopper takes a single product out of the shelf to investigate it more closely. Finally, a third level of information retrieval allows respondents to zoom in specific features to inspect them in detail. This level rebuilds situations whereby shoppers inspect the backside of a package to read nutrition information or look up further – mostly textual - information about specific features. As in real shopping situations, the three stages can be repeated multiple times before decision-making. The two alternative experimental setups are explained in detail. Two prototypical applications are presented to highlight the application potential. First experiences obtained in the field are reflected to gain an initial understanding on the feasibility of the proposed process tracing methodology. Researchers are encouraged to utilize the method for their own research in process tracing studies.

Process Tracing Beyond the Brain: The Use and Usability of Systematic Observations and Sequential Analyses Methods to Study Processes Underpinning Probabilistic Inferences

6 July
12:30
M2

Gaëlle Vallée-Tourangeau
Kingston University London

Judgement and decision-making studies traditionally involve short-term, lab-based settings where participants' responses to experimentally controlled stimuli are recorded and analysed. Process-tracing studies have sought to go beyond these input-output analyses and use various methods to trace the cognitive processes taking place in vivo to shed light on how judgements and choice are actually made. A shared assumption between traditional and process-tracing studies is that the cognitive processes that underpin judgements and choices are uniquely determined by neural activity. In this talk, I challenge this assumption by showing that it only holds because of the fixed nature of the tasks that have been traditionally used both in input-output and in process-tracing studies of complex cognition. Studying cognitive processes "beyond the brain" demands that experimenters relax the constraints they traditionally impose on the environment and free participants to move and disturb the information they are presented with. This opens up new avenues to understand cognitive processes as involving both neural and motor activity. Using the cases of a Bayesian reasoning task, I will introduce and illustrate the use of the method of systematic observation and sequential analysis (Bakeman & Quera, 2011). The objective of this observational study was to understand the mechanisms by which performance is improved when participants are given the opportunity to interact with the information display. Twenty psychology students took part in the study in exchange for course credits. The data were collected individually in the Kingston Psychology Observation Laboratory. Participants were invited to solve a series of three Bayesian reasoning problems presenting the statistical information using natural frequency statements. They were given a pack of cards prepared so that the number of cards provided matched the frequency counts in the problem statements. Hand movements were recorded from one camera attached to the ceiling and one camera attached on the wall of our observation lab. Behaviours were coded and analysed using Observer XT, a software application traditionally used to code and analyse observational data in studies of animal behaviour, infant behaviour, doctor–patient interactions, and ergonomics research. Results showed that Bayesian performance was best explained by a significant interaction between type of behavior and performance, $F(3, 105) = 6.94$, p ¡ .001, partial eta-squared = .17. Bonferroni-corrected post hoc independent t-tests comparisons confirmed that successful reasoners spent a significantly greater proportion of their time changing the presentation of the layout compared to unsuccessful reasoners, $t(35) = 3.16$, p ¡ .001, Cohen's d = 1.07. I will conclude by discussing the theoretical and methodological implications of these findings for the study of judgment and decision-making in practice and speculate on possible extensions of process-tracing methods beyond the brain using mobile eye-tracking, virtual reality, and ubiquitous computing.

Studying Visual Attention During Food Choice: The Case of Granola Bars

5 July 16:45 lobby in front of M2

Ellen J. Van Loo[1,2], Carola Grebitus[2] and Wim Verbeke[1]
[1]Ghent University; [2]Arizona State University

Achieving a more sustainable and healthy lifestyle is of great importance to society and to the individual. Sustainability and nutrition/health-related information on food labels are tools that assist consumers in making sustainable and healthy food choices. A large body of literature employs self-reported use of health or sustainability information when examining the effect on food choices. This research moves beyond relying on self-reported measures of label use, and instead uses eye-tracking measures to quantify the visual attention given to health and sustainability labels while making food choices. While eye-tracking technology has led to useful insights into consumers' use of nutritional information on food packages, it has never been applied to a combination of health-related and sustainability labeling. This study analyzes the impact of both sustainability- and health-related food labels on consumer visual attention and how it relates to food choice. A choice experiment was designed for granola bars. In a choice experiment, respondents are asked to select their preferred alternative from a given set (i.e., the choice set) in which each alternative is described by attributes of varying levels. Five attributes were included: genetic modification, sustainable production, (Fair trade and Rainforest Alliance), sweetener content claims (25% less sugar, 50% less sugar and no sugar alcohols), antioxidant content (high in antioxidants, good source of antioxidants) and price. During the choice decision making, the visual attention of respondents was measured using an eye-tracking technology. In total, the choices and visual attention of 115 participants were recorded. The sweetener content and genetic modification claims are fixated on the most, followed by the sustainable claims, antioxidants claims and price. We also found that visual attention and choice are related and higher attention leads to a higher choice likelihood.

The Constructive Role of Visual Attention During Product Choice: An Analysis of the Influence of Top Down, Bottom Up and Working Memory Processes

5 July 16:45 lobby in front of M2

Nick Zuschke
University of Hamburg

Since visual attention is a reliable predictor of choice it has extensively been used to analyze consumer decisions processes. Visual attention can be addressed with different theoretical expectations about eye movements. Top down control of visual attention can be defined as goal driven attention, while bottom up control of visual attention can be defined as stimulus driven attention. Research on goal driven attention typically addresses the influence of task instruction, utility effects, heuristics, learning effects or attention phases. In contrast research on stimulus driven attention typically investigates the influence of position, surface size, saliency and visual clutter on visual attention. Working memory demands also influence eye movements and

research typically focusses on information complexity, presentation effects, decision difficulty, time pressure, distracters, consideration sets, and pair-wise comparisons. Recent findings suggest that independent of utility effects, bottom up factors may increase the likelihood to attend a product and increased visual attention in turn down streams on choice likelihood. Prior research suggests that downstream effects are driven by mere exposure and information non-attendance. Moreover, there is evidence that downstream effects occur when consumers cope with working memory demands. So far, research mostly analyzed top down, bottom up and working memory processes separately and in a rather unstructured manner. However, in order to shed further light on the occurrence and underlying processes of downstream effects, a structured approach, manipulating top down, bottom up and working memory processes in an integrative manner is needed. This study addresses this issue by means of a choice based conjoint experiment combined with eye tracking. Choice based conjoint analysis reveals which particular bottom up process is acting on choice but provides insights of the decision process only indirectly. A complementary use of eye tracking allows enriching input output analysis with visual attention measures. In order to simulate a real purchase situation, the presented products were real life equivalents of chocolate bars differing on nine attributes (brand, claim, claim salient, key visual, guarantee, color identical, color glossy, size, price with two features each. For example, brand differed in real vs. fictitious. Top down processes were manipulated by varying task motivation, i.e. promising subjects a reward when they participated accurately. Working memory demands were manipulated by varying information complexity. In the high complexity condition, consumers were confronted with five products per choice set (decision trial) and a total amount of 16 choice sets. Consumers in the low complexity condition were confronted with three products per choice set and a total amount of 12 choice sets. Attributes in both conditions were the same nine attributes mentioned above. In order to disentangle bottom up processes and utility effects consumers were surveyed after the experiment, to find out whether they were influenced by marketplace metacognitions, such as the lay belief that products in the center may be more popular. Results are analyzed by linear and (conditional) logit regression. First results on attribute nonattendance, mere exposure and downstream effects are presented.
