



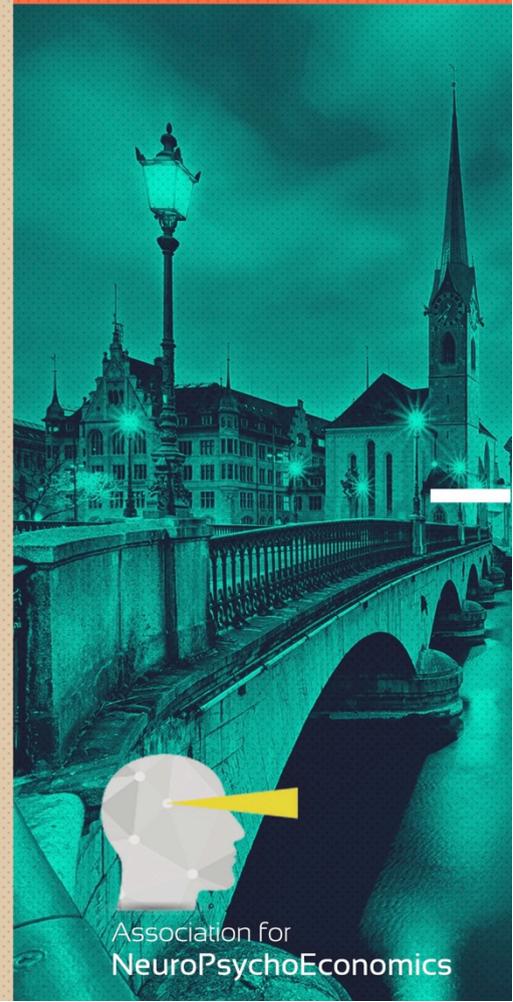
NeuroPsychoEconomics  
Conference



**14** <sup>TH</sup> NEURO  
PSYCHO  
ECONOMICS  
CONFERENCE

MAY  
**24 — 25**  
2018

MARRIOTT HOTEL  
ZÜRICH,  
SWITZERLAND



Association for  
NeuroPsychoEconomics

# 2018 NeuroPsychoEconomics Conference Proceedings

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## 2018 NeuroPsychoEconomics Conference Program

Conference Theme: “From behavior to processes: Perspectives from neuroscience, economics, and psychology”

**ZÜRICH MARRIOTT HOTEL**  
(Neumühlequai 42, 8006 Zürich, Switzerland)

*The conference language is English.*

### Thursday, May 24, 2018

6:30-8:00 PM: Get-together over dinner (dinner covered by registration fee)  
Location: Restaurant Brasserie Johanniter  
(Niederdorfstrasse 70, 8001 Zürich)

### Friday, May 25, 2018

8:00-8:30 AM: Registration and arrival coffee  
Location: Foyer in front of Room 3ab

8:30-8:45 AM: Welcome address  
*Carlos Alós-Ferrer*, Universität Zürich  
Location: Room 3ab

8:45-9:30 AM: Keynote speech I  
*Alan Sanfey*, Donders Institute for Brain, Cognition and Behaviour  
Social motivations in choice: insights from decision neuroscience  
Location: Room 3ab

9:30-10:15 AM: Keynote speech II  
*Samuel M. McClure*, Arizona State University  
The present and future of time discounting  
Location: Room 3ab

10:15-10:30 AM: Coffee break  
Location: Foyer in front of Room 3ab

10:30 AM-12:10 PM:

**Session I**

**Track:** **Symposium: The role of dopamine in economic decision-making**

**Track chair:** **Philippe Tobler**

**Location:** **Room 3a**

- 10:30 AM: *Alexander Soutschek*  
Changing economic preferences with dopaminergic manipulations
- 10:50 AM: *Caroline Burrasch*  
Running on dopamine: the gut-brain axis in action control
- 11:10 AM: *Guillaume Sescousse*  
Reward and punishment appraisal: investigating the role of dopamine during learning and decision-making
- 11:30 AM: *Caroline Jahn*  
Noradrenaline and dopamine in motivation
- 11:50 AM: *Lydia Hellrung*  
Self-regulation of the dopaminergic midbrain

**Track:** **Consumer behavior and neuromarketing**

**Track chair:** **Christian Ruff**

**Location:** **Room 3b**

- 10:30 AM: *Aneta Disterheft, Urszula Garczarek-Bak*  
Electrodermal responses to a chain store ad predict its private label products purchasing but only for familiar stores
- 10:50 AM: *Egle Vaiciukynaitė, Francesco Massara, Rimantas Gatautis*  
Emotionally-rich brand post and consumer sociability behavior on Facebook: what does really work?
- 11:10 AM: *Anida Krajina*  
Generation Y and Generation Z visual attention in the online environment: evidence from eye tracking and laddering
- 11:30 AM: *Luis-Alberto Casado-Aranda, Juan Sanchez-Fernandez, Francisco J. Montoro Ríos*  
A neuropsychology study on how consumers process online risk facets
- 11:50 AM: *Tamara Masters, Shelley Rathee, Grace Yu,*  
What's in a name? Brand transgression, biometrics and forgiveness

12:10-1:10 PM:

Lunch and poster session  
Location: Foyer in front of Room 3ab

1:10-2:50 PM:

**Session II**

**Track:** **Symposium: What pupillary measures of arousal can (and cannot) tell us about decision-making**

**Track chair:** **Anjali Raja Beharelle and Todd Hare**

**Location:** **Room 3a**

- 1:10 PM: *Eran Eldar*  
Focus versus breadth: pupil size and neural information processing
- 1:30 PM: *Ian Krajbich*  
The interaction of pupil dilation and gaze in simple value-based choice
- 1:50 PM: *Christian Ruff*  
How arousal optimizes human decision-making
- 2:10 PM: *Anjali Raja Beharelle*  
The role of pre-stimulus arousal in exploration-exploitation trade-offs
- 2:30 PM: *Carlos Alós-Ferrer, Alexander Ritschel*  
Effortful Bayesian updating: a pupil-dilation study

**Track:** Management  
**Track chair:** Tamara Masters  
**Location:** Room 3b

- 1:10 PM: *Ann Tank*  
Neuroaccounting is waiting in the wings, indeed! – A meta-analysis of neuroeconomic research in accounting
- 1:30 PM: *Konstantinos Gavriilidis, Vasileios Kallinterakis, Belma Ozturkkal*  
Institutional herding and mood
- 1:50 PM: *Georg Windisch, Nicole Rosenkranz*  
Means and ends: the role of employee identification in strategic change
- 2:10 PM: *Thorbjørn Knudsen, Davide Marchiori, Massimo Warglien*  
Distributed hierarchical decision processes produce persistent differences in learning performance
- 2:30 PM: *David Hirschfeld, Johannes Hewig, Natalie Ulrich, Marcus Wagner*  
Effects of entrepreneurship and sustainability orientation in three behavioral economic paradigms

2:50-3:00 PM: Short break

3:00-4:40 PM: **Session III**

**Track:** Symposium: Bridging neuro-computational mechanisms of perceptual and economic decisions  
**Track chair:** Rafael Polanía  
**Location:** Room 3a

- 3:00 PM: *Gaia Lombardi*  
The role of visual-attention in the framing effect
- 3:20 PM: *Silvia Maier*  
Dissociating consideration latencies from weighting in multiattribute decisions
- 3:40 PM: *Arkady Konovalov*  
Response times as an indicator of value in individual and strategic choice
- 4:00 PM: *Carlos Alós-Ferrer, Michele Garagnani*  
Response times in risky decision making
- 4:20 PM: *Rafael Polanía*  
Efficient coding of subjective value

**Track:** Behavioral economics  
**Track chair:** Todd Hare  
**Location:** Room 3b

- 3:00 PM: *Goekhan Aydogan, Jesse St Amand, Ian C. Ballard, Warren K. Bickel, Samuel M. McClure*  
The force of habit: repeated decisions reduce framing effects and lateral prefrontal involvement in choice
- 3:20 PM: *Joshua Zonca, Luca Polonio, Giorgio Coricelli*  
Poor information processing predicts non-strategic behavior in interactive games
- 3:40 PM: *Julia Felfeli, Anja Achtziger*  
Confidence judgment in own skills: the effects of gender and incentives
- 4:00 PM: *Sarah Rudorf, Thomas Baumgartner, Sebastian Markett, Katrin Schmelz, Roland Wiest, Urs Fischbacher, Daria Knoch*  
Intrinsic connectivity networks underlying individual differences in control-averse behavior
- 4:20 PM: *Leydiana de Sousa Pereira, Jadielson Alves de Moura, Danielle Costa Morais, Ana Paula Cabral Seixas Costa*  
Individuals' behavior behind the punishment in a monetary game

- 4:40-5:00 PM: Coffee break  
Location: Foyer in front of Room 3ab
- 5:00-5:10 PM: Meet the editor  
Editor of the *Journal of Neuroscience, Psychology, and Economics (JNPE)*  
*Samuel M. McClure*, Arizona State University  
Location: Room 3ab
- 5:10-5:40 PM: Fellow address  
*Bernd Weber*, Universität Bonn  
Contextual influences on food choice - insights from behavior and neuroscience  
Location: Room 3ab
- 5:40-6:05PM: Walk from Zürich Marriott Hotel to Universität Zürich  
(Lichthof Süd, Rämistrasse 71, 8006 Zürich)
- 6:05-6:10 PM: Best-paper-of-the-conference award ceremony  
*Carlos Alós-Ferrer*, Universität Zürich  
Location: Universität Zürich, Lichthof Süd, Rämistrasse 71, 8006 Zürich
- 6:10-6:15PM: Good-bye note  
*Carlos Alós-Ferrer*, Universität Zürich  
Location: Universität Zürich, Lichthof Süd, Rämistrasse 71, 8006 Zürich
- 6:15-8:30PM: Award reception,  
sponsored by the Professorship for Decision and Neuroeconomic Theory, Department  
of Economics, University of Zurich  
Swiss apéro: Complimentary snacks and beverages served  
Location: Universität Zürich, Lichthof Süd, Rämistrasse 71, 8006 Zürich

## Poster session

Poster presentations will take place on May 25 from 12:10 to 1:10 PM in the Foyer in front of Room 3ab.

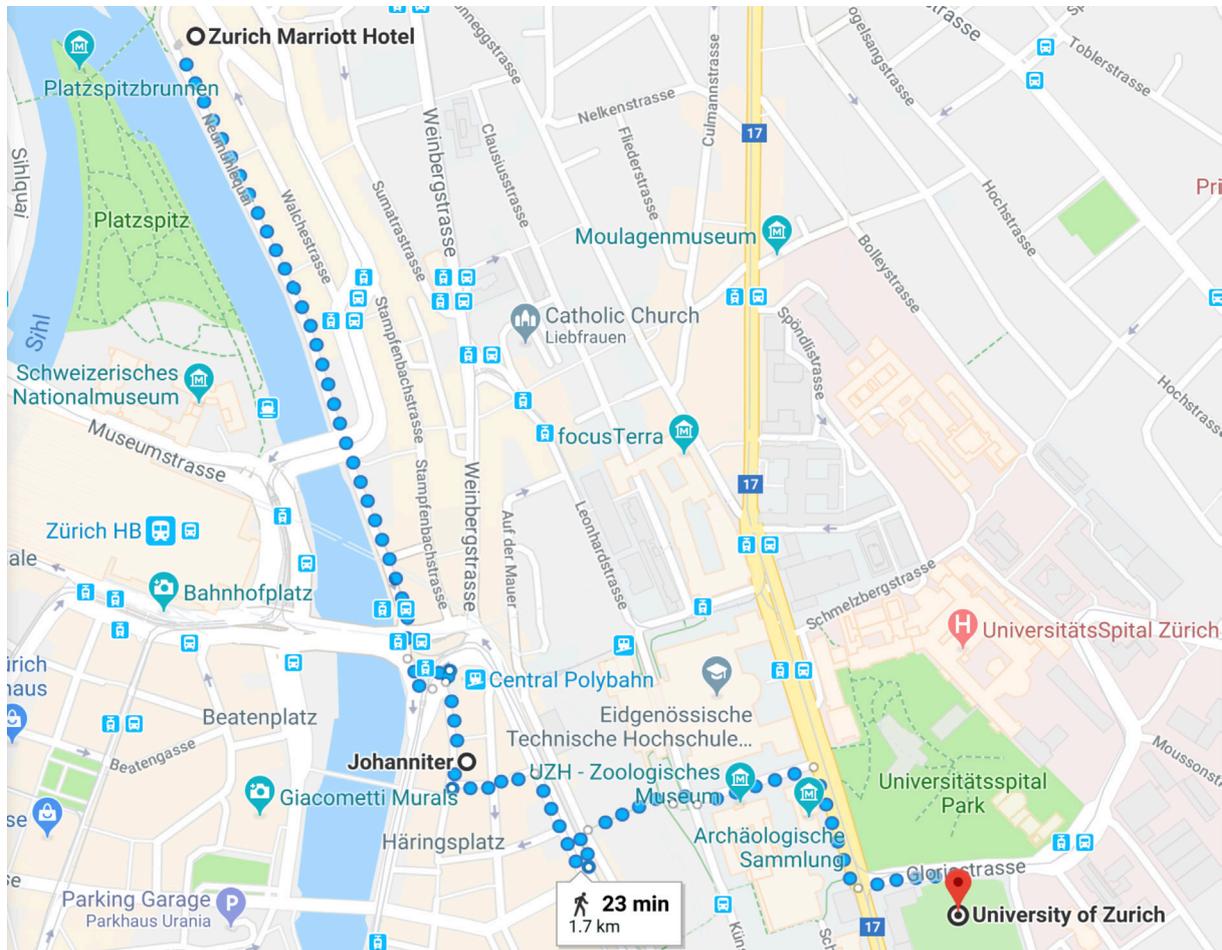
Poster session presenters must hang their poster during the coffee break on May 25 at 10:15-10:30 AM at designated spaces and take them off again at the end of the poster session.

- P01** *Oliver Braganza*  
Proxycconomics, an agent based model of Campbell's law in competitive societal systems
- P02** *Aadarsh Das, Gaurav Marathe, Tanusree Dutta*  
Implementing loss-aversion principle in incentive programs: the unfathomed yet rosy modus operandi
- P03** *Jasper Dezwaef, Jelle Demanet, Timothy Desmet, Marcel Brass*  
Beyond asking: exploring the use of an implicit procedure to estimate consumers' willingness-to-pay
- P04** *Sebastian Gluth, Peter Kraemer, Mikhail Spektor*  
Evidence for a single-process account of memory-based decisions
- P05** *Katerina Kokmotou, John Tyson-Carr, Vicente Soto, Yuxin Xie, Stephanie Cook, Timo Giesbrecht, Athanasios Pantelous, Andrej Stancak*  
Effects of loss aversion on the neural processing of actual and counterfactual decision outcomes: an event-related potential study
- P06** *Gabriel R. D. Levrini, Freddy Linares Torres*  
Reading competences of government scholarship students from Amazon native communities: an eye tracking social inclusion case study
- P07** *Emanuele Lo Gerfo, Alessia Gallucci, Rosalba Morese, Alessandra Vergallito, Stefania Ottone, Francesca Bosco, Ferruccio Ponzano, Leornor Josefina Romero Lauro*  
The role of ventromedial prefrontal cortex and temporo-parietal junction in third-party punishment behavior: a tDCS study
- P08** *Richard Martina*  
Reconceptualization of entrepreneurial expertise: a multi-dimensional model
- P09** *Jan Andre Millemann, Sven Heidenreich, Martin Reimann, Christoph Krick*  
How do consumers perceive new products? Evidence from a functional magnetic resonance imaging (fMRI) study
- P10** *Cordelia Mühlbach*  
Exploring the decision process within a triadic comparison - the procedure of the repertory grid technique examined by eye-tracking
- P11** *Rosalba Morese*  
To cooperate or to compete: the influence of ingroup and outgroup contexts
- P12** *Ksenia Panidi, Alicia Vorobyeva, Matteo Feurra, Vasily Klucharev*  
Transcranial magnetic stimulation of the right DLPFC modulates risk aversion but not probability weighting
- P13** *Jeison Parra, Ernest Mas-Herrero, Roshan Cools, Guillaume Sescousse, Josep Marco-Pallares,*  
Subjective utility value of pseudo-reward
- P14** *Julia Puaschunder*  
Trust and reciprocity drive social common goods contribution norms
- P15** *Jyotirmaya Satpathy, Ahalya Hejmadi*  
Decision signatures in managerial brain architecture

- P16** *Renata Schoeman, Manie De Klerk*  
Adult attention-deficit hyperactivity disorder: a database analysis of South African private health insurance
- P17** *Judit Simon, Ildiko Kemeny, Akos Varga, Erica van Herpen, Aikaterini Palascha*  
The investigation of consumers understanding of health claims and health symbols using eye-tracking experiment and survey methods
- P18** *Sebastian P. H. Speer, Maarten A.S. Boksem*  
Decoding proposers' motivations in the ultimatum game
- P19** *Loreen Tisdall, Renato Frey, Rui Mata*  
Group- versus individual level analyses of neural correlates of risk preference

# Conference venue

**ZÜRICH MARRIOTT HOTEL**  
(Neumühlequai 42, 8006 Zürich, Switzerland)



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## How to get here

See <http://www.marriott.com/hotels/maps/travel/zrhdt-zurich-marriott-hotel/> for more details

- :: By car: Paid parking inside the Marriott hotel
- :: By train: Approximately 8 min walking from Zürich main train station (600 meters)
- :: By air: Approximately 10 min driving from Zürich International Airport (9.6 kilometers)





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# Changing economic preferences with dopaminergic manipulations

Alexander Soutschek<sup>1</sup>

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## Abstract

The neurotransmitter dopamine plays an important role in encoding economic preferences in social interactions, but it remains unknown as to whether dopaminergic signals promote selfish or prosocial actions. Here, we provide evidence that the function of dopamine in social preferences is gender-specific. In a pharmacological and an independent neuroimaging study, we tested the hypothesis that the dopaminergic system encodes the value of sharing money with others more strongly in women than in men. In a pharmacological study, we observed that reduced dopaminergic activity resulted in more selfish decisions in women and more prosocial decisions in men. Converging findings from an independent neuroimaging study revealed gender-related activity in the striatum, a brain region receiving dopaminergic input, during prosocial decisions. Thus, the dopaminergic system appears to be more sensitive to prosocial rewards in women than men, providing a neurobiological account for why women often behave more prosocially than men.

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<sup>1</sup> Corresponding author: Alexander Soutschek, University of Zurich, [alexander.soutschek@econ.uzh.ch](mailto:alexander.soutschek@econ.uzh.ch).

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# Running on dopamine: the gut-brain axis in action control

Caroline Burrasch<sup>2</sup>

---

## Abstract

Research on the gut-brain axis has received a tremendous amount of attention during the last years, but focused primarily on the influence of the microbiome on the brain and behavior. Here, we explore the impact of the vagus nerve as another key contributor to the interplay of gut and brain and a known modulator of the dopaminergic system, as well as other modulators of metabolic function, and their effect on reward-related behavior and brain responses. In our studies, we employed methods such as transcutaneous vagus nerve stimulation and food rewards, combined with behavioral tasks and fMRI. We were able to observe that vagus nerve stimulation enhances the invigoration of effort-based behavior. Moreover, glucose metabolism and BMI had a modulatory effect on effort discounting. Our results highlight the role of the gut-brain axis on dopaminergic function and its impact on motivated behavior and reward responsivity.

---

<sup>2</sup> Corresponding author: Caroline Burrasch, University of Tübingen, [caroline.burrasch@uni-tuebingen.de](mailto:caroline.burrasch@uni-tuebingen.de).

---

## Reward and punishment appraisal:

### investigating the role of dopamine during learning and decision-making

Guillaume Sescousse<sup>3</sup>

---

#### Abstract

In this talk I will present a series of studies that we performed to investigate the causal role of dopamine in shaping the sensitivity to reward and punishment. We addressed this question both in the context of experienced reward and punishment, using a reversal learning task, and in the context of expected reward and punishment, using a risky decision-making task. We investigated the role of dopamine using the D2-receptor antagonist sulpiride, in a within-subject, double-blind, placebo-controlled design. In the first study, we showed that dopamine D2 receptor blockade impaired reward vs punishment learning in healthy individuals, in line with prior work suggesting that valence-dependent learning depends on dopaminergic tone. Paradoxically, we found that the same drug manipulation had an opposite effect in individuals suffering from gambling addiction, and tended to enhance reward vs punishment learning. I will provide further suggestive evidence that these paradoxical effects of sulpiride reflect an underlying interaction with endogenous dopamine levels. In the second study, we investigated whether dopamine D2 receptor blockade influenced risky decision-making, both in the gain and loss domains. While we did not find any effect on the tendency to take risks, we observed that sulpiride significantly impacted the subjective weighing of probabilities in the gain domain, in the direction of more objective, economically rational decision-making. Altogether, our results provide evidence for the causal role of dopamine in modulating reward sensitivity, both in the context of experienced and expected rewards.

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<sup>3</sup> Corresponding author: Guillaume Sescousse, Radboud University, [g.sescousse@donders.ru.nl](mailto:g.sescousse@donders.ru.nl).

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# Noradrenaline and dopamine in motivation

Caroline Jahn<sup>4</sup>

---

## Abstract

Catecholaminergic neuromodulation is critical for numerous aspects of behaviour. Indeed, both dopamine and noradrenaline are directly involved in various functions including attention, motivation, decision-making, learning and memory. But as we extend the range of cognitive functions in which they are involved, the boundaries between the specific contribution of dopamine and noradrenaline become increasingly tenuous. Our aim is to dissociate the functional role of dopamine and noradrenaline in motivation using a direct comparative approach with neurophysiology and pharmacology in rhesus monkeys. Even though they share numerous features, the activity of dopaminergic and noradrenergic neurons can be readily distinguished in monkeys performing tasks manipulating the ratio between costs and benefits. More specifically, the firing of noradrenergic neurons is closely related to the novelty of the information to process, the amount of effort needed to complete trials and obtain the reward and post-error adaptation, whereas the firing of dopaminergic neurons is more closely associated with the incentive influence of rewards on behaviours. Using pharmacology, we confirm the specific causal role of noradrenaline in two complementary aspects of motivation: force production and variability in choices, potentially in line with its role in behavioural flexibility. Altogether, this work is compatible with the idea that even though dopamine and noradrenaline share several features and both contribute to motivation, the nature of their contribution differ. Whereas dopamine mediates the incentive influence of potential rewards on action initiation, noradrenaline seems to mediate the mobilization of effort to face difficulties and overcome upcoming challenges, such as having a more variable behaviour or producing effortful actions.

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<sup>4</sup> Corresponding author: Caroline Jahn, Brain and Spine Institute Paris, [caroline.jahn@cri-paris.org](mailto:caroline.jahn@cri-paris.org).

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# Self-regulation of the dopaminergic midbrain

Lydia Hellrung<sup>5</sup>

---

## Abstract

Over recent years, it has been shown that the dopaminergic midbrain is not only associated with reward processing and reinforcement learning but also with effort allocation and cognitive control. Therefore, volitional self-regulation of SN/VTA might be helpful not only for a better understanding of learning, but also relevant in economic decision-making. It has been shown so far that such a self-regulation can be learned by real-time fMRI neurofeedback. However, the achieved regulation performances were very heterogeneous between participants and not all of them were successful in self-regulation. Here, we compare SN/VTA self-regulation patterns of brain activity that differentiate between successful and non-successful learning.

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---

# Self-regulation of the dopaminergic midbrain

Aneta Disterheft<sup>6</sup>, Urszula Garczarek-Bak

---

## Abstract

The results of the present study show that among three psychophysiological measures (frontal beta asymmetry, zygomaticus activity and electrodermal activity) and two self-report measures (ad attitude and brand attitude) only the electrodermal activity (specifically the number of electrodermal responses) correlated with the number of purchased products of a given brand. Specifically, that was the case only for familiar brands. 24 subjects watched 10 video ads of chain stores (5 familiar and 5 unfamiliar to them) while their brain, facial muscle and electrodermal activity was measured. Then they answered questions regarding the ad attitude and brand attitude. Later, participants made 20 purchase choices (10 between familiar and 10 between unfamiliar brands). Every time they were presented with 5 products of the same category (e.g. yoghurt, juice), each of them being a private label good from one of the previously advertised chain store. The aim of the study was to identify the research method which might be most helpful in estimating future market share of a particular chain store (measured as a number of chosen products from a given store). The number of electrodermal responses was able to explain 11.2% of variance of the number of purchased products of a familiar brand (every single response increased the number of purchased products by 0.169). When predicting whether the brand performance will be better than the median for other brands, the logistic regression model gave 67% of accuracy. The results suggest that electrodermal activity may serve as a reliable measure in estimating market share, even in case of video advertisements which do not promote any particular product, as is often the case in chain store ads.

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# Emotionally-rich brand post and consumer sociability behavior on Facebook: what does really work?

Egle Vaiciukynaite<sup>7</sup>, Francesco Massara, Rimantas Gatautis

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## Abstract

Recently, social network sites (SNSs) have become extremely popular and play an important role in the everyday lives of consumers. Empowered by SNSs, a consumer has become more active and spend more time with their family, friends or even companies online. Companies may communicate and exchange product or service-related information with consumers on official company's Facebook page. Therefore companies seek to encourage online conversations for several beneficial outcomes such as building and maintaining relationship with their consumers, achieving consumer loyalty. Hence, companies not only need to gain a better understanding of consumer sociability behavior but also need to understand what emotional cues of brand posts encourage consumer sociability behaviors on Facebook brand page. The purpose of this paper is to explore the emotional features of brand posts and media types that facilitate different consumer sociability behaviors on Facebook. This study used liking, commenting and sharing behavior and diverse emoji reactions (e.g., love, haha) as a sociability behavior measures of consumer engagement. This study follows neuromarketing approach and uses a mixed-methods research followed by an analysis of content and text performed with the Linguistic Inquiry and Word Count (LIWC) Software, and emotions in photos by using FaceReader Software. A content analysis of 1,821 brand posts was conducted from the hotel brand Facebook pages of 18 brands during one year from 30th of June in 2017 and reverse order. The results demonstrated that the number of liking, love, haha, wow, sharing can be facilitated by images. Brand post with emoticons and emoji generate liking behavior on Facebook. Findings indicate that the number of likes, love can be increased by emotionally-rich images. Brand post accompanied with social words exhibits liking behavior.

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# Generation Y and Generation Z visual attention in the online environment:

## evidence from eye tracking and laddering

Anida Krajina<sup>8</sup>

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### Abstract

The aim of this paper is to reveal the results of empirical research on consumer behavior, more precisely, visual attention and behavioral patterns in the online environment and compare the results between two generations (Generation Y and Generation Z). Empirical research was conducted by using eye tracking, complemented with in-depth laddering interviews based on the means-end chains model, in order to examine the values of both generations. Research is embedded in the scientific framework of neuroscience and neuromarketing and has a mixed character (explanatory, exploratory and confirmative). The research objective concerns the discovery of cognitive and emotional processes based on visual attention in the online environment of two groups of consumers. In other words, the work focuses on identifying the differences between actual exposure and perceived exposure for different types of content: text and graphics (image). Text and images are designed to potentially attract visual attention to certain content elements called call-to-action. Call-to-action is a digital element or tool that helps reinforce and engage customers, in particular by encouraging some desirable action in the online environment. It serves as a strategy itself and is implemented particularly in the area of digital marketing. Therefore, the exposure as an expression in this study refers to both the type of content and the exposure of the elements of call-to-action in the content. Retrospective interviews are used as a complementary method to eye tracking, and help participants to verbalize experiences, recall process, explain both decision-making and reasons why the attention has been devoted to some elements, and not to others. The results lead to better understanding of consumer behavior in theory and optimizing online content in practice.

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# A neuropsychology study on how consumers process online risk

Luis-Alberto Casado-Aranda<sup>9</sup>, Juan Sanchez-Fernandez, Francisco J. Montoro Ríos

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## Abstract

Despite the enormous growth of e-commerce transactions, consumers still experience barriers mainly related to the perceived risk during online purchases. E-commerce literature has consequently explored the construct of online perceived risk aiming to reveal the type of risk that exerts greater impact on consumer. Yet, no consensus has been reached neither on its type of dimensions nor on their relative importance. This is the first study that resorts to neurological tools to objectively examine the differences between three risk dimensions, namely financial, privacy and performance, in a low-involvement purchase environment. Despite behavioral findings do not reveal differences between the three types of risks, brain data advance that they are indeed distinct dimensions and that financial risk may convey the lowest subconscious negative value and aversion. In turn, privacy risk confers subconsciously ambivalence and uncertainty whereas performance risk elicits the highest disappointment and distrust during the purchase process. Web contents and online purchase process could be strongly improved if retailers consider the current findings.

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# What's in a name?

## Brand transgression, biometrics and forgiveness

Tamara Masters<sup>10</sup>, Shelley Rathee, Grace Yu

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### Abstract

Billions of dollars are spent by firms to keep and satisfy customers. Can an edge be created simply by the name of the product? Does a brand name impact forgiveness? Transgressions that lead to negative emotions of betrayal can be incited by firms as well as individuals. The psychological response of a consumer to a product transgression can lead to loss of that consumer's business as well as negative comments that may turn other consumers away from the brand, and lead to additional loss of revenue. Companies build brands under the premise that the brand will be a long-term asset that generates profits as the consumer is willing to pay more than the firm has to invest to provide the service or product. Firms are economically motivated to grow customers, and keep them loyal and repurchasing over time. However, the continued value and loyalty of customers to a brand will likely be tested at some point when the product does not perform at the level expected or even worse, fails. For example a mobile phone that has problems with battery capacity deterioration. Even worse, a mobile phone that bursts into flames or a shampoo bottle that breaks into pieces if it falls out of a slippery hand to the shower floor, a mouthwash that stains teeth purple, or a kink free garden hose that kinks and then explodes. Continued satisfaction and the willingness of a customer to forgive product malfunction can be a valuable asset to maintaining and continually building revenue. Linking choice data and decision process with eye tracking and facial recognition metrics we investigate the process of how the type of brand name can impact whether an individual is likely to forgive a brand for poor performance or not. This research focuses on the psychological effect of a specific type of brand with numbers (LEET) compared to brand names without numbers (ALPHA) and how willing consumers are to forgive the brand if a performance problem occurs. There has been no published research investigating the effect of brand name (ALPHA versus LEET) on forgiveness. Over 7 studies using eye tracking, facial recognition, and behavior studies we provide evidence of the preconscious effect of brand on forgiveness and repurchase. We find that a LEET brand leads to more concrete processing, which evokes less emotion and results in greater likelihood of forgiveness when product performance goes bad. This research uniquely joins a psychological process and biometrics to forgiveness on a matter of economic importance.

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# Focus versus breadth: pupil size and neural information processing

Eran Eldar<sup>11</sup>

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## Abstract

I propose that changes in pupil diameter track brain-wide levels of neural gain, which control the balance between broadly integrative information processing and narrowly focused selective attention. Neural gain, which is thought to be modulated throughout the brain by the locus coeruleus-norepinephrine system, determines how strongly neurons respond to input signals. When gain is high, both excitatory and inhibitory signals have greater impact, and as a result, competitive interactions between different neural representations increase, such that weak representations are further inhibited while strong representations become more dominant. In such a state, we expect processing to be more narrowly focused on the most strongly represented sources of information. In contrast, low gain may allow simultaneous representation, and thus integration of a broader range of sources of information. In this talk, we will first examine the whole-brain effects of neural gain using functional connectivity and graph-theoretic analyses of neuroimaging data. The results reveal signs of brain-wide fluctuations in gain that are tracked by pupillometric indices and show that high gain is coupled with a focusing, clustering effect on neural interactions throughout the brain. I will then present four behavioral experiments designed to investigate the effects of variations in gain on information processing. In the first experiment, I will show that pupillary and neuroimaging indices of high gain are associated with learning that is more narrowly focused on particular types of stimulus features, in accordance with individual predisposition. The second experiment will show that high gain has a similar effect on perception of an ambiguous stimulus, making it more focused and less integrative, and that the effects of gain do not have to be tied to individual predisposition, but rather, they can be flexibly manipulated by means of subliminal priming. The third experiment will show that with high gain, memories also become more specific to attended aspects of experimental stimuli. In the fourth experiment, I will show that the reduced integration that is associated with high gain comes with a benefit – weakersusceptibility to classical decision-making biases. Finally, I will propose a Bayesian account of the presented results that highlights the effects of gain on inference.

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# The interaction of pupil dilation and gaze in simple value-based choice

Ian Krajbich<sup>12</sup>

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## Abstract

When people are making decisions, they tend to look back and forth between the alternatives, gathering support for each alternative in a way that seems to be driven by attention. This evidence accumulation and comparison process can be captured by the attentional drift diffusion model (aDDM), in which the subjective value of the unattended item is discounted relative to the attended item. The aDDM uses gaze location as a proxy for attention, but it is limited in that it does not utilize measures of the strength of attention. One way to measure attentional strength may be to look at pupil dilation. Pupil diameter is thought to be a measure of the strength of visual attention and has been shown to regulate breadth vs. focus. Interestingly, pupil diameter has also been implicated in response caution in the DDM, which directly ties pupil diameter to the latent decision process. In this paper, we use a binary food-choice experiment with eye-tracking to study the relationship between pupil diameter, gaze, and decision making (N=44). The food-choice paradigm is a well-established task where we know that gaze plays an important role. We use the aDDM to model the effects of pupil dilation on key model parameters, namely the drift rate, boundary separation, non-decision time, and gaze bias. Importantly, we control for several major factors that affect pupil diameter measurements, including stimulus luminance and the pupil foreshortening error. Based on prior work, we hypothesized that one effect of increased pupil dilation would be to broaden the scope of attention and thus result in less of a gaze bias on choice. We also hypothesized that increased pupil dilation might also increase boundary separation, increasing response times (RTs) and accuracy. In simple model-free analyses we find that pupil diameter is negatively correlated with trial difficulty (i.e. indifference) and is also negatively correlated with RT, after controlling for difficulty. Our model-based analyses with the aDDM further reveal that wider-pupil trials have less gaze bias, which supports our gaze-bias hypothesis. These results suggest an important connection between pupil dilation and the attentional biases in value-based decision-making.

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# How arousal optimizes human decision-making

Christian Ruff<sup>13</sup>

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## Abstract

During wakefulness, organisms deal with the changing demands of their environment by continuously adapting their level of arousal. Arousal is a comprehensive physiological and psychological state characterized by increased physiological activation, motor preparation, responsiveness to sensory inputs, emotional reactivity, and enhanced cognitive processing. These arousal responses are thought to be controlled by the noradrenergic arousal system (Locus coeruleus – LC-NE) in the brainstem that releases catecholamines throughout the cortex via long range neuro-modulatory projections. Levels of LC activity may fluctuate slowly with endogenous changes in arousal and co-vary with stimulus-independent fluctuations of pupil baseline (PBL) even in the absence of any changes in visual stimulation. Converging evidence suggests that increased noradrenergic arousal leads to better performance on a wide range of perceptual tasks. However, several important questions concerning this association remain unresolved. By which arousal related neural mechanism are these perceptual enhancements instantiated? Do arousal-related behavioural enhancements reflect increased response speed, choice accuracy, or in fact optimality of perceptual decisions? Does arousal mainly affect perceptual decisions, or does it also lead to better/more optimal performance for other types of decisions routinely taken by humans? Here, we investigate the neural mechanisms by which arousal-related brain state fluctuations, indexed by pre-stimulus pupil dilation, impact on perceptual and value-based choices in humans. We find that during elevated arousal, both types of choices are faster and more accurate. Computational modelling indicates that these arousal-dependent behavioral enhancements reflect increased precision in the representation of task-relevant evidence. Functional imaging demonstrates that changes in evidence representation predicted by behavioral modelling correspond to neural gain increases in regions that represent the choice-relevant decision variables. Moreover, the neural gain increases in these two regions correlated with participants' reward rates on the corresponding tasks.

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# The role of pre-stimulus arousal in exploration-exploitation trade-offs

Anjali Raja Beharelle<sup>14</sup>

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## Abstract

Adaptive gain theory (AGT) posits that switches between exploration and exploitation are arbitrated by a norepinephrine-based arousal system that responds to changes in the expected utility of selecting an action. Critically, AGT hypothesizes that exploration occurs when baseline arousal is elevated within the context of more long-term (e.g. minutes) changes in utility, and that behavioral responses to these changes in utility are regulated by the anterior cingulate cortex (ACC). In this paper, we used fluctuations in pupil diameter as an index of arousal to test key predictions of the AGT: 1) Pre-stimulus baseline arousal and activity in brain areas associated with value-based decision-making will be increased for current exploratory choices as well as for choices leading up to exploration. 2) Increases in pre-stimulus baseline arousal are linked to increases in neural activity in anterior cingulate cortex (ACC) during explore vs. exploit choices. Participants (N = 66) played a restless bandit task while undergoing simultaneous measurements of fMRI and measurement of a pupil diameter index (PDI) of arousal. Changes in the PDI and neural activity were examined for exploratory vs. exploitative choices for the current trial and 6 preceding trials. We found two significant temporal clusters during which PDI was increased for explore vs. exploit choices. Baseline PDI showed a significant effect on probability to explore. Importantly, this relationship held even when controlling for the estimated option values and other decision variables previously linked to exploration. Pupil diameter during the baseline period also showed a sustained increase up to two trials prior to exploration, even though participants most often exploited during these prior trials (i.e., few decisions to explore were repeated). Interestingly, this was accompanied by a decrease in utility (as indexed by the difference in the estimated bandit values). Neural activity in frontopolar cortex, middle frontal, and precentral gyri showed corresponding activity increases in the baseline period up to one trial before exploratory choices. Lastly, we found that, across participants, higher baseline arousal preceding explore vs. exploit choices was associated with greater activity in ACC during explore vs. exploit choices. Our results provide novel evidence for the central prediction of AGT that exploratory behavior is triggered by context-adaptive responses of the arousal system. Pre-stimulus baseline arousal shows an extended increase prior to exploratory choices that is independent of decision variables known to influence exploration and is selectively modulated by the learned value estimates prior to explore choices only. Correspondingly, neural activity in previously reported exploration regions is increased up to one trial before exploratory choices. Finally, greater activity in the ACC is linked to increased pre-stimulus baseline arousal for explore vs. exploit decisions.

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# Effortful Bayesian updating: a pupil-dilation study

Carlos Alós-Ferrer<sup>15</sup>, Alexander Ritschel

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## Abstract

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 did not affect the participant's behavior (effort), or increased cognitive effort was induced but did not result in improved performance. To disentangle these candidate explanations, we examined pupil dilation as a physiological measure of cognitive effort in a laboratory experiment with a belief-updating task. Monetary incentives were varied within subjects, allowing us to compare cognitive effort across incentive conditions.

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# Neuroaccounting is waiting in the wings, indeed! - A meta-analysis of neuroeconomic research in accounting

Ann Tank<sup>16</sup>

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## Abstract

Within the field of behavioural accounting researchers traditionally studied human behaviour while collecting, summarizing, analysing and reporting relevant accounting information to potential decision maker. In their article, Birnberg and Ganguly (2012) (Is neuroaccounting waiting in the wings? An essay, *Accounting, Organization and Society* 37(1): 1-13) evaluate what behavioral accounting researchers can learn from neuroeconomics but conclude that “a separate sub-field within behavioural accounting is not likely in the near future due mostly to practical.” Inspired by that conclusion, this paper is designed to provide an overview of the neuroeconomic approaches in accounting research today and analyses, whether a separate sub-field neuroaccounting is emerging or not. This is done by means of a meta-analysis, in which related publications in the relevant accounting journals are systematically collected and analysed. The analysis is accomplished using three steps. First, the term neuroaccounting is defined and a brief look at the historical development is taken. The second section portrays the research methodology applied in conducting the literature review. Third, the findings of the meta-analysis are discussed and the potential of future neuroeconomic studies in behavioural accounting is illustrated.

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# Institutional herding and mood

Konstantinos Gavriilidis, Vasileios Kallinterakis<sup>17</sup>, Belma Ozturkkal

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## Abstract

Drawing on a unique data set of daily portfolio holdings for Turkish mutual funds we investigate the relationship between mood and institutional herding on the premises of various established mood proxies (weekend effect; holiday effect; Ramadan; sunshine; new/full moon) for the January 2002 - August 2008 period. Results indicate that fund managers in Turkey herd significantly, with their herding growing in magnitude as the number of active funds per stock rises and appearing stronger on the buy- than the sell-side. Although the relationship of mood with institutional herding occasionally assumes the correct sign as per theoretical expectations, institutional herding is found to be insignificantly different across various mood states, thus denoting that mood does not impact the propensity of fund managers to herd.

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## Means and ends:

# the role of employee identification in strategic change

Georg Windisch, Nicole Rosenkranz<sup>18</sup>

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### Abstract

Strategic change remains a topic of great debate for its consequential bearing on an organization's long-term survival. Yet, the overwhelming majority of strategic change initiatives fail. Prior literature tells us that organizational members' identification with the ends of a strategic change leads to its success, while a lack of identification leads to its failure. In our almost four year ethnographic case study of a multinational engineering company, however, organizational members were amenable to a strategic change and still finished the process dis-identified with the organization, leading to the failure of the strategic change initiative. Based on this case, we develop a theoretical model that provides a novel perspective on strategic change, reflecting on the means of strategic change, rather than the ends. More specifically, we define four distinct means of change - cascading, consistency, evolution and frequency - that affect individual's identification with the organization throughout the process of a strategic change. Further, linking the four means of change to the fundamental psychological motives underlying employees' identification allows us to explain what drives individuals to adapt their identification over the course of a strategic change.

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# Distributed hierarchical decision processes produce persistent differences in learning performance

Thorbjørn Knudsen, Davide Marchiori<sup>19</sup>, Massimo Warglien

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## Abstract

Human organizations are commonly characterized by a hierarchical chain of command that facilitates division of labor and integration of effort. Higher-level employees set the strategic frame that constrains lower-level employees who carry out the detailed operations serving to implement the strategy. Typically, decisions on strategy and operations are carried out by different individuals that act over different timescales and have access to different kinds of information. Compared to operational decisions, strategy decisions occur less frequently, and are based on more general, albeit coarser information. We hypothesize that the hierarchical distribution of such decision processes among different individuals introduces strong coupled learning-processes that, depending on random initial conditions, will either hinder or facilitate learning. To test this, we design laboratory experiments of dyads where one individual is assigned the role of carrying out strategy decisions and the other must carry out operational decisions. Each dyad is facing a repeated learning task, which is complicated by the tangled nature of the underlying decision processes. To analyze experimental results, we develop a computational model that can disentangle individual contributions. We show that such distributed hierarchical decision processes produce persistent differences in learning performance, which are neither based on the subjects' competences nor on how they are matched, but are the sole consequence of the reinforcement of initial random conditions. Comparison of experimental and simulation data shows that such self-reinforcing dynamics are sufficient to account for the observed heterogeneity of the dyadic learning processes.

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# Effects of entrepreneurship and sustainability orientation in three behavioral economic paradigms

David Hirschfeld<sup>20</sup>, Johannes Hewig, Natalie Ulrich, Marcus Wagner

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## Abstract

Innovation is suggested to be key to sustainable development. Since innovation results from entrepreneurship, a key question is about the relationship of entrepreneurship and individuals' sustainability orientation. Risk, as a variable potentially affecting both, is involved in our exploratory study using three different behavioral economic paradigms. Our sample consists of twenty individuals and includes self-reported data on psychometric scales, behavioral data, and EEG and fMRI data. For the offer game, analysis of reaction time data reveals a significant main effect of ambiguity indicating longer reaction times in ambiguous trials. For the decision-making data, sustainability orientation was found to interact significantly with ambiguity indicating that participants with a high sustainability orientation were relatively more cautious under ambiguity and riskier without. In the stock trading game, analysis of the reaction time data did reveal a significant effect of risk, which indicated fastest reaction for mixed as compared to both low and high risk. Furthermore, a significant interaction of risk with sustainability orientation was found in this paradigm, revealing relatively slower reaction times in mixed trials for participants with a high sustainability orientation as compared to faster reaction times of participants with a high sustainability orientation for both low and high risk trials. For the public goods game, the mixed model of the latency data revealed a significant effect of the trial with a decline in reaction time from trial 1 to trial 14 and an increase from trial 15 to 21. There was a significant interaction of the trial with sustainability orientation revealing a significant positive relationship with reaction time in trial 1. Finally, the mixed model of the decision-making data revealed a significant effect of the trial indicating an increase in offer size from trial 1 to trial 16 (trial 16 being significantly higher than trial 14), and a subsequent decrease to 21. These findings indicate complex interactions of especially sustainability orientation and to a lesser degree entrepreneurship when it comes to content and speed of economic choices in decision situations differing in terms of risk conditions and social context that are to be related further to fMRI and EEG data.

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# The role of visual-attention in the framing effect

Gaia Lombardi<sup>21</sup>

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## Abstract

Subjective preferences have been shown to change across different contexts even when the options are kept constant. The framing effect is well documented example of a preference reversal in which individuals seem to change their subjective valuation of the options in the choice set. However, the neurological and internal mechanisms that leads people to change their choices depending on the different frames are still unclear. Here, we examine the hypothesis that changes in framing cause changes in the allocation of visual-attention to the different options, and how visual-attentional changes give rise to changes in the decision process. We document that in decision making under risk the framing of sure alternatives as a gain – as opposed to a loss – induces a visual-attentional advantage for the sure option relative to the risky one which is accompanied with an increase in the choice probability of the sure option, i.e., an increase in risk aversion. Based on an evidence accumulation process (aDDM), we propose an explanation for the framing effect that is exclusively dependent on a reallocation of visual-attention through two mechanisms – a direct positive effect of increased relative visual-attention on the probability of choosing the sure option and a stronger attentional discounting of the less-attended risky option. Our results suggest that frames have an impact on the allocation and on the discounting role of visual-attention that has prominent effect on choices.

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# Dissociating consideration latencies from weighting in multiattribute decisions

Silvia Maier<sup>22</sup>

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## Abstract

Considerable behavioral and neural evidence indicates that decisions are dynamic processes that unfold over time. Here, we examine these temporal dynamics directly to better understand cognitive and neural decision mechanisms. Using multiattribute food choices from four independent experiments, we demonstrate that dynamic and asynchronous evidence accumulation models lead to new insights into multiattribute decision processes and how they will respond to changes in the environment or individual goals. We find that both how quickly and how strongly taste and healthiness attributes weigh into the decision process are key determinants of choice outcomes, and consequently, individual differences in self-control. By combining computational modeling with experimental manipulations of attention and neural activity, we show that the processes determining the relative weighting and speed of consideration for healthiness and taste attributes during food choices are dissociable at the cognitive and neural levels. At the cognitive level, we find that directing attention toward healthiness led to significant, but independent (i.e. uncorrelated), changes in both how quickly and how strongly healthiness and taste attributes affected choices. At the neural level, we show that cathodal tDCS over the left dlFPC caused a specific increase in the decision weight for taste, but did not change the speed with which taste or healthiness attributes entered into the decision process. In addition to generating a more complete understanding of multiattribute choice mechanisms, we find that asynchronous evidence accumulation models make better out-of-sample predictions about self-control behavior than traditional logistic regression models.

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# Response times as an indicator of value in individual and strategic choice

Arkady Konovalov<sup>23</sup>

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## Abstract

Revealed preference is the dominant approach for inferring preferences, but it is limited in that it relies solely on discrete choice data. However, the choice process also produces response times (RTs), which are continuous and (typically) easily observable. It has been shown that RTs often decrease with strength-of-preference: this is a basic property of sequential sampling models such as the drift diffusion model widely used in the perceptual choice domain. What remains unclear is whether this relationship is sufficiently strong, relative to the other factors that affect RTs, to allow us to reliably infer strength-of-preference across individuals. Using several experiments, we show that even when every subject chooses the same alternative, we can still rank them by preference based on their RTs and predict their behavior on other choice problems; using just our subjects' RTs, we can estimate their individual utility functions. These results beg the question of whether others can exploit individuals' RTs to infer their preferences. In a follow up two-stage bargaining experiment, we find that buyers tend to quickly reject unreasonably high prices, but take more time to respond to offers that are close to their valuation. This allows sellers to infer buyers' values from observable response times (RT), creating an incentive for buyers to manipulate their RT.

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# Response times in risky decision making

Carlos Alós-Ferrer<sup>24</sup>, Michele Garagnani

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## Abstract

We conduct an experiment on risky decision making disentangling the effect of the numerical distance between the perceptual (numerical) and monetary values of stimuli on choice probabilities and response times. We estimate CARA utilities out-of-sample to be able to evaluate subjects' distance from indifference. This allows us to classify choices as "correct responses" or "errors" depending on estimated utility. By design, we take care of excluding possible heuristics and biases involved in the decision-making process. In line with well-established facts in psychophysics, error rates and response times are larger when stimuli are more similar (and hence the decision is harder) in terms of the estimated utility, but perceptual distance still plays a role. This suggests a cardinal view of preference, where preference strength determines choice frequencies.

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# Efficient coding of subjective value

Rafael Polanía<sup>25</sup>

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## Abstract

Preference-based decisions are essential for survival, for instance when deciding what we should (not) eat. Despite their importance, choices based on preferences are surprisingly variable and can appear irrational in ways that have defied mechanistic explanations. Here we propose that subjective valuation results from an inference process that accounts for the information structure of values in the environment and that maximizes information in value representations in line with demands imposed by limited coding resources. This strategy explains subjective value variability, preference-based choices and predicts a new preference illusion during subjective value reports that we validate with empirical data. Interestingly, the same strategy also explains the level of confidence associated with these reports. Our results imply that preference-based decisions reflect information-maximizing transmission and statistically optimal decoding of subjective values by a limited-capacity system. These findings provide a unified account of how humans perceive and value the environment to optimally guide behavior.

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## The force of habit:

# repeated decisions reduce framing effects and lateral prefrontal involvement in choice

Goekhan Aydogan<sup>26</sup>, Jesse St Amand, Ian C. Ballard, Warren K. Bickel, Samuel M. McClure

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### Abstract

We face a consistent set of choices every day - what to eat, whether to exercise, how much to spend - for which self-control is required to satisfy long-term goals. As with other executive functions, self-control is generally considered to be an effortful process that is subject to occasional failure. We argue that choices made for regularly occurring decisions lead to the formation of habits, while reducing the cost of maintaining a consistent level of self-control. We refer to this process as the habitization of self-control. To test our predictions related to the habitization of self-control, we asked participants to complete an intertemporal choice task weekly for five weeks. We tested differences that relate to habit formation and the exertion of self-control between weeks one and five. In two studies, we (1) examined the behavioral effects of habit formation on participants' discount rates as well as their sensitivity to framing effects, and (2) analyzed the effect of habitization on activation differences in the fronto-parietal control network and dorsal striatum. In study 1, we found habitization reduced the size of the date-delay effect in a temporal discounting task. This finding suggests that habitization renders behavior less susceptible to contextual variables that may otherwise bias choice. In study 2, we found that dorsolateral prefrontal cortex (dlPFC) activity was negatively correlated with subjective value on week one and this correlation was significantly reduced by week five. In contrast, activity in the dorsal striatum showed increasing correlation with subjective value across sessions. We conclude that habit formation is associated with a shift in the neural locus of delay discounting from the dlPFC to the dorsal striatum. We show that habit formation in intertemporal choice has two positive effects. First, it decreases susceptibility to contextual variables that otherwise bias preferences. Second, habits permit consistent rates of delay discounting to be expressed and develop alongside a shift in decision-related neural activity from the fronto-parietal control network to the dorsal striatum.

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# Poor information processing predicts non-strategic behavior in interactive games

Joshua Zonca<sup>27</sup>, Luca Polonio, Giorgio Coricelli

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## Abstract

In social contexts, we refer to strategic sophistication as the ability to adapt our own behavior based on the possible actions of others. Growing experimental evidence has shown that agents often deviate from normative responses in interactive games, and non-equilibrium models have been introduced to explain players' behavior in terms of hierarchical levels of strategic thinking. In line with these accounts, extensive experimental evidence has linked strategic choices to game representation processes and cognitive reflection, which expresses the tendency to implement either rich or miserly information processing. Nonetheless, the cognitive mechanisms underlying strategic behavior are far from being understood. In the current study, we hypothesize that the interplay between representation-building processes and cognitive reflection could explain the heterogeneity observed in game playing. In two eye-tracking experiments, we registered eye movements of participants while playing matrix games of increasing relational complexity (2 x 2 and 3 x 3 matrices). We analyzed patterns of information acquisition to individuate the types of payoff comparison performed by participants and understand the type of game representation they were building. Results show that, in both classes of games, strategic choices were explained by the ability to incorporate the counterpart's incentives in the model of the current game. Such ability was predicted by the CRT score, and completely mediated the relationship between cognitive reflection and strategic behavior. High CRT players anticipated others' actions incorporating information about other's incentives in their model of the environment, and indeed chose strategically. Conversely, low CRT players analyzed game matrices disregarding relevant comparisons on others' payoffs, and such incomplete visual analysis led to non-strategic choices. Our results provide novel evidence about the interaction between thinking dispositions and representation-building mechanisms, and its crucial role in explaining interactive behavior. In particular, we suggest that strategic behavior roots in general abilities in information encoding and integration, while miserly information processing predicts sub-optimal game representations and non-strategic behavior.

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# Confidence judgment in own skills: the effects of gender and incentives

Julia Felfeli<sup>28</sup>, Anja Achtziger

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## Abstract

The aim of these two studies was to investigate the effects of monetary incentives on the judgment of own skills. As earlier research on confidence judgment has shown, males are prone to be overconfident in their own skills whereas females are underconfident. One objective of our studies was to explore if monetary incentives could be a valid intervention to prevent confidences biases in both genders. Participants answered general knowledge questions and rated their confidence concerning the correctness of their answer to these questions. In Study 1, we incentivized each correct answer, whereas a realistic confidence judgment was incentivized in Study 2. Furthermore, we measured the response time on confidence rating to examine if confidence judgments rely on automatic or controlled processes. We found that males were more confident in their own skills than females in both studies independent of the incentives. The incentivization of correct answers in Study 1 had no effect on the confidence judgments, but the incentives for the realistic judgment in Study 2 led to less confidence. Regarding the response times on confidence ratings, we found in Study 1 that participants who took longer rated their confidence lower as participants with shorter response times.

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# Intrinsic connectivity networks underlying individual differences in control-averse behavior

Sarah Rudolf<sup>29</sup>, Thomas Baumgartner, Sebastian Markett, Katrin Schmelz, Roland Wiest, Urs Fischbacher, Daria Knoch

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## Abstract

When people sense that another person tries to control their decisions, some people will act against the control, whereas others will not. These individual differences in control-averse behavior have been well documented in behavioral studies, but their origins are less well understood. Here, we use a neural trait approach to examine whether individual differences in control-averse behavior might originate in stable brain-based characteristics, much like a neural fingerprint. To do so, we analyze the association between intrinsic connectivity networks (ICNs) as measured by resting state fMRI and control-averse behavior in an economic exchange game. In this game, subjects allocate money between themselves and varying, anonymous interaction partners. Critically, their interaction partners either let them choose freely (Free condition) or request a minimum amount to be returned, thereby controlling the subjects' choice options (Controlled condition). The amount to which subjects return less in the Controlled than in the Free condition measures their individual level of control-averse behavior. We find that the intrinsic connectivity within the salience network (SN) positively predicts individual control-averse behavior. Specifically, subjects with a more prominent connectivity hub in the dorsal anterior cingulate cortex show greater levels of control-averse behavior. Interestingly, this result is specific to the SN and was not found in the central executive network or the default mode network. These findings provide the first evidence that the heterogeneity in control-averse behavior might originate in systematic differences of stable brain states.

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# Individuals' behavior behind the punishment in a monetary game

Leydiana de Sousa Pereira<sup>30</sup>, Jadielson Alves de Moura, Danielle Costa Morais, Ana Paula Cabral Seixas Costa

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## Abstract

Economic decisions are often self-conflict situations in which individuals are trying to select the choice that brings the greatest reward with lower risk. This study aims to analyze the decision-maker responses to uncertainty situations using neuroscience techniques and tools to identify aspects related to rewards and punishment behavior. Electroencephalography and eye-tracker equipment were used to collect psychophysiological data. A monetary game was developed to display experimental stimulus. Pupillary results indicate punishment stimulus caused more pupil dilation than reward stimulus. In an event-related potential results occurred 300 ms after event display (P300) indicates highest amplitude in punishing stimulus. These results together suggest high punishment magnitude cause negative emotional charge or frustration. Such kind of study can provide insights.

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# Proxyeconomics, an agent based model of Campbell's law in competitive societal systems

Oliver Braganza<sup>31</sup>

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## Abstract

In many areas of society we rely on competition to better achieve societal goals. Ideally, this motivates effort and efficiently allocates resources. However, competition generally depends on quantitative proxy measures in order to assess performance, which leads to an increasing use of such quantitative “proxies” in modern societies. Examples include: in science, the publication count of an author, in healthcare, the number of patients treated or in business, the profit achieved. Importantly, some practices may optimize “proxy performance” but not the actual societal goal. In such cases, individual decisions and cultural practices may shift away from the societal goal and toward the proxy. Such processes have been described by a law attributed to Charles Goodhart or Donald T. Campbell, most pithily phrased as: "When a measure becomes a target, it ceases to be a good measure." While the original mentions of this law address policy determination or education respectively, we propose it applies to any competitive societal system: “Any proxy measure in a competitive societal system becomes a target for the competing individuals (or groups), potentially leading to corruption of the measure”. Here we develop a theory of this process, termed “Proxyeconomics”, where a “Proxy economy” is a competitive societal system in which practices are primarily oriented towards the proxy measure, rather than the actual societal goal. Importantly, such excessive proxy orientation will remain hidden, as long as the proxy remains the primary evaluative tool. To develop formalizations of the necessary building blocks of such a theory we construct an agent based model integrating agent level decision mechanisms with system level selection mechanisms. We find that intrinsic moral incentives can bound the long term evolution to bad (excessively proxy oriented) practices, even when the information contained in the proxy is limited.

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# Implementing loss-aversion principle in incentive programs:

## the unfathomed yet rosy modus operandi

Aadarsh Das, Gaurav Marathe<sup>32</sup>, Tanusree Dutta

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### Abstract

Motivation constitutes the paramount mantra for better performances of employees, paving the way for success of an organisation. Improving motivation is no less a complicated task for firms to spur performance and innovation. Both monetary and non-monetary incentives are employed to enhance motivation among the employees. Incentives have been the nuclei of controversies in many organisations spanning multiple industries over the past years. The present article sheds light on the application of behavioural economics in designing incentives in an Indian microfinance firm. The principle of loss aversion, where, people feel more pain in losing something than gaining, is employed by providing a prepayment bonus to the employees. We expect to observe enhanced performance among the employees awarded a prepayment bonus compared to those who get rewarded for their performances at the end of a month much alike to conventional reward programs. The results suggest otherwise, leaving us room to ponder over the very implementation of prepayments in organisations.

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## Beyond asking:

# exploring the use of an implicit procedure to estimate consumers' willingness-to-pay

Jasper Dezwaef<sup>33</sup>, Jelle Demanet, Timothy Desmet, Marcel Brass

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### Abstract

It is generally accepted that information about consumers' willingness-to-pay (WTP) is vital for companies to outline a competitive pricing strategy. Yet, the validity of the current WTP estimations is often doubted. A way to increase the validity of these estimations would be to obviate the problems, such as answering strategies, inherent to explicit consumer research. In order to do this, we explore to what extent implicit techniques allow us to estimate consumers' WTP. We outline a procedure that potentially can be used to estimate WTP without explicitly asking what consumers are willing to pay. In order to test whether this innovative procedure works, we conduct two exploratory studies. Results of the first study demonstrated that the procedure was successful in eliciting automatic price evaluations. However, the pattern observed in the data was not useful to appraise implicit WTP estimates. Therefore, the procedure was adjusted, and an additional study was conducted. Firstly, the results of the second study replicated the finding that the procedure elicits automatic price evaluations. Additionally, the observed data pattern allowed to interpret implicit WTP estimates. Taken together, these studies proof that the procedure is fruitful in eliciting automatic price evaluations. Therefore, we argue that this novel procedure can be used to implicitly estimate consumers' WTP.

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# Evidence for a single-process account of memory-based decisions

Sebastian Gluth<sup>34</sup>, Peter Kraemer, Mikhail Spektor

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## Abstract

Many every-day decisions require the retrieval of relevant information from memory, but the neural and cognitive mechanisms underlying memory-based decisions remain elusive. In a recent study, we found that decisions are biased by memories in the sense that remembered options are preferred even if they are comparatively unattractive. We implemented this memory bias into a decision-making model, assuming that people compare the value of the remembered option with a below-average reference value. Here, we compare this model with an alternative dual-process account that assumes people to arbitrate between a "heuristic" process (that simply chooses the remembered option with some probability above .5) and a "utility" process (that decides on the basis of the remembered option's value without any memory bias). The two competing accounts make similar predictions with respect to the choice data but differ in their response time (RT) predictions: The single-process account predicts the slowest RTs for below-average remembered options, the dual-process account predicts the slowest RTs for average remembered options. We analyzed the RT data of a recent study with  $n = 90$  participants that made decisions on the basis of retrieving choice options from memory. The RT analysis provided strong evidence in favor of the single-process account: When the value of the remembered option was below average, the RT were slowest ( $t(89) = 4.18$ ;  $p < .001$ ). Also, the strength of the memory bias on choice and the shift of the RT distributions were correlated with each other ( $r(88) = .25$ ;  $p = .017$ ), suggesting a common underlying mechanism. The present study is an eminent example of how the analysis of RT data can help to disambiguate between competing cognitive theories of decision making.

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# Effects of loss aversion on the neural processing of actual and counterfactual decision outcomes: an event-related potential study

Katerina Kokmotou<sup>35</sup>, John Tyson-Carr, Vicente Soto, Yuxin Xie, Stephanie Cook, Timo Giesbrecht, Athanasios Pantelous, Andrej Stancak

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## Abstract

Loss aversion is the tendency to prefer avoiding losses over acquiring gains of the same amount. Individual differences in loss aversion have been shown to mediate the neural processing of experienced decision outcomes. Fully informed evaluation of decision outcomes often depends on comparisons between chosen and unchosen options. Neuroimaging studies have elucidated the processing of alternative, but foregone, outcomes. However, the way in which loss aversion modulates the cortical processing of such counterfactual outcomes remains unknown. The present study compared the effects of loss aversion on neural evaluations of monetary outcomes resulting from chosen and unchosen gambles (actual vs counterfactual outcomes) using electroencephalographic (EEG) recordings. A monetary gambling task and parametric modelling of choices were used to assess loss aversion. Participants were asked to accept or reject a series of gambles with 50% chance of winning or losing variable amounts of money. Feedback was given about the actual or counterfactual outcome. EEG activity was recorded continuously using a 128-channel EGI (Electrical Geodesics, Inc., USA) system. Event-related potentials (ERPs) time-locked to feedback onset for both actual and counterfactual outcomes were analysed and correlated with loss aversion. Feedback ERPs were stronger for actual losses compared to gains, while there was no difference between counterfactual gains and losses. Loss aversion correlated with ERPs for actual outcomes in central-parietal midline electrodes. In contrast, there was no association between loss aversion and counterfactual outcome processing. Results suggest a context-specific influence of loss aversion on the neural processing of decision outcomes; loss aversion appears to be unrelated to the evaluation of unchosen decision outcomes. Instead, it appears to be relevant only when outcomes have an actual financial impact for individuals.

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# Reading competences of government scholarship students from Amazon native communities: an eye tracking social inclusion case study

Gabriel R. D. Levrini<sup>36</sup>, Freddy Linares Torres

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## Abstract

The objective of this research is to analyse the reading skills of scholars with eye tracking device from native Amazonian communities contemplated with universities scholarships from the Government of Peru using biometric, linguistic and psychological techniques. Two group of escolar were selected as experiment sample: the first group 48 selected scholarship students from five different Peruvian Amazon public and private universities; and the second group, used as control, contained 46 scholarship student from three different universities based in metropolitan Lima. Literature research explore educational potential in relation to the individual characteristic of reading comprehension skills, which, by definition, is related to learning from text reading. The main research conclusions are: a) on average, scholarship beneficiaries from indigenous communities have a greater fixation duration than recipients from Lima based students' in all the Areas of Interest; b) on average, grantees from Amazon communities had more fixation points in all the areas of interest, which could mean greater difficulty understanding the texts, in some AOI, significant differences were found between the groups; c) grantees from Amazon communities had greater fixation duration and more fixation points, which indicates longer reading time and potential problems in reading comprehension; d) Scholars also showed more difficulty to understanding texts. Nevertheless their proved that their major effort in the reading process also represents a major greater success for them as scholarship members.

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# The role of ventromedial prefrontal cortex and temporo-parietal junction in third-party punishment behavior:

## a tDCS study

Emanuele Lo Gerfo<sup>37</sup>, Alessia Gallucci, Rosalba Morese, Alessandra Vergallito, Stefania Ottone, Francesca Bosco, Ferruccio Ponzano, Leonor Josefina Romero Lauro

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### Abstract

Third-party decision-makers, sacrificing selfish interests, punish offenders, who violate either fairness or cooperation norms to maximize their self-interest. The degree of punishment increases with the severity of norm violation. This choice to punish is defined as altruistic punishment. Third-party can also show an opposite and apparently paradoxical behavior, namely anti-social punishment, which is the tendency to spend one's own money even to punish cooperative behavior or fair allocation. Previous fMRI studies correlates punishment behavior with the recruitment of reward system areas (e.g. ventro medial prefrontal cortex VMPFC ) and with increased activation of the mentalizing network (e.g. tempo parietal junction TPJ) and central-executive network. The Study Aim is to investigate with anodal transcranial direct current stimulation (a-tDCS) the role of VMPFC and TPJ in punishment behaviors. In a cross-over study participants played third-party punishment after either a-tDCS over VMPFC, right TPJ or sham tDCS. As third-parties, our subjects saw a series of (un-)fair monetary allocations between unknown proposers and recipients and were asked to determine whether and how much to punish the proposer using their own monetary endowment. Our findings highlight that tDCS differently modulates the VMPFC and the TPJ activity when people observe unfair and fair economic interactions, suggesting that different brain networks, namely the reward and mentalizing systems, underlie altruistic and anti-social punishment behaviours.

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# Reconceptualization of entrepreneurial expertise: a multi-dimensional model

Richard Martina<sup>38</sup>

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## Abstract

Knowledge about entrepreneurial expertise, how experts think and make decisions have progressed in the last decade. Despite this advancement, studies have struggled to provide a general conceptual model of expertise that is empirically validated. We attribute these limitations to the lack of existing conceptualization of entrepreneurial expertise to take into consideration individual's dual cognitive processes and the multiple dimensions of entrepreneurship. Therefore, in this study, we advance a multi-dimensional model consisting of dual cognitive processes containing analytical and emotion-based information processes. We suggest three broad categories of entrepreneurial knowledge that are malleable to the specific sector in which an entrepreneur operates. Finally, we present testable propositions regarding the antecedents of entrepreneurial expertise.

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# How do consumers perceive new products?

## Evidence from a functional magnetic resonance imaging (fMRI) study

Jan Andre Millemann<sup>39</sup>, Sven Heidenreich, Martin Reimann, Christoph Krick

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### Abstract

From a company's perspective, understanding consumers' reactions to new products is of utmost importance. Within this respect, several studies have tried to shed light on psychological processes underlying consumers' reactions to innovative products. However, a substantial amount of information processing in new product evaluations proceeds rather unconsciously and is thus difficult to assess by traditional methods employed in earlier research, such as questionnaires, interviews or experimental observations. Yet, recent advances in cognitive neuroscience have shown promising results in dismantling such underlying psychological mechanisms. Especially neuroimaging techniques, such as the fMRI, seem promising to shed light on how consumers perceive and react to new products. Hence, to better understand cognitive processes underlying the perception of product innovations we conducted a fMRI experiment using 43 individuals. Our preliminary results show that the neuronal activity of perceiving product innovativeness differs between its two subdimensions, functional and behavioral innovativeness. While functional innovativeness provokes hemodynamic changes in the temporal lobe, inferior parietal cortex and angular gyrus and the medial prefrontal cortex, behavioral innovativeness induces neuronal activity in the SMA, the posterior cingulate cortex, and the anterior insula. Following the neurobiological analysis, we applied PLS SEM to test the correlation between the self-reported measures (perceived functional and behavioral innovativeness) and its corresponding neuronal results (beta coefficients extracted from ROIs). Our findings imply that product innovations trigger, depending on their type of innovativeness, varying neurobiological and cognitive mechanism. By investigating the differences between the derived neurological networks, we provide future scholars with insights into the underlying neurological mechanisms that accompany new product evaluations and trigger new product adoption decisions. From a managerial perspective, evidence from our study provides marketing managers with in-depth insights on how to align marketing measures more efficiently with consumers' neuronal processing to enhance new product perceptions, which in the end might contribute to new product success.

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# Exploring the decision process within a triadic comparison - the procedure of the repertory grid technique examined by eye-tracking

Cordelia Mühlbach<sup>40</sup>

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## Abstract

This study intends to provide further insights into the advanced methodological research with the repertory grid technique (RGT) in combination with an eye-tracking measurement. The RGT is an in-depth interview technique originally developed for the application in clinical psychology. Due to its high functionality it is currently used in a wide variety of research fields (e.g. organizational development, measuring customer satisfaction or usability testing). In this study a set of 21 employer brand logos will be examined as elements, compiled in triadic comparisons. During the RGT the individual perception respectively the associated similarities and differences of the research elements could be elicited and evaluated. This associated perception will be complemented by the eye-tracking sequence with focus on the decision made during the first step of repertory grid procedure. By combining these research instruments two complementary research goals for linking choice data with insights from the decision process will be achieved. 1) Will there be a pattern of fixations and cascades which correlates with the element choice (especially with respect to divergent element from the triadic comparison)? 2) Does the order of the elements within the triadic comparison have an influence on the choice of the divergent element in the RGT? With the qualitative experiment design, the RGT provides insights into the individual perception of each participant and a summarized quantitative data analysis will add further aggregated insights about the whole sample. The analyzation of saccades and fixations from the eye-tracking data will gain additional insights concerning the eye movement while the RGT decisions were made.

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# To cooperate or to compete: the influence of ingroup and outgroup contexts

Rosalba Morese<sup>41</sup>

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## Abstract

One of the most important characteristics of human beings is the ability to cooperate, which allows us to build social relationships in very large social groups. Cooperation is an important stage in human evolution, allowing the formation of social norms that allow groups to survive and develop modern societies. People tend to punish unfair behaviour that violates the norms of cooperation even if the punishment may imply a personal cost, as in the case of altruistic punishment behaviour. On the other hand, in the literature some studies report the existence of an opposite, apparently paradoxical and puzzling behaviour, the anti-social punishment: the tendency of some people to spend their own money to punish cooperative behaviour. It could be explained as a form of competition between different groups in which the violation of the social norm of cooperation is aimed at creating damage to the antagonist group. Recently, the scientific interest in neuroscience focuses on the investigation of neuronal processes involved in cooperation and competition behaviours modulated by their own or different contexts of group membership. Specifically, neuroimaging studies delineate that distinct brain areas can be recruited in the processing of cooperation and competitive behaviours. In the literature cooperation is associated with neural areas of reward system. In contrast, competition behaviour can be correlated with activations in areas related to mentalizing, for the complexity of social cognitive processing. During a neuroimaging studies these two behaviours, altruistic punishment and anti-social punishment, were investigated in different group contexts to compare how individuals behave with members of their own group (ingroup) and with members of another group (outgroup). Groups were defined on a real nationality basis (Chinese or Italian). Behavioural results showed that altruistic punishment emerged all experimental conditions, ingroup and outgroup, instead anti-social punishment was applied only in outgroup context. Neuroimaging data showed that during the altruistic punishment reward areas are recruited and that during anti-social punishment brain area of regulation of emotions related social contexts was involved. Altruistic punishment and anti-social punishment could be play a central role in motivation of social norms of cooperation and competition.

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# Transcranial magnetic stimulation of the right DLPFC modulates risk aversion but not probability weighting

Ksenia Panidi<sup>42</sup>, Alicia Vorobyeva, Matteo Feurra, Vasily Klucharev

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## Abstract

Recent economic theories of choice under risk postulate that the observed risk-taking behavior in monetary domain may be a result of the value of money (i.e. how much a person values one additional dollar, or decreasing marginal utility of money) as well as specific perception of probabilities (i.e. probability weighting). However, existing neuroeconomic studies of risk taking usually focus on the analysis of the degree of the observed risk taking per se without disentangling its individual components. Employing Transcranial Magnetic Stimulation (TMS), we attempt to explore the effects of decreased dorsolateral prefrontal cortex (DLPFC) excitability on the marginal utility of money and on the perception of probability in risky choice. In the present study, a within-subject design is employed. Participants attend the laboratory for three sessions separated in time by 3 to 4 days. In each session, they first undergo a 40-second repetitive TMS by a perturbation continuous theta-burst (cTBS) protocol on either the right DLPFC or left DLPFC, or a sham stimulation on the right in a randomized and counterbalanced order. After the stimulation, participants answer a series of 96 binary lottery choice questions presented in a randomized order in the domain of gains as well as losses. These questions comprise several Multiple Price Lists similar to a well-known task widely used in Economics and Neuroeconomics to estimate the parameters of risk preferences. A rich set of data on each participant allows us to estimate not only the coefficient of risk-aversion, but also the parameters of probability weighting by fitting the rank-dependent utility model with various versions of the probability-weighting function. Preliminary results suggest that, in the gain domain, down-regulation of the right DLPFC excitability tends to make participants more likely to risk (relative to sham right DLPFC stimulation). A similar effect is observed for the left DLPFC stimulation when the subject's reference point does not include money received for participation in the study. At the same time no effect is observed on probability weighting parameters independently of the functional specification. Thus, our preliminary results suggest that DLPFC may be involved in determining risk attitudes but rather via an involvement in the perception of monetary outcomes, and not outcome probabilities.

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# Subjective utility value of pseudo-reward

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## Abstract

Complex behavioral patterns usually involve sequences of actions. To reduce the complexity of such patterns, information is provided at different steps of the sequences indicating the result of the sub-goals of the task. Previous studies have revealed that pseudo-reward prediction errors activate similar brain regions of the ventral striatum than reward prediction errors. In addition, people prefer options with more pseudo-rewards, even when they do not provide more final rewards. In the present study we tested the hypothesis that pseudo-rewards might bias the decisions toward sub-optimal choices. 174 healthy university students participated in two experiments. The task consisted in two routes representing by two figures with two steps. The first step was a sub-goal (change in the color of the figure; pseudo-feedback, p1) necessary to continue. Then, a second step had a probability (p2) of obtaining a final reward. One figure had more probabilities of pseudo rewards but lower probability of reward when the first sub-goal was achieved. The second figure presented the opposite pattern. In Experiment 1 the two options had the same probability of final reward. Using different probabilities or pseudo-reward/reward (0.8-0.2/0.7-0.3/0.6-0.4) we demonstrated that people had always preference for the most pseudo-rewarding option, even when the two options were equally rewarding. In Experiment 2 we manipulated the probability of pseudo reward each time one figure yielded a reward, by decreasing the probability of pseudo-rewards in these figures and increasing the other one. This manipulation also changed the probability of final reward. The goal of the present experiment was to determine whether people would continue preferring the most pseudo-rewarding figure, event this supposed lower probability of final reward. Results of this experiment showed that in two different conditions (0.7-0.3 and 0.8-0.2) people preferred the most pseudo-rewarding figure even at cost of less final reward (final probability of reward for PS- compared to PS+: 0.33 vs 0.16 in the 0.7-0.3 condition; 0.26 vs 0.13 in the 0.8-0.2 condition). Results of this study demonstrate that people provides utility value to the pseudo-rewards and that this utility value might impair the decisions of people leading to sub-optimal behaviors.

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# Trust and reciprocity drive social common goods contribution norms

Julia Puauschunder<sup>44</sup>

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## Abstract

In the emergent field of tax psychology, the focus on regulating tax evasion recently shifted towards searching for situational cues that elicit common goals compliance. Trust and reciprocity are argued to steer a socially-favorable environment that supports social tax ethics norms. Experiments, in which 256 participants played an economic trust game followed by a common goods game, found evidence for trust and reciprocity leading to individuals contributing to common goals. The more trust and reciprocity was practiced and experienced, the more common goals were supported - leveraging trust and reciprocity as interesting tax compliance antecedents. The results have widespread implications for governmental-citizen relations. Policy makers and public servants are advised to establish a service-oriented customer atmosphere with citizens breeding trust and reciprocity in order to reach common societal goals.

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# Decision signatures in managerial brain architecture

Jyotirmaya Satpathy<sup>45</sup>, Ahalya Hejmadi

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## Abstract

Scholarship of neuroscience with social science has witnessed advance in Neuroeconomics and Neuromanagement at the dawn of this Century. Neuroeconomics combines theory and methods to study decision-making. Theoreticians focus on use of additive utility representations to describe decision behaviour that challenge empirical results. Each revision consistently confronts differing evidence. This is result of potent mix of volatility, uncertainty, complexity and ambiguity fueled by advances in biology and neuroscience. It is empirical that sciences progress when they take secondary principles as point of departure. It is challenging to compare several courses of action and select one to be executed. Manager has to take decisions with inadequate information. It is important to understand intricacy of managerial brain associated with executive functions. In order to explain neural basis of decision-making, ability to process multiple alternatives and choose optimal course of action, especially in managerial context, scientists combine research methods from neuroscience, experimental economics, behavioural economics, and cognitive psychology. Is building models of cognition an efficient means of answering managerial decision questions? Interchangeably using “Psychological” data and “cognitive and neuromanagement” data, this paper regards as “psychological” any information that go beyond standard “choice data”. Neuro-tracing and imaging techniques are beginning to reveal structural anatomy of neural circuits in unprecedented detail. Imaging studies suggest that differences in cognition and behaviour (might) relate to differences in managerial brain connectivity. Perceptive the coverage to which two managerial brains can differ is crucial. How do managers know where they are, where they have been and where they are going in their decision path? Are we approaching psycho - economic questions and decisions with the right angle? An attempt is made to explore how managers arrive at a rational decision. Methodology is based upon deductive review approach. Attempts employ multi - method approach and triangulation of methods drawing on positivist and interpretivist research paradigms. This likens methodology to building with “foundation” (philosophical premises), “Pillars” (consisting of research approach / strategies / data collection / analysis matrix) and “subsidiary inclusive structure” (operational framework). This starts from theoretic review leading to specificities as a waterfall - based (“top – down”) approach. Contributions from fundamental and applied sciences are equally represented and cover a broad range of scientific work, reaching from mathematical modeling to scholarly introductions into new research disciplines and related methodologies and technologies

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# Adult attention-deficit hyperactivity disorder: a database analysis of South African private health insurance

Renata Schoeman<sup>46</sup>, Manie De Klerk

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## Abstract

Adult attention-deficit hyperactivity disorder (ADHD) is a chronic, costly and debilitating disorder. In South Africa (SA), access to funding for care and treatment of ADHD is limited, and research is lacking. This study aimed to establish the current situation with regard to the psychiatric management of and funding for treatment of adult ADHD in the private sector in SA. A diagnostically refined retrospective claims database analysis was conducted. We report on findings of a quantitative analysis of a on a diagnostically refined retrospective claims database using medical data, pharmacy data and enrolment information as captured for the largest administrator of medical schemes in SA, representing 3 million beneficiaries (29% of all South African medical scheme beneficiaries across 17 medical schemes). We examined the prevalence, costs and funding profile of claims over a 2-year period for adult beneficiaries with possible ADHD of a large medical administrator in SA. The prevalence of adult ADHD was lower than published international rates. The presence of adult ADHD increased the prevalence of comorbidity and doubled the health care costs of beneficiaries. Contrary to public belief, comorbidities (including their medicine costs) rather than psychiatric services or medicines were the main cost drivers. The current private health insurance funding model for ADHD limits access to funding. This affects early diagnosis and optimal treatment, thereby escalating long-term costs. Improved outcomes are possible if patients suffering from ADHD receive timely and accurate diagnosis, and receive chronic and comprehensive care. Balanced regulation is proposed to minimise the risk to both medical schemes and patients. A collaborative approach between stakeholders is needed to develop an alternative cost-effective funding model to improve access to treatment and quality of life for adults with ADHD in SA.

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# The investigation of consumers understanding of health claims and health symbols using eye-tracking experiment and survey methods

Judit Simon<sup>47</sup>, Ildiko Kemeny, Akos Varga, Erica van Herpen, Aikaterini Palascha

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## Abstract

The health claims and health symbols on the packaging on the products may draw attention of consumers during the product choice process. The main research question of the study was: how do visual elements on the package attract attention to health claim products and has it any relationship with the health literacy and health-oriented behaviour of the consumers? The research had 2 steps, where the main focus had the first step, the experiment, that aimed to quantify the effects of different types of visual imagery on attention and choice of health claim products using eye-tracking. The second step of the research was a survey: after the eye-tracking step the respondents faced a questionnaire on the literacy of the health-related issues of food and on their attitude towards health-conscious behaviour. In the eye-tracking experiment a mixed design was used in which Image and Health goal were manipulated between subjects and product category (cereals, dairy, fish products and beverages) within subjects. Participants were asked to examine the products in each product assortment and click on the one they would buy. We separated behavioural segments based on the questionnaire, we have got 4 different segments according to their health consciousness and knowledge on health related issues. Investigating the results of the experiment where we could not confirm the expectation that images would be especially suited for drawing attention, we can differentiate the results based on behaviour clusters in some extent. We might say that for the more health conscious consumers are the health claims more attractive than images, but for the less health conscious consumers, who are interested in health benefits, but are not very concerned of health risks are the images important, they can attract the attention faster than only the claims.

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# Decoding proposers' motivations in the ultimatum game

Sebastian P. H. Speer<sup>48</sup>, Maarten A.S. Boksem

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## Abstract

In the Ultimatum Game (UG), the proposer may have different motivations for splitting their endowment evenly. They may do so out of fairness concerns (“fairness-driven” decisions) or because they want to avoid rejection of the offer on the responders’ side (“strategic” decisions). In this study, we used fMRI to identify neural patterns that discriminate between these two motivations. Participants played twelve rounds of the UG and Dictator Game (DG), as proposers. We used support vector classifiers trained on whole brain activation patterns to classify which game the participants were playing (UG vs DG). As responders do not have the option to reject the offer in the Dictator Game, the neural mechanisms underlying the decision-making processes between these two games should differ for fairness driven versus strategic decision makers. In addition, searchlight analyses were applied to explore where in the brain we can accurately classify which games were played. Further, a representational similarity analysis (RSA) searchlight procedure was used to investigate where in the brain the neural similarity between games correlated with individual differences in offer size between games. Results indicated that we were able to accurately discriminate between neural patterns associated with UG and DG trials. More importantly, we found that the classification accuracy for the participants correlated strongly with their average difference in offer size between UG and DG. Thus, the better the classifier was able to distinguish the neural patterns the higher their difference in offer size between games was. The classification searchlight revealed that we could accurately classify between UG and DG patterns in the inferior frontal gyrus (IFG), the orbitofrontal cortex (OFC), insula and anterior cingulate cortex (ACC). With regard to the RSA searchlight, we found that dissimilarity between neural patterns associated with the two games correlated significantly with individual differences in offer size in the amygdala, posterior cingulate cortex (PCC) and the medial prefrontal cortex (MPFC). These results provide insights into the underlying neural mechanisms of social decision-making as patterns of brain activity are identified that elucidate players’ underlying motivations for their economic decisions: distributing money evenly out of fairness concerns or out of strategic reasons.

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# Group- versus individual level analyses of neural correlates of risk preference

Loreen Tisdall<sup>49</sup>, Renato Frey, Rui Mata

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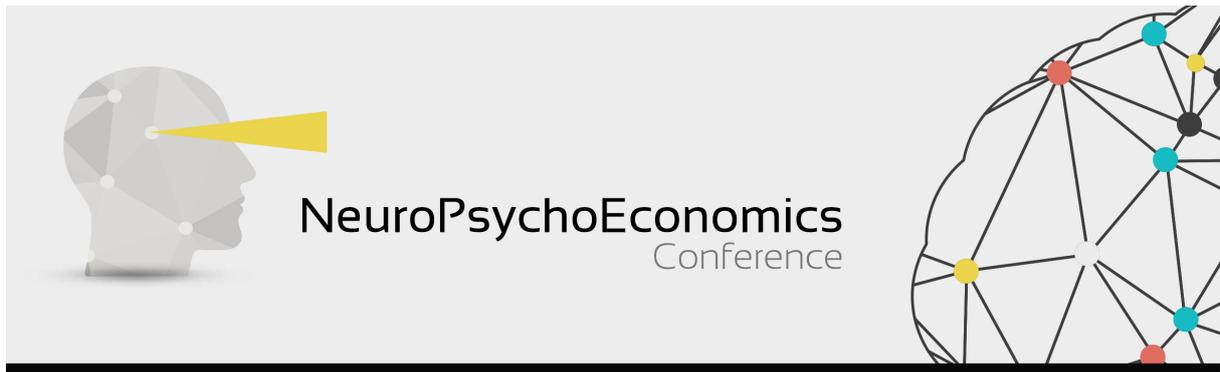
## Abstract

Throughout our lifetime, we make many decisions for which we cannot anticipate the outcome. The degree to which decision outcomes vary is understood as risk, and individuals' willingness to take risks - their risk preference - is a central topic in economics, developmental and clinical psychology, decision neuroscience, and genetics. The literature is saturated with definitions and measures of risk (preference), yet recent work suggested low to no convergence of behavioral measures thereof. This finding contradicts the proposed convergence of risk preference measures at the level of the brain, where quantitative and qualitative reviews have identified several core functional correlates. How can we have risk preference measures that do not correlate but apparently activate the same brain regions? We hypothesized that the disparate set of results observed at behavioral and neural level could be due to (1) neural convergence being lower at the level of the individual than the group, and (2) neural indices of risk preference having limited predictive validity for behavior. To address this proposition, we analyzed functional neuroimaging data from 116 individuals, who completed two common behavioral measures of risk preference: the balloon analogue risk task and a mixed-gambles task. Conjunction analysis of group-level neural responses to risky versus safe decisions in both tasks confirmed activation differences in bilateral caudate as a common neural substrate of risk preference. Interestingly, at individual level, caudate activation in one task was not significantly predictive of caudate activation in the other task, and caudate activation was also not predictive of behavior in the two tasks. Going beyond caudate activation, similar results were obtained for further key regions associated with risk preference, including insular cortex, nucleus accumbens and anterior cingulate cortex. Taken together, our results confirmed our hypotheses, suggesting that repeated measures designs may uncover divergence of behavioral and neural indices of risk preference when analyzed at the level of the individual, and further highlight the gap between the brain and behavior. Considering that individuals' risk preference has been shown to predict critical lifetime outcomes including health, wealth, and criminality, identification of reliable, predictive individual differences is essential for successful prevention and intervention efforts.

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## 2019 Call for submissions

We are happy to announce that submissions are now open for the 15th Annual NeuroPsychoEconomics Conference in **Rome, Italy**. The conference will be held on **June 6-7, 2019** at LUISS University (Viale Pola, 12, 00198 Roma RM, Italy, [www.luiss.edu](http://www.luiss.edu)). The conference chairs are Professors Fabio Babiloni (University of Rome Sapienza), Simona Romani (LUISS University), and Rumen Pozharliev (LUISS University).

The **deadline for submissions** is Friday, **March 15, 2019**, 11:59pm CET.

The conference theme of 2019 is:

### **“Tackling the underlying neural and psychological mechanisms of human economic decision making”**

Topics preferably combine problems in economics, psychology, and/or neuroscience, and include (but are not restricted to):

- **Linking choice data and decision processes.** Understanding the neurophysiological drivers that underlie behavior and decision making. For example, studies that link behavior to response times, neural activity (e.g., EEG or fMRI), gaze patterns (e.g., eye tracking), or click patterns (e.g., Mouselab).
- **Investigating the underlying mechanisms of decision processes** by means of fundamental tools from economics, psychology, neuroscience, mathematics, and statistics (including formal modeling).
- **Applying integrative approaches to broaden our understanding of the key features of decision processes**, such as understanding how people make decisions (e.g., economic decisions) or how the brain calculates gains and losses, especially with regard to cognitive, affective, motivational, or social factors.
- **Applying the principles of affective, cognitive, and social neuroscience research** to research questions in management & organizational behavior, marketing & consumer behavior, financial decision making, law, information systems, or translational medicine.
- **Discussing possible ethical/legal issues** that emerge from such applications.
- **Methodological presentations** on state-of-the-art investigations in decision neuroscience. For example, fMRI, TMS, DTI, EEG/ERP, genetics, and endocrinological studies.

Both empirical and conceptual submissions are welcome.

## Competitive paper submissions

- Competitive papers for the 2019 NeuroPsychoEconomics Conference must be submitted **by March 15, 2019, 11:59pm CET**. The link to the online submission tool can be found at <http://www.jnpe.org> (under “Conference” and “Submissions”). Please do not submit your competitive paper by email but only through the online submission tool.
- Competitive paper submissions can either consist of a full paper of up to 40 double-spaced pages **or** an extended abstract of up to 1,500 words.
- *Full paper submissions* (up to 40 double-spaced pages) must include a short abstract of no more than 350 words (for inclusion in the *NeuroPsychoEconomics Conference Proceedings*, ISSN 1861-8243) and conform to the author guidelines of the American Psychological Association (APA). When submitting your paper, you will be asked to indicate whether or not you intend to publish the full paper, if accepted, in the *Journal of Neuroscience, Psychology, and Economics* (ISSN 1937-321X).
- *Extended abstract submissions* (up to 1,500 words) will go through an expedited review process and should go beyond a research proposal (i.e., empirical extended abstracts should present information on data and results, conceptual extended abstracts should clearly state their theoretical contribution). Extended abstract submissions must also include a short abstract of no more than 350 words (for inclusion in the *NeuroPsychoEconomics Conference Proceedings*, ISSN 1861-8243), in addition to the extended abstract of no more than 1,500 words.
- **In submitting a competitive paper, the submitter affirms that, if accepted, at least one co-author will register for the 2019 NeuroPsychoEconomics Conference and appear at the conference to present the paper.**

## Poster submissions

- Poster proposals for the 2019 NeuroPsychoEconomics Conference must be submitted **by March 15, 2019, 11:59pm CET**. The link to the online submission tool can be found at <http://www.jnpe.org> (under “Conference” and “Submissions”). Please do not submit your poster proposal by email but only through the online submission tool.
- Poster proposals will go through an expedited review process. Your poster proposal is an extended abstract (up to 1,500 words) that describes the research presented on the poster, and a short abstract (up to 350 words) for inclusion in the *NeuroPsychoEconomics Conference Proceedings*, ISSN 1861-8243.
- If your proposal gets accepted, posters to be presented at the conference may have a maximum size of 120 cm (height) x 90 cm (width).
- The best posters may be invited for presentation in a special session at the conference (5-10 minute verbal presentation).
- **In submitting a poster proposal, the submitter affirms that, if accepted, at least one co-author will register for the 2019 NeuroPsychoEconomics Conference and appear at the conference to present the poster.**

## Symposium submissions

- Symposium proposals for the 2019 NeuroPsychoEconomics Conference must be submitted **by March 15, 2019, 11:59pm CET**. The link to the online submission tool can be found at <http://www.jnpe.org> (under “Conference” and “Submissions”). Please do not submit your symposium proposal by email but only through the online submission tool.
- In symposium sessions, a number of presentations (usually between two and six) discuss a common topic, with the goal of shedding new insights on this topic.
- Symposium proposals are single-blind reviewed (meaning submitter and presenter information are disclosed in the proposal) and are judged on overall quality, innovativeness, and fit with the NeuroPsychoEconomics Conference.
- A symposium proposal is one single document that must include the following: (1) title of the symposium, (2) complete names, affiliations, and emails of all participants, (3) a short abstract summarizing the symposium topic, and (4) a 3-6 page overview of the symposium including (a) a brief discussion of why the symposium topic should be of interest to the attendees of the NeuroPsychoEconomics conference, and (b) a short abstract (up to 350 words) of each individual talk.
- **In submitting a symposium proposal, the submitter affirms that, if accepted, all presenters involved in the symposium session will register for the 2019 NeuroPsychoEconomics Conference and appear at the conference to present their work.**

**We look forward to your submissions and seeing you in Rome!**

# Membership & mailing list

## Membership

You can become a member of the Association for NeuroPsychoEconomics online at <http://www.jnpe.org>.

Membership includes a subscription to the peer-reviewed *Journal of Neuroscience, Psychology, and Economics*, a discount in conference fees, and special announcements.

## Mailing list

In order to subscribe to the NeuroPsychoEconomics mailing list, please send an e-mail to [mailinglist@neuropsychoeconomics.org](mailto:mailinglist@neuropsychoeconomics.org) with `Subscribe` in the subject field.

You will receive up-to-date information on topics at the interface of economics, management, psychology, and neuroscience through the official NeuroPsychoEconomics mailing list. The list will also cover information about conferences and publications from those fields.

You will also have the possibility to send own information through the list.

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