

Poster 2-011

ELECTROCORTICAL CORRELATES OF RISK-TAKING IN THE HOT COLUMBIA CARD TASK

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Descriptors: Risk-taking, Computational Model, Single-trial EEG
To capture real-life risk-taking, laboratory tasks need to reflect its dynamic, sequential nature. The hot Columbia Card Task (hCCT) meets this requirement and lends itself to formal analysis via computational models. We aimed to leverage these features and investigate EEG correlates of model-based factors driving risky decisions. Participants ($n = 44$) reported real-life risk taking and performed the hCCT while EEG was continuously recorded. A computational expected utility (EU) model explained choices best. This entailed weighting expected value (combining gain/loss magnitudes and respective probabilities) according to individual risk attitude and loss aversion. We then employed single-trial multiple robust regression within subjects to predict EEG activity during decision making at each time point and electrode from trial-wise EU. The number of risky decisions and a model-derived tendency to take risks in the face of impending losses were significantly linked to higher real-life ethical risk-taking. An EEG signal of EU emerged at centroparietal sites (300–700 ms) which shifted to a frontocentral distribution after 800 ms. Lower expected utility predicted more negative EEG signal. Computationally formalizing hCCT choices seems promising in predicting some aspects of real-life risk-taking. Neural signals of model-derived parameters validates our computational approach. Findings may indicate increased attentional processing of potential losses (P3 interval) and subsequent response preparation for high expected payoff, resembling a continuous negative variation (CNV).

Poster 2-012

GENDER DIFFERENCES IN PSYCHOPHYSIOLOGICAL CORRELATES DURING THE IOWA GAMBLING TASK IN HEALTHY OLDER ADULTS

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Descriptors: Decision-making, Event-related Potentials, Gender
Past literature has demonstrated behavioral gender differences in the decision-making process, which men make more advantageous decisions and earn more money than women. A recent psychophysiological study has shown that women are more sensitive to losses than wins in young adults. However, these gender differences in the elderly are still unclear. A total of 39 healthy older participants (23 men, 16 women) performed an adapted version of the Iowa gambling task for event-related potentials. As neural correlates, we investigated the feedback-related negativity (FRN) and the P3 component, which were analyzed in the feedback stage of the decision-making process. Consistent with previous research, men reached better scores compared to women on the Iowa gambling task. Event-related potentials, showed that men obtained a large FRN amplitude in the ambiguity than the risky phase compare to women. Also, men presented a larger FRN latency than women. However, no significant gender differences were observed in the P3 component. Our results indicate that deficits in decision-making performance related to gender are persistent with aging. A greater activation of men at frontal sites in the ambiguity phase could be related to increases attentional resources in order to learn the contingencies of wins and losses. This explain why men picked more advantageous decks and earned more money than women. Therefore, these observations contribute to the heterogeneity on gender-related differences observed in both men and woman brain aging, when performing the same decision-making task.

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OCULOMOTOR INDICATORS CAN DIFFERENTIATE VARIOUS TYPES OF INFERENCE PROCESSES

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Descriptors: Eye Tracking, Reasoning, Cognitive Procedures
The study of the cognitive processes using eye tracking has become an increasingly popular research area. At the same time, the area of intersection between eye movements and natural reasoning is still understudied. In this work, we studied the possibilities of using such psychophysiological parameters for differentiating reasoning processes within types of logical inference. Eighty three-term inferences (two premises and the conclusion) were presented: Modus Ponens [MP], Modus Tollens [MT], Modus Ponendo Tollens [MPT], Modus Tollendo Ponens [MTP]; each type was displayed in two variants (correct and incorrect or with inclusive and exclusive disjunction, 10 stimuli in each variant). Fifteen healthy Russian speakers took part in the experiment and had to answer whether the presented argument was correct or incorrect. The response time and the oculomotor parameters (eye tracker SMI Hi-Speed, 1250 Hz) were analyzed. Significant differences in various parameters (the response time, the fixations and saccades count, the duration of fixations, the scanpath length) were obtained for different variants of the same type of inference, for correct/incorrect variants of each type of inference. The correct variant of MP significantly differ from all other correct arguments in the duration of fixations which indicates its relative simplicity and basic nature. Thus, the oculomotor parameters can be used for multidimensional differentiation of the inference processes in accordance with the various explicit and implicit levels of the related cognitive mechanisms.

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Poster 2-014

DOES CONCEALING UNTRUSTWORTHINESS EVOKE CONFLICT MONITORING?

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Descriptors: Deception, Conflict Monitoring
Deception studies demonstrated event-related potentials (ERPs) to be promising indicators for discriminating deceptive from honest behavior utilizing underlying neuro-cognitive processes. We focused on the role of conflict monitoring as indicated by the frontal N2 component in an adapted Concealed Information Test (CIT). Stimuli consisted of faces that differed in trustworthiness and were learned prior to the task. Participants were instructed to either indicate a face to be truthfully trustworthy, truthfully untrustworthy or to conceal the actual untrustworthiness by indicating the face to be trustworthy (probe). To investigate robustness of findings across varying ERP quantification techniques, results were calculated for mean, baseline-to-peak and peak-to-peak amplitudes. Data of 30 participants (15 female; age: $M = 23.73$ years, $SD = 4.09$) revealed longer response times and lower correct rates for deceptive vs. truthful responses. A more negative frontal N2 amplitude was found for probes and truthful untrustworthy stimuli compared to truthful trustworthy stimuli when measured as mean or baseline-to-peak amplitude. Results suggest that deception involves N2-related conflict monitoring, response slowing following deceptive responses, and tendencies to avoid deception in terms of lower correct rates. Mean and baseline-to-peak amplitudes are appropriate to illustrate the picture type main effect, whereas the peak-to-peak amplitude is preferable to depict the Picture type \times Condition interaction.