51. Different phenotypes of resting-state cognition: functional connectivity study

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Resting-state fMRI can be used to study functional connectivity of the brain not engaged in any explicit task. Our aim in this study was to quantify different dimensions of thought during rest and find their correlates with functional networks. Scans were collected from 35 participants during 6 min resting-state sessions, after which we asked them to fill out the Amsterdam Resting-State Questionnaire, a retrospective self-report concerning their subjective experience. The questionnaire was used to assess 10 dimensions of thought: Discontinuity of Mind, Theory of Mind, Self, Planning, Sleepiness, Comfort, Somatic Awareness, Visual and Verbal Thought and Health Concern. Functional networks were identified using Independent Component Analysis. Our findings include decrease of activity in the salience network for Somatic Awareness, decrease in the fronto-parietal network for Sleepiness and others. Reports on the subjective state of mind helped to explain variance in measured time courses. Correlating dimensions of thought to measures of functional connectivity can lead us to better understand the significance of different networks in the brain. This study was supported by a grant (2015/17/N/HS6/03549) from the National Science Center, Poland.

52. Frontal complexity: higher variability correlates with lower creativity and lower HRV

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Heart rate variability (HRV) reflects the change of time intervals between adjacent heartbeats. HRV is considered to be a good indicator of control over our health or psychological challenges. High HRV is associated with good health and well-being, while low HRV is related to pathological states. In order to investigate the relationship between HRV and creativity, a group of 28 young adults was tested with a computerized version of the Guilford's Alternative Uses Task (AUT): the idea AUT (iAUT), developed basing on previous work of Fink and colleagues (Fink 2009). Upon the task the participants were instructed to announce their idea by pressing an 'idea button' and reported it. Creativity levels were assessed with respect to their fluency (number of ideas) and originality. The EEG signal was recorded duringresting-state and the following iAUT task performance. The latter was analysed in epochs corresponding to the time period of idea generation. Complexity of bioelectrical activity was calculated using Higuchi's Fractal Dimension (HFD).Statistical analysis showed negative correlation between resting-state frontal HFD index and HRV. Moreover, complexity of the EEG signal recorded from the frontal and central regions of the scalpboth upon resting-state and task condition (idea generation) correlates negatively with creativity (originality).

53. Reconfiguration of brain subnetworks related to increasing cognitive effort

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Large-scale functional connectivity enables to investigate dynamical changes of brain networks during changing external demands. These networks can be divided into multiple distinct modules (subnetworks), which allow efficient information processing. Despite growing number of studies investigating functional networks, temporal changes of particular modules remains unclear. The aim of our study was to determine which modules play crucial role in whole brain network reconfiguration during changing difficulty level in standard n-back letter task. In order to address this question we used novel network based statistic (NBS) approach and graph theory measures applied to predefined network division. For increasing working memory load, we found disconnection of brain subnetwork consisting

mainly of regions belonging to default mode network (DMN). Furthermore, we found significant decrease of overall network modularity. This effect was a result of topological changes in DMN, cingulo-opercular and visual networks. Our findings suggest that whole network topological changes observed in other studies may arise as a result of connectivity decrease between DMN regions. Moreover, we provide evidence that changes of specific brain subnetworks can contribute to overall network modularity differences. This study was supported by a grant (2015/17/N/HS6/03549) from the National Science Center, Poland.

54. A matter of connectivity: Action video game training affected functional dependencies between cortical regions during resting state activity

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Study. Playing action video games, especially first person shooters is highly demanding for cognitive system. Recent studies suggest that there is a causal relationship between action game training and improvement across wide range of cognitive tasks. However, it is still unclear how this improvement might be reflected in connectivity pattern of resting state brain activity (RS). In this context, the aim of our study was to investigate whether action video game training affected functional dependencies (in particular synchrony) between cortical regions during RS.
Methods. We consider resting EEG data recorded from 19 women before and after training using video game. The control group (N =10) were women playing simple non-action game ("Neverball 3-D Puzzle Game"), while experimental group (N = 9) were women playing action game ("Unreal Tournament 3"). Phase locking between selected electrode pairs was calculated. Our approach is based on the Phase Locking Value as an average phase difference in time (Burgess, 2013).
Results. The study is expected to show the different synchrony maps across the groups. This will lead to knowledge about changes in dynamics of the synchrony between different regions of the brain caused by training using action games.

55. The cognitive training with the game "Kalkulilo" and mathematical abilities in children – the preliminary results of a pilot study

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The cognitive benefits of playing video games are widely proved and the use of computer technology to support learning has become popular. Several studies on the effect of this type of intervention on mathematical abilities provided promising results showing the positive outcomes, including counting skills, numbers recognizing and the spatial-numerical relationship. The aim of our study was to examine the effect of training with the use of computer mathematical game "Kalkulilo" on mathematical abilities in pupils aged 5-10. "Kalkulilo" is an educational tool that could be very useful for development and strengthening the processing of spatial-numerical association. The obtained results showed that training with the use of "Kalkulilo" did not improve an accuracy in any condition of number magnitude comparison task. However, after training we observed a reduction of response times in case of numbers presented in different formats (i.e. when dots vs. digits were compared). There were no significant differences found for numbers displayed in the same formats (digits vs. digits, dots vs. dots). This result may suggest that cognitive training using "Kalkulilo" supports the processing of mental representations of numerical magnitudes and switching between different notation of numbers, what may strengthen the number sense and mathematical skills.

56. Mental representations of the number magnitudes of simple and decimal fractions

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The SNARC (Spatial Numerical Association of Response Codes) effect is an example of the spatial-numerical relationship based on the Mental Number Line. It refers to faster left hand responses to low magnitude numbers and vice versa to high magnitudes and right-sided reactions. We investigated this relationship in case of fractions, both

simple and decimal. The participants were required to respond to the color of displayed fractions (the number magnitude of presented fractions was task-irrelevant). The trials were defined as congruent (in case of right/left response to high/low number magnitude of fraction) or incongruent (in a contrary case). The results revealed the SNARC effect for decimal fractions, however we found that this effect could be obtained only for fractions with one-digit numerator (e.g. 0,2 or 0,8). In the case of simple fractions the SNARC effect was obtained only for high magnitudes (e.g. ½ or ¼) as compared to low (e.g. 1/8). Additionally, we found that this effect is dependent on the proficiency in magnitude comparison skills. This results suggest the impact of experience in the spatial-numerical association development and that the spatial-numerical association is more pronounced in case of the fractions that we use more frequently in everyday practice.

57. No relation between leftward bias in gymnastic exercise and lateralized cognitive task performance

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We have measured performance asymmetry in a gymnastic exercise in male freshmen of the University of Physical Education in Krakow. The students performed series of jumps off the box. The distance from the target and lateral deviation were measured. We found a consistent group level leftward bias, inversely related to targeting precision. Attentional (pseudo-neglect) brain asymmetries have been hypothesized to be at play in similar behavioral asymmetries in sports. In an attempt at establishing the source of the leftward bias observed in our study we correlated the bias values with Nicholls' greyscales performance asymmetry and language asymmetry estimated with lateralized rhyme detection, as well as with a number of laterality measures. No meaningful correlations with measures of central asymmetry were found, which suggests that the side bias in jumping may be more of a peripheral than central character.

58. Battery Tests For Examination Cognitive Function - attempt to create a screening tool compared with the reference tool – preliminary reports

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The prevalence of cognitive impairment is increasing very fast all over the world. It is connect with the phenomenon of an aging society and the risk of dementia increases with age. According to Global Burden of Disease researches (2010) scientists have demonstrated that neurological diseases included dementia are the third cause of increasing amount of years when we are living with disabilities (YLD). Objective of the study was creating a shorter version of the tool using to screening cognitive disorders at people over 65 years old. This tool was create to finding alternative of paper tests with a view to significantly reduce the time the study and interpretation of the results. The study was attended by 73 people, with 46 people constitute a test group and a control group of 27 people. The inclusion criteria for the study group was the diagnosis of cognitive impairment made by the physician based on clinical diagnosis. Preliminary statistical analysis showed a correlation in the group of subjects between the results obtained in the computer-based test and the results obtained in the tests, which are tests of paper reference. In summary, preliminary results demonstrate the usefulness of the battery of tests for screening cognitive disorders. Using this tool may increase the detection of cognitive disorders including mild cognitive impairment at an early stage, and therefore affect the proceedings in the therapeutic process and improving the quality of life of people with dementia.

59. What does Baddeley's Grammatical Reasoning Test measure?

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The main aim of the study was to test validity of Baddeley's Grammatical Reasoning Test (BGRT) presented in the literature as a short general mental abilities test (GMA). In BGRT two letters and a sentence describing order of this letters are displayed on the screen, the participants' task is to read a sentence and decide whether it is true or not, e.g. A does not precede B - BA. TRUE/FALSE. BGRT consists of 64 combinations of sentences created according to 6 conditions: positive or negative, active or passive, true or false, precede or follow, A or B as a first letter in a sentence, a pair of AB or BA. There are 3 minutes to complete as many sentences as possible. To test BGRT validity we conducted