Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS
PROGRESSING OF NUMBERS AND LETTERS IN THE HUMAN BRAIN

The abilities to read and to perform simple calculations are crucial to our daily lives. Hence, during our primary education, we receive intensively training for these skills. During this learning phase we are taught to associate a specific meaning to very basic, artificial stimuli, such as Roman letters and Arabic numbers. Interestingly, recent studies suggest that this early-life training actually reshapes our brain and generates visual areas focused exclusively on the processing of these artificial stimuli. Two such areas, known as the letter form area and the number form area, respectively, have been described. This division of processing for numbers and letters is particularly interesting, considering that these stimuli are similar in regards to their visual features, and only differ in the meaning we learned to associate with them. In fact, if you consider Roman numerals, or take a closer look at the title above, you will note that they can even be used interchangeably.

My research aims to better understand the visual processing of numbers and letters. Particularly, I am interested to see whether the number and the letter form areas are actually entirely distinct entities or if there is a functional/spatial overlap between the regions. In addition, I would like to know how the current demands of the environment, i.e. the tasks being performed, alter the activity of these areas. Finally, as these regions are shaped by our experiences, I would like to explore how much experience is actually needed to develop these areas and, further, to what extent the respective neuronal terrain remains flexible even in adulthood.

Publications

PUBLICATIONS
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• Can predictive coding explain repetition suppression? *Cortex; a journal devoted to the study of the nervous system and behavior*
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• Causal evidence of the involvement of the number form area in the visual detection of numbers and letters. *NeuroImage*
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• The relationship between stimulus repetitions and fulfilled expectations *NEUROPSYCHOLOGIA*
  Grotheer, M., Gyula Kovacs, K.
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• Repetition probability effects for inverted faces *NEUROIMAGE*
  Grotheer, M., Hermann, P., Vidnyanszky, Z., Kovacs, G.
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• Repetition Probability Effects Depend on Prior Experiences *JOURNAL OF NEUROSCIENCE*
  Grotheer, M., Kovacs, G.
  2014; 34 (19): 6640-6646