

ZMATH 2016e.00247

Vogel, Stephan E.; Keller, Carmen; Koschutnig, Karl; Reishofer, Gernot; Ebner, Franz; Dohle, Simone; Siegrist, Michael; Grabner, Roland H.

The neural correlates of health risk perception in individuals with low and high numeracy.

ZDM, Math. Educ. 48, No. 3, 337-350 (2016).

Summary: The ability to use numerical information in different contexts is a major goal of mathematics education. In health risk communication, outcomes of a medical condition are frequently expressed in probabilities. Difficulties to accurately represent probability information can result in unfavourable medical decisions. To support individuals with low-numeracy skills, pictographs such as graphs or icon arrays have been proposed to increase risk communication. The neurocognitive mechanism underlying the processing of health risk perception in individuals with low- and high-numeracy remain to be explored. To investigate the neural correlates of health risk perception, the brain responses of individuals with low- and high-numeracy were measured using functional magnetic resonance imaging. In the health risk perception condition, participants were instructed to indicate how concerned they would be of having cancer, given an icon array in which the probability of developing cancer was displayed. In the number line condition the same icon arrays were presented and participants were instructed to indicate the absolute number of displayed black icons. Results of the study showed that the low-numeracy group was more accurate in the health risk condition compared to the high-numeracy group, which overestimated health risks. A comparison of brain activation between the groups demonstrated that the high-numeracy group expressed larger brain engagement during the health risk condition in regions that are commonly associated with conflict monitoring, decision-making and emotional processing. These results provide initial evidence that individuals with high-numeracy engage regions of the brain to a different extent compared to individuals with low-numeracy.

Classification: C80 C30 C40 F20 K50

Keywords: functional magnetic resonance imaging (fMRI); high- and low-numeracy; number line; health; risk perception; icon arrays

doi:10.1007/s11858-016-0761-4