Dependence of hemispheric asymmetry on alertness in healthy subjects and in visual hemineglect patients

Kathrin Finke[*][†][1], Ellen Matthias[2], and Peter Bublak[3]

[1]Ludwig-Maximilian-University Munich – Germany
[2]Ludwig-Maximilian-University – Germany
[3]Friedrich Schiller University Jena, Germany – Germany

Abstract

Typically, in healthy subjects watching a multiple-object display, a slight processing advantage for left as compared to right visual field stimuli can be observed. This subtle bias in attentional competition is assumed to result from a functional dominance of the right hemisphere for spatial attention. As evidenced by visual hemineglect patients, damage to this right-hemispheric spatial attention system gives rise to a clear rightward bias and visual extinction for left-sided stimuli. Recent evidence, however, indicates that this holds true actually only for the "default state" of arousal, i.e. in conditions of adequate intrinsic alertness in healthy subjects and of low-level intrinsic alertness in neglect patients. In a series of experiments we systematically investigated the consequences of manipulations of arousal level on spatial and non-spatial components of visual attention in healthy subjects with different baseline arousal levels as well as in neglect patients. Our paradigms were based on Bundesen's (1990) theory of visual attention, which permits to extract parametric estimates of independent components of selective attention. Our results indicate that the degree and direction of spatial attentional imbalances are strongly influenced by arousal level: On the one hand, persons with a low general level of intrinsic alertness are specifically vulnerable to leftward extinction. On the other hand, enhancement of phasic alertness can optimize the spatial distribution of attentional weights even in neglect patients. We conclude that the brain system underlying spatial attention is decisively influenced by the alertness system and that efficient neglect treatment might build upon this relationship.

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[*]Speaker
[†]Corresponding author: finke@psy.lmu.de