

Interference Control in Healthy and Pathological Ageing

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In the course of ageing the human mind undergoes several alterations. Verbal abilities, for example, expand through our lifespan and remain stable up to a very advanced age while other cognitive functions like interference control worsen as we grow old (Hedden & Gabrieli, 2004). Interference control refers to the ability to regulate and inhibit interfering information streams and plays an important role in ageing, since impaired inhibitory processing compromises the efficiency of other cognitive domains (Hasher & Zacks, 1988). To investigate mechanisms of interference control different conflict paradigms like the Flanker (Eriksen & Eriksen, 1974) or Simon (Simon, 1969) tasks are frequently employed. According to Kornblum and colleagues (1990) the Flanker and Simon conflict are processed in different temporal stages of conflict resolution. Correspondingly distinct neural networks were found to support different types of conflict (Fan et al., 2003). There is evidence that elderly subjects show higher compatibility effects compared to young subjects during the Simon task, indicating inhibitory deficits on response selection level (Kubo-Kawai & Kawai, 2009). In contrast most studies find comparable Flanker effects between young and older participants (Nieuwenhuis et al., 2002; Falkenstein et al., 2001). Thus, on a behavioural level the resolution of conflicts occurring during stimulus encoding seems not to be affected by increasing age. Nonetheless, electrophysiological investigations reveal age-related differences in conflict processing during the Flanker task, pointing to a different strategy of conflict resolution (Wild-Wall et al., 2008). Hence, the present literature suggests that distinct stages of conflict processing are affected differently in the course of healthy ageing.

Because the deterioration of certain cognitive domains is a concomitant effect of ageing, it is sometimes difficult to differentiate between age-dependent and pathological alterations of cognitive abilities. Such a differentiation is particularly challenging when deficits are very subtle as demonstrated in patients with Mild Cognitive Impairment (MCI). MCI comprises a heterogeneous population of individuals with cognitive detriments that are more pronounced than expected regarding age and education (Petersen, 2004). Recent findings suggest that processing of tasks requiring interference control is altered in MCI patients compared to healthy controls. In a study by Wylie and colleagues (2007) MCI-patients showed a higher Flanker effect in comparison to healthy old subjects, indicative of a reduced

ability to inhibit activation from irrelevant stimuli. However, there is no study available investigating different conflict tasks with the same population of healthy adults and MCI patients and methods that can shed light on the temporal and spatial characteristics of their neural correlates.

In order to get better understanding of age-related alterations of interference control on behavioural and neural level, young and old healthy adults and MCI patients will be examined with EEG and fMRI while confronted with a combination of a Simon and Flanker task. Additional neuropsychological evaluation can discern whether there is a relation between alterations of interference control and other cognitive (dys)functions. Thus, this project aims at facilitating an early differential diagnosis of healthy and pathological developments in the course of ageing.

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