

**The effect of music-induced emotion on visuospatial learning in people with Parkinson's disease**

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*Background:* Emotional states influence cognitive processes including visuospatial learning. Parkinson's disease (PD), besides manifesting with the cardinal motor symptoms, presents cognitive dysfunctions, including impairment in visuospatial abilities, and affective disturbances. It has been demonstrated that visuospatial learning and movement preparation might share similar attentional and working memory resources in PD.

*Aim:* To investigate whether manipulation of the emotional state by means of music was able to influence the performance in a visuospatial learning task in PD patients.

*Methods:* 10 PD patients and 11 healthy elderly (ELD) performed a visuospatial learning task while listening two musical pieces evoking neutral or fearful emotions. Targets were presented on a screen in a preset order over four session blocks and subjects were asked to learn the sequence order by attending to the display. At the end of each block, participants were asked to verbally recall the sequence and a score was assigned (Verbal Score, VS).

*Results:* Statistical analysis showed that in both groups VS improved significantly after two blocks, but at the end of the task ELD reached a significantly higher VS compared to PD ( $p=0.001$ ). Regarding the effect of music, listening to the Neutral music piece improved VS already after the first block, whereas listening to the Fear music piece delayed the learning of VS (improvement after the second block), with no differences between PD and ELD.

*Discussion:* Fearful music exerted the same influence on visuospatial learning in elderly and in PD, despite differences in cognitive abilities between groups. Our hypothesis is that the fearful music influenced the fronto-parietal network, involved in visuospatial learning, and particularly the dorsolateral prefrontal cortex (DLPFC), traditionally considered involved in cognition, but also in emotional processes.

*Conclusions:* The induced fear state exerts its effect on cognitive circuits underpinning visuospatial ability making less prominent the contribution of individual cognitive and affective characteristics.