

Vestibular dysfunction, beyond benign paroxysmal positional vertigo, affects mental rotations: Comment on “Visual dependence and spatial orientation in benign paroxysmal positional vertigo”

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Dear Editor,

We read with interest the work by Nair et al. “Visual dependence and spatial orientation in benign paroxysmal positional vertigo” [3]. In this work, benign paroxysmal positional vertigo (BPPV) and control subjects have been compared on their ability to perform Mental Rotation Tests (MRT). The Authors report that BPPV and control subjects did not differ in terms of overall performance, but that BPPV subjects performed MRT more slowly than control subjects at higher angular orientations compared to the 0° orientation condition suggesting that the cognitive ability of mental rotation is affected by BPPV.

A previous study by Candidi et al. [1] had already reported that reaction times and accuracy of responses in BPPV and vestibular neuritis patients were impaired in mental rotation tasks compared to healthy control subjects. Moreover, both the pattern of results and the strategy used to perform the rotations in “own-body rotation” and “human-figure

rotation” tasks were similar in the three groups thus suggesting that patients’ impaired mental rotation ability was not to be attributed to a different strategy from the control individuals. These results could be of interest for a better comprehension of the study by Nair et al. as they extend the idea that vestibular inputs are crucial, not only for performing body-related spatial rotations, but also object-based ones [2]. A spatial embodiment framework would hold that imagined body transformation is likely to use some gravitational reference information regarding the actual body position [2]. A missing update about body orientation with respect to gravity (a condition that may be experienced in VN and BPPV and microgravity) would thus interfere with the task of mentally transforming one’s own body [1]. The results from Nair et al. suggest that vestibular information is relevant for mental rotations in the large as their impairment also impacts object-based mental rotations [3]. During exposure to microgravity, vestibular input from the otoliths about the direction of gravity is absent (apart from the resting discharge level) while during VN and BPPV there is an unbalance in bilateral vestibular information which triggers vertigo and balance problems. As discussed elsewhere, several cortical sites receive vestibular input, and a missing update

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about the direction of gravity, or a corrupted inflow, could interfere with tasks in which this information is involved [1].

In conclusion, we believe that the results by Nair et al. [3] are in line with, and extend, previous results showing that dysfunctional vestibular inflow impairs mental rotation of both own body and human figures suggesting that unilateral acute disorders of the peripheral vestibular input massively affect the cerebral processes underlying mental rotations.

References

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