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Reciprocal influences between cognitive decline and vestibular processing: Commentary to "Dizziness in patients with cognitive impairment"

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In a recent interesting work, Lee et al. compared the changes in different neuropsychological tests in two groups of patients affected by cognitive impairment with or without postural instability [3]. In this work, entitled "Dizziness in patients with cognitive impairment", the authors further evaluated the degree of relationship between the impairment in Dizziness Handicap Inventory (DHI) and the impairment in different neuropsychological domains. The background upon which the authors base their hypotheses is grounded on experiences postulating reciprocal top-down and bottom-up influences between vestibular information processing and specific cognitive abilities [4]. This was indeed evident in those patients who were affected by vestibular impairment and also had difficulty with path integration tasks [2]. Conversely, experimental studies show that cortical-vestibular projection disruption may lead to vestibulo-ocular reflex (VOR) asymmetry and self-movement dysperception [1]. Lee et al. corroborate these findings from a neuropsychological perspective since a certain degree of relationship was found among the DHI, the Rey Complex Figure Test, and the backward digit span test. Lee et al. depicted that dizziness may interfere with spatial organization and cognitive attentional processes such as spatial ability [3]. Furthermore, the study showed significantly higher DHI scores in patients with postural instability compared to patients without postural instability. These results were discussed highlighting that diminished postural stability due to a neurodegenerative disorder would demand more spatial cognitive ability to stand and walk, and that postural sway itself may distract from attentional capacity [3]. However, considering that control of posture and locomotion is a more demanding task for patients with baseline imbalance, especially when attention is captured by another cognitive task [3], it could have been of interest to relate these results with other studies previously evidencing postural detriment in patients affected by both unilateral vestibular hypofunction and different degrees of cognitive impairment. A study by Micarelli et al. found that postural stability, when evaluated with a posturography platform, is not only correlated with cognitive decline but also that central signal integration, evaluated via body sway frequency domain, is poorly processed within different stages of cognitive decline [6]. These relationships are not only useful for diagnostic purposes but also for rehabilitation stages, since subsequent rehabilitative clinical trials

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demonstrated that VOR recovery and postural outcomes were highly affected by cognitive processes [5, 7]. These findings should be taken into account, remarking that the vestibular system is intrinsically and highly convergent with other sensory and motor signals as well as primarily embedded into reflex generation for spinal and ocular-motor control [6]. These sensory and motor signals interact with various cognitive processes, impacting on postural behaviour in term of adaptive and anticipatory demand, and modifying quality of life, risk of falls, and rehabilitative treatment outcomes [5, 7].

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