# Comparison of Cognitive Functions in Migraineurs with and without Osmophobia

Garascia G[1], Granato A[1], Bartole L[1], Lombardo T[2], Pelusi L[2], Cattaruzza T[2], Manganotti P[1]

[1]Clinical Unit of Neurology, Headache Centre, Department of Medicine, Surgery and Health Sciences, University of Trieste, Trieste, Italy
[2]Clinical Unit of Neurology, Centre for the Diagnosis and Treatment of Dementias and Memory and Cognitive Disorders, Department of Medicine, Surgery and Health Sciences, University of Trieste, Trieste, Italy

## Background and aims

Osmophobia, a heightened sensitivity to certain odors, is common among migraine sufferers. Cognitive impairment and dementias have been linked to olfactory deficits. Aim of this study was to assess whether migraine patients with osmophobia (Osm) present with different cognitive abilities compared to those without osmophobia (NOsm).

## Materials and methods

A cross-sectional prospective study involving Osm and NOsm episodic migraine patients was performed. After excluding patients with chronic migraine and conditions potentially affecting olfaction or cognitive function, such as nasal disorders or certain medications, migraine data were collected. Cognitive performance was assessed using the Montreal Cognitive Assessment (MoCA), the Rey Auditory Verbal Learning (RAVL), the Rey-Osterrieth Complex Figure (ROCF), the Multiple Features Target Cancellation (MFTC) and the Stroop Color and Word (SCW) tests. Results were expressed as raw, adjusted and Equivalent Scores (ES). Statistical analysis was performed to compare cognitive performance between groups, with the significance level set at $p < 0.05$.

## Results

50 patients were enrolled (median age: 38 [29-45] years; gender: 43 F, 7 M). 27 presented with osmophobia, all reporting this symptom during attacks; 15 of them experienced it also interictally, none reported it exclusively interictally. They reported a median of 5 worsening and 2 triggering-attack odors. Cigarette smoke was the most frequently cited in both categories (85.2% and 37% of Osm patients, respectively). Osm patients had a longer migraine history and more frequent pain exacerbation during physical activity, as well as more nausea and vomiting accompanying their attacks. Despite these clinical differences, cognitive performance did not differ significantly between the Osm and NOsm groups across most neuropsychological tests. The only significant finding was a slower SCW test Reading Time Score in NOsm patients. However, by comparing the ES distribution to the expected one in general population, we found that both groups performed below the general population average, even if within the normal range, indicating a suboptimal cognitive performance.

| TEST | EQ. SCORE | NO OSMOPHOBIA | | OSMOPHOBIA | |
|---|---|---|---|---|---|
| | | N | % | N | % |
| MoCA | 2,0 | 6 | 26,1% | 4 | 14,8% |
| | 3,0 | 11 | 47,8% | 15 | 55,6% |
| | 4,0 | 6 | 26,1% | 8 | 29,6% |
| RAVLT IMMEDIATE RECALL | ,0 | 1 | 4,3% | 3 | 11,1% |
| | 1,0 | 2 | 8,7% | 0 | 0,0% |
| | 2,0 | 1 | 4,3% | 9 | 33,3% |
| | 3,0 | 7 | 30,4% | 4 | 14,8% |
| | 4,0 | 12 | 52,2% | 11 | 40,7% |
| RAVLT DELAYED RECALL | ,0 | 0 | 0,0% | 2 | 7,4% |
| | 1,0 | 1 | 4,3% | 2 | 7,4% |
| | 2,0 | 5 | 21,7% | 2 | 7,4% |
| | 3,0 | 6 | 26,1% | 7 | 25,9% |
| | 4,0 | 11 | 47,8% | 14 | 51,9% |
| RAVLT RECOGNITION | 4,0 | 23 | 100,0% | 27 | 100,0% |

| TEST | EQ. SCORE | NO OSMOPHOBIA | | OSMOPHOBIA | |
|---|---|---|---|---|---|
| | | N | % | N | % |
| ROCF COPY | ,0 | 1 | 4,3% | 0 | 0,0% |
| | 3,0 | 7 | 30,4% | 7 | 25,9% |
| | 4,0 | 15 | 65,2% | 20 | 74,1% |
| ROCF DELAYED RECALL | ,0 | 2 | 8,7% | 1 | 3,7% |
| | 1,0 | 1 | 4,3% | 2 | 7,4% |
| | 2,0 | 0 | 0,0% | 2 | 7,4% |
| | 3,0 | 4 | 17,4% | 1 | 3,7% |
| | 4,0 | 16 | 69,6% | 21 | 77,8% |
| SCWT INTERFERENCE/ ERRORS | ,0 | 0 | 0,0% | 1 | 3,7% |
| | 1,0 | 3 | 13,0% | 4 | 14,8% |
| | 2,0 | 12 | 52,2% | 12 | 44,4% |
| | 3,0 | 8 | 34,8% | 9 | 33,3% |
| | 4,0 | 0 | 0,0% | 1 | 3,7% |
| SCWT INTERFERENCE/TIME | ,0 | 1 | 4,3% | 0 | 0,0% |
| | 2,0 | 4 | 17,4% | 2 | 7,4% |
| | 3,0 | 7 | 30,4% | 10 | 37,0% |
| | 4,0 | 11 | 47,8% | 15 | 55,6% |

***Table*** *- Distribution of patients' equivalent scores*
***Legend****: MoCA: Montreal Cognitive Assessment; RAVLT: Rey Auditory Verbal Learning Test; ROCF: Rey-Osterrieth Complex Figure; SCWT: Stroop Color and Word Test.*

## Conclusions

Both groups exhibited slight cognitive impairment compared to the general population, with no impact of osmophobia on global cognition.

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