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Screening performances of an abbreviated UPSIT Italian version in Parkinson's disease diagnosis

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Introduction: Hyposmia is a frequent finding in Parkinson's disease (PD), usually tested through the University of Pennsylvania Smell Identification Test (UPSIT). Our study stems from a secondary analysis from our previous work validating the culturally adapted version of the 40-item UPSIT smell test for the Italian population [1], and is aimed at providing a briefer version of this test, able to discriminate between PD patients and healthy subjects (HS).

Materials and methods: We assessed the diagnostic performance of each UPSIT item through several univariate (Fisher's $\chi2$, Odds Ratio, Area Under the Receiver Operating Characteristic-AUCROC-curve) and multivariate (machine-learning-based: Logistic Regression and Linear Discriminant Analysis) statistical approaches. Secondly, we selected the best-discriminating 8 items by which we trained a Partial-Least-Square Discriminant Analysis (PLS-DA) and a Decision Tree (DT) model aimed at class (PD vs. HS) prediction.

Results: The 8 selected items were coconut, apple, lilac, banana, watermelon, clove, motor oil, orange. Class predictions of PLS-DA and DT models performed better with the 8-item version when compared to the full 40-item version. Moreover, an AUC-ROC curve built with the selected odors showed the best performance (sensitivity 86.8%, specificity 82%) in predicting the PD condition at a cut-off point of ≤ 6. These performances were higher to those previously calculated for the 40-item UPSIT test (sensitivity 82% and specificity 88.2 % with a cut-off point of ≤ 21).

Conclusions: Our selection contains one odor (i.e., apple) which is Italian-specific, pointing out the need for cultural adaptation of smell testing; conversely, some of our selected best discriminating odors (namely, banana, orange, clove, coconut, motor oil) are in common with existing brief smell test versions validated on PD patients of other cultures, supporting the view that disease-specific odor patterns may exist. Further testing is needed to validate results on an independent cohort and to assess the PD-specificity of our odor subset.

References
[1] Picillo M, Pellecchia MT, Erro R, Amboni M, Vitale C, Iavarone A, Moccia M, Allocca R, Orefice G, Barone P. The use of University of Pennsylvania Smell Identification Test in the diagnosis of Parkinson's disease in Italy. Neurol Sci. 2014 Mar;35(3):379-83. doi: 10.1007/s10072-013-1522-6. Epub 2013 Aug 22. PMID: 23975523.