# ASSESSMENT OF SEVERAL SIMPLE, LOW-TECH "REAL-LIFE" SMELL TESTS IN PD PATIENTS AND CONTROLS: AN INTERNATIONAL, MULTICENTRE STUDY DESIGNED, TESTED AND ANALYSED BY PD PATIENTS

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**BACKGROUND:** Microsmia or even anosmia can precede both the development of motor symptoms and diagnosis in PD. The University of Pennsylvania Smell Identification Test (UPSIT), a 40 item scratch and sniff test is predominantly a research instrument rather than part of the battery of diagnostic tools. We wanted to look at more everyday olfactory assessments to determine loss of sense of smell in PD.

**METHODS:** 66 experimental subjects (46 PD, 20 controls) participated in tests of olfactory function. In test 1, subjects smelt 29 male and female fragrances and had to ascribe the correct gender to each. In test 2, 63 subjects (44 PD, 19 controls) smelt 5 samples (all distilled water) and were asked to say whether they smelt roses, fruit, rubber, bleach or nothing. In test 3, 20 subjects (14 PD, 6 controls) were asked to identify 10 components of the bouquet of 4 wines from a list of 16 choices. Subjects also completed a questionnaire including questions about sense of smell.



### Perceived sense of smell is worse in PD (0-10 scale - many control data missing)

|  | Controls | PD |
|---|---|---|
| Sample size | 13 | 41 |
| Minimum | 5 | 0 |
| Maximum | 10 | 9 |
| Range | 5 | 9 |
| Mean | 8.46 | 4.05 |
| Std. deviation | 1.81 | 2.36 |

Pooled standard deviation = 2.24094
Difference between means = 4.4128 s.e. of difference = 0.71328 with 52 d.f.
95% confidence interval for the difference between means 2.9814 to 5.8441

t value testing mean difference=0.05 is 6.12
Significance level is 0.0000 (0.00%) for 2 sided test

### There was no significant difference between controls and PD in ASAP-30 test

|  | Control | PD |
|---|---|---|
| Sample size | 22 | 44 |
| Minimum | 11 | 9 |
| Maximum | 25 | 23 |
| Range | 14 | 14 |
| Mean | 17.91 | 16.57 |
| Std. deviation | 3.80 | 3.74 |

Difference between means = 1.3409 s.e. of difference = 0.98169 with 64 d.f.
95% confidence interval for the difference between means -0.62025 to 3.3021

t value testing mean difference=0.05 is 1.31
Significance level is 0.1932 (19.32%) for 2 sided test

**RESULTS:** PD patients had significantly (P<0.001) poorer subjective sense of smell based on self-assessment (4.1±2.4SD) than controls (8.5±1.8SD) on a 0-10 scale. In test 1, there was no significant difference between PD and control groups identifying the gender of fragrances. Neither controls (17.9±3.8) nor PD patients (16.6±3.7) scored higher than random guesswork (15.5).

In test 2, PD subjects and controls did not differ in the number of correct identifications (2.4 and 3.0 respectively out of 5).

### There was no significant difference between controls and PD in the distilled water test

|  | Controls | PD |
|---|---|---|
| Sample size | 19 | 44 |
| Minimum | 1 | 0 |
| Maximum | 5 | 5 |
| Range | 4 | 5 |
| Mean | 2.95 | 2.39 |
| Std. deviation | 1.68 | 1.65 |

Difference between means = 0.561 s.e. of difference = 0.45473 with 61 d.f.
95% confidence interval for the difference between means -0.34828 to 1.4703

t value testing mean difference=0.05 is 1.12
Significance level is 0.2655 (26.55%) for 2 sided test

In test 3, there was no significant difference between PD subjects and controls in the number of bouquet components identified (3.7 and 4.0 out of 10 respectively).

**CONCLUSIONS:** An ideal olfactory test should allow sufficient dynamic range for differentiation of control and anosmia groups. Previous work by ourselves under equivalent test conditions demonstrated clear separation of PD and control groups on the UPSIT test [Stamford, 2016] and correlation with self-assessed anosmia. Despite differences in self-assessed sense of smell comparable with the previous trial [Stamford, 2016], the tests used here do not appear to differentiate between controls and PD patients. Largely, this appears to be due to low scores by the control cohort, thus allowing insufficient dynamic range for differentiation of normosmia and microsmia.

### There was no significant difference between controls and PD in the wine bouquet test (UK)

|  | Count | Mean | Min | Max | Median | SDE |
|---|---|---|---|---|---|---|
| **Controls** |  |  |  |  |  |  |
| Correct | 6 | 4 | 2 | 6 | 4.5 | 1.67 |
| False positive | 6 | 5.67 | 4 | 7 | 6 | 1.51 |
| Total | 6 | 9.67 | 7 | 12 | 9.5 | 1.75 |
| **PD** |  |  |  |  |  |  |
| Correct | 13 | 3.69 | 1 | 6 | 4 | 1.49 |
| false positive | 13 | 7.08 | 1 | 16 | 6 | 4.11 |
| PD total | 13 | 10.78 | 4 | 18 | 10 | 4.15 |

**REFERENCE:** Stamford JA (2016) Smell perception and judgement in pd patients: results of a study designed, conducted, analysed and reported by PD patients (presented at MDS, Berlin, June 2016).

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