ODOR AWARENESS SCALE MODIFIED TURKISH VERSION (OASmTR) and EXPOSURE and ODOR PERCEPTION in HOSPITAL WORKERS

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Aims of study

The purposes of this study were:

1- To adapt the Odor Awareness Scale (OAS Smeets et al.) transculturally into Turkish, to test its usage in field studies as a practical tool,
2- To apply OAS to hospital workers (OAS modified Turkish or TOAS), and to evaluate its relation to occupational exposure status

Methods

Cross-sectional design

The Scale was applied to hospital workers in March-April 2011

The study was carried out in a small local occupational disease hospital with a total of 187 workers.

124 of 187 workers were reached; 13 were excluded because of missing data and finally 111 workers were included (64.9%).

Transcultural adaptation

Self-reported positive and negative OAS (32 Questions):


- Standart transcultural adaptation procedure was performed (translation-retranslation by bilingual translators; expert panel evaluation by public health, ENT and neurology specialists, occupational physician and occupational nurse and pilot application)

Variables:

- OASmTR (20 questions adapted version)
- Sociodemographics-age, sex, health conditions, habits and working conditions
- Working features - for analysis especially exposure to dust or chemicals in the working environment

Reliability tests

- Test-retest repeatability was studied in a sample of 30 workers from a different hospital with correlation between two evaluations (in one week) Intraclass correlation coefficient: 0.96(0.94-0.99)

- Conditions include:
  - the same measurement procedure
  - the same measuring instrument
  - the same location
  - the same observer (training nurse gave the instructions)

- After re-evaluation and redaction the test was ready to be applied to the study group
Cronbach's alpha of all questions in this group was 0.746 for 32 items

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.
Bartlett's Test of Sphericity

Cronbach's Alpha N of Items
0.936 20

These 4 subdomains and relevant questions were determined as:
- odor attention (4, 10, 11, 12, 13),
- odor recognition-differentiation (7, 8, 9, 18),
- positive odor awareness (1, 2, 3, 5, 6, 14) and
- negative odor awareness (15, 16, 17, 19, 20).
1. When you walk through the woods, do you pay attention to the odors surrounding you?
2. When someone is busy in the kitchen, do you notice the odor of the food being prepared?
3. Do you notice food odors emanating from houses when you are outdoors?
4. When you are studying, or concentrated in general, do you get distracted by odors in the environment?
5. When you visit someone else’s house, do you notice how it smells?
6. Do you sniff at a new book?
7. When an acquaintance smells differently from normal, for example, because of a new perfume, do you immediately notice?
8. Do you notice the smell of people’s breath or sweat?
9. Do you pay attention to the perfume, the aftershave or deodorant other people use?
10. Are you the first one to smell gas?
11. Are you the first one to smell when the milk is sour?
12. Are you the first one to smell a fire, even when the smell only comes from a barbecue or fireplace?
13. Are you the first one to smell spoilt food in the fridge?
14. Do you feel cheerful or happy when you pick up a pleasant odor in the air?
15. Do you get angry or annoyed by an indistinct or unfamiliar smell in the environment?
16. Does an unpleasant smell in the environment that won’t go away make you anxious?
17. Do you notice food odors from houses when you are outdoors?
18. Do you sniff at clothes before you put them on?
19. The smell of smoke or food is still lingering in your clothes from the night before. Do you put new clothes before putting them away?
20. Does the smell of food sometimes put you off it?

Results

- Group mean age was 36.5±9.1, mean working year 11.5±8.7
- % 20.1 Nurse, % 1.0 MD, % 12.3 technicians and laboratory workers, %15.3 support workers and % 51 cleaners and other health workers
- 47.7% of study group were male and 53.3% were female.
- Mean total score was 36.0±12.1 (between 16.0-80.0)

Since smoking and pack year is significantly higher in male workers partial correlation analysis was performed, and even though the sex effect was adjusted, there was
- negative significant correlation between level of chemical exposure and odor recognition (r = -0.257; p<0.000)
- negative significant correlation between level of dust exposure and positive odor awareness (r = -0.247; p=0.000)
- significant negative correlation between level of dust exposure and odor recognition(r = -0.27; p=0.000)
- negative significant correlation between level of dust exposure and odor awareness(r= -0.19; 0.041)
- significant negative correlation between smoking and chemical exposure (r = -0.27; p<0.000)

Discriminant validity

- By categorizing the scores of the four different domains in factor analysis as below or over the mean, multivariate logistic regression analysis was performed for evaluating the effects of age, sex, working with chemical agents accoring to work group (0-1), working years, working in dusty environment (0-1), smoking (ever-never) and BMI
### Logistic regression analysis results for positive odour awareness

<table>
<thead>
<tr>
<th>Step 1(a)</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
<th>95.0% C.I. for EXP(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive odour awareness</td>
<td>Lower</td>
<td>Upper</td>
<td>Wald</td>
<td>df</td>
<td>Lower</td>
<td>Upper</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-1.211</td>
<td>0.649</td>
<td>3.481</td>
<td>1</td>
<td>0.062</td>
<td>3.298</td>
<td>0.083 1.063</td>
</tr>
<tr>
<td>Chemical exposure (1)</td>
<td>0.035</td>
<td>0.034</td>
<td>1.092</td>
<td>1</td>
<td>0.296</td>
<td>1.036</td>
<td>0.970 1.006</td>
</tr>
<tr>
<td>Dust (1)</td>
<td>-0.705</td>
<td>0.078</td>
<td>1.081</td>
<td>1</td>
<td>0.298</td>
<td>1.049</td>
<td>0.131 1.867</td>
</tr>
<tr>
<td>Smoking (1)</td>
<td>-0.912</td>
<td>0.087</td>
<td>4.356</td>
<td>1</td>
<td>0.037</td>
<td>2.123</td>
<td>1.091 16.233</td>
</tr>
<tr>
<td>Constant</td>
<td>1.415</td>
<td>1.204</td>
<td>1.777</td>
<td>1</td>
<td>0.278</td>
<td>4.116</td>
<td></td>
</tr>
</tbody>
</table>

Logistic regression analysis for positive odour awareness which revealed that exposure to dust increases the risk of having positive odour awareness score below median 4.2 times (1.1-16).

### Logistic regression analysis results for odour recognition/differentiation

<table>
<thead>
<tr>
<th>Step 1(a)</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
<th>95.0% C.I. for EXP(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Odour recogn./differ awareness</td>
<td>Lower</td>
<td>Upper</td>
<td>Wald</td>
<td>df</td>
<td>Lower</td>
<td>Upper</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.261</td>
<td>0.040</td>
<td>0.353</td>
<td>1</td>
<td>0.533</td>
<td>1.298</td>
<td>0.548 3.073</td>
</tr>
<tr>
<td>Chemical expo. (1)</td>
<td>0.011</td>
<td>0.024</td>
<td>0.227</td>
<td>1</td>
<td>0.634</td>
<td>1.011</td>
<td>0.965 1.060</td>
</tr>
<tr>
<td>Dust expo. (1)</td>
<td>-0.792</td>
<td>0.492</td>
<td>2.589</td>
<td>1</td>
<td>0.108</td>
<td>2.207</td>
<td>0.841 5.789</td>
</tr>
<tr>
<td>Smoking (1)</td>
<td>-0.785</td>
<td>0.457</td>
<td>2.955</td>
<td>1</td>
<td>0.086</td>
<td>2.193</td>
<td>0.896 5.370</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.918</td>
<td>0.031</td>
<td>0.794</td>
<td>1</td>
<td>0.373</td>
<td>0.399</td>
<td></td>
</tr>
</tbody>
</table>

### Logistic regression analysis results for odour attention

<table>
<thead>
<tr>
<th>Step 1(a)</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
<th>95.0% C.I. for EXP(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Odour attention</td>
<td>Lower</td>
<td>Upper</td>
<td>Wald</td>
<td>df</td>
<td>Lower</td>
<td>Upper</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-0.391</td>
<td>0.423</td>
<td>0.058</td>
<td>1</td>
<td>0.846</td>
<td>1.005</td>
<td>0.410 2.459</td>
</tr>
<tr>
<td>Chemical expo. (1)</td>
<td>0.005</td>
<td>0.000</td>
<td>0.000</td>
<td>1</td>
<td>0.992</td>
<td>1.005</td>
<td>0.410 2.459</td>
</tr>
<tr>
<td>Dust expo. (1)</td>
<td>1.125</td>
<td>0.460</td>
<td>5.989</td>
<td>1</td>
<td>0.014</td>
<td>3.080</td>
<td>1.064 7.854</td>
</tr>
<tr>
<td>Smoking (1)</td>
<td>0.972</td>
<td>0.439</td>
<td>4.969</td>
<td>1</td>
<td>0.026</td>
<td>2.663</td>
<td>1.126 6.299</td>
</tr>
<tr>
<td>Constant</td>
<td>0.576</td>
<td>0.912</td>
<td>0.398</td>
<td>1</td>
<td>0.528</td>
<td>1.778</td>
<td></td>
</tr>
</tbody>
</table>

Exposure to dust increases the risk of having odour attention score below median 3.0 times, smoking 2.6 times.

### Logistic regression analysis results for negative odour awareness

<table>
<thead>
<tr>
<th>Step 1(a)</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
<th>95.0% C.I. for EXP(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative odour awareness</td>
<td>Lower</td>
<td>Upper</td>
<td>Wald</td>
<td>df</td>
<td>Lower</td>
<td>Upper</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-0.382</td>
<td>0.429</td>
<td>0.793</td>
<td>1</td>
<td>0.397</td>
<td>1.773</td>
<td>0.668 2.951</td>
</tr>
<tr>
<td>Chemical expo. (1)</td>
<td>0.017</td>
<td>0.023</td>
<td>0.566</td>
<td>1</td>
<td>0.452</td>
<td>0.983</td>
<td>0.940 10.284</td>
</tr>
<tr>
<td>Dust expo. (1)</td>
<td>0.118</td>
<td>0.455</td>
<td>0.067</td>
<td>1</td>
<td>0.796</td>
<td>1.125</td>
<td>0.461 2.745</td>
</tr>
<tr>
<td>Smoking (1)</td>
<td>0.268</td>
<td>0.430</td>
<td>0.387</td>
<td>1</td>
<td>0.534</td>
<td>1.307</td>
<td>1.096 4.037</td>
</tr>
<tr>
<td>Constant</td>
<td>1.394</td>
<td>0.987</td>
<td>1.995</td>
<td>1</td>
<td>0.158</td>
<td>4.030</td>
<td></td>
</tr>
</tbody>
</table>

### How do workers assess their own odour perception

<table>
<thead>
<tr>
<th>Percentage (%)</th>
<th>Much less sensitive than others</th>
<th>Less sensitive than others</th>
<th>Equally sensitive to others</th>
<th>More sensitive than others</th>
<th>Much more sensitive than others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage (%)</td>
<td>18.8%</td>
<td>9.0%</td>
<td>22.5%</td>
<td>35.1%</td>
<td>31.5%</td>
</tr>
</tbody>
</table>

**Means of:**

- **Positive odour awareness:** 6.5 + 14.8 + 14.6 = 16.3
- **Odour attention:** 5.5 + 10.7 + 12.4 = 18.6
- **Odour recognition/differentiation:** 4.5 + 11.9 + 13.7 = 15.7
- **Negative odour awareness:** 5.5 + 12.3 + 13.8 = 15.3
When this preference question is analysed; there was no difference among odour awareness scores of responders with preferences of not seeing with glasses, not losing little toe or not losing one ear.

On the other hand individuals with lower odour attention were found to have higher neglect for loss of smell.

### Discussion

- There was positive correlation between the levels they are affected and the odour awareness scores. (never-seldom groups; for last 12 item)
- The responders in never or seldom groups in all questions were found to have odour attention scores lower than mean; the responders in never or seldom groups in questions of avoidance of people or workplace with unpleasant odours were found to have recognition/differentiation scores lower than mean
- These findings might be interpreted that the odour scale does its job

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### Strengths

- This is the first approach to evaluate the awareness as a screening test in a field related occupational exposure

### Weakness and limitations

- Cross-sectional
- Sample size, missing data,
- No external criterion validity (confirmation with a biologically or wellknown valid smell-test)

### Conclusion

- Odor Awareness Scale domains are affected by cultural perception
- It is practical to be used in the field.
- In this respect, it might be improved to be a rapid screening and follow-up instrument to detect changes— (the possible adverse effects of especially chronic exposure on smell sense)