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

Sibel Kiran*, Saadet Colak Özdemir**

* MD, PhD, Assoc.Prof. Zonguldak Karaelmas University, School of Medicine, Health Science Institute, Public Health Department,

** Nurse, Occupational health services of Uzun Mehmet Occupational DiseaseS' Hospital, MpH in Public Health, Zonguldak Turkey

E-mail: sibelkiran@gmail.com

www.karaelmas.edu.tr
www.med.karaelmas.edu.tr

ZONGULDAK KARAELMAS ÜNİVERSİTESİ TIP FAKÜLTESİ

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) :

- *Monique A.M. Smeets, Hendrik N.J. Schifferstein, Sarai R. Boelema and Gerty Lensvelt-Mulders, The Odor Awareness Scale: A New Scale for Measuring Positive and Negative Odor Awareness, Chem. Senses 33: 725-734, Advance Access Publication July 11, 2008*

- 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)

Reliability tests

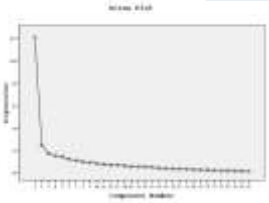
- Test-retest repeatability was studied in a sample of 30 workers from a different hospital with correlation between two evaluations (in one week) Intraclass corelations coefficent: 0.96(0.94-0.99)
- Conditions include:
  - the same measurement procedure
  - the same measuring instrument
  - the same 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

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

Cronbach alfa of all questions in this group was 0.746 for 32 items

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,879
Bartlett's Test of Sphericity	Approx. Chi-Square	1946,166
	df	496
	Sig.	,000



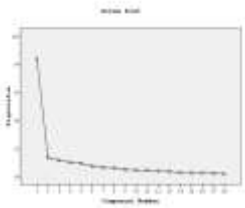
Total Variance Explained

Component	Initial Eigenvalues Total	% of Variance	Cumulative %	Rotation Sums of Squared Loadings Total	% of Variance	Cumulative %
1	12,083	37,759	37,759	4,667	14,584	14,584
2	2,456	7,674	45,433	4,648	14,526	29,111
3	1,703	5,323	50,756	3,406	10,642	39,753
4	1,486	4,644	55,400	3,161	9,878	49,631
5	1,403	4,384	59,783	2,391	7,473	57,104
6	1,176	3,675	63,458	1,861	5,815	62,919
7	1,080	3,376	66,835	1,253	3,916	66,835
8	,948	2,962	69,797			
9	,897	2,805	72,601			
10	,808	2,526	75,128			
11	,735	2,298	77,426			
12	,665	2,078	79,504			
13	,659	2,061	81,565			
14	,612	1,911	83,476			
15	,531	1,660	85,137			
16	,524	1,637	86,773			
17	,493	1,542	88,315			
18	,458	1,433	89,748			
19	,393	1,229	90,977			
20	,354	1,107	92,083			
21	,320	1,001	93,085			
22	,312	,976	94,060			
23	,285	,891	94,951			
24	,254	,793	95,745			
25	,242	,758	96,502			
26	,236	,738	97,240			
27	,195	,608	97,848			
28	,172	,539	98,387			
29	,157	,489	98,876			
30	,137	,428	99,304			
31	,125	,391	99,695			
32	,097	,305	100,000			

Extraction Method: Principal Component Analysis.

Cronbach alfa of all questions in this group was 0.936 for 20 items

Cronbach's Alpha	N of Items
.936	20



Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.914
Bartlett's Test of Sphericity	Approx. Chi-Square	1230.820
	df	190
	Sig.	.000

Total variance explained

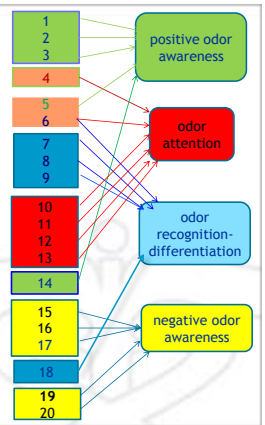
Component	Initial Eigenvalues Total	% of Variance	Cumulative %	Rotation Sums of Squared Loadings Total	% of Variance	Cumulative %
1	9,208	46,042	46,042	3,385	16,923	16,923
2	1,359	6,797	52,839	3,238	16,191	33,113
3	1,238	6,189	59,028	3,198	15,990	49,104
4	1,038	5,192	64,220	3,023	15,116	64,220
5	,939	4,695	68,914			
6	,775	3,876	72,791			
7	,718	3,591	76,382			
8	,642	3,208	79,590			
9	,562	2,810	82,400			
10	,493	2,464	84,864			
11	,445	2,223	87,087			
12	,427	2,136	89,223			
13	,395	1,977	91,200			
14	,356	1,781	92,981			
15	,292	1,462	94,443			
16	,263	1,313	95,756			
17	,242	1,210	96,967			
18	,220	1,100	98,066			
19	,204	1,019	99,085			
20	,183	,915	100,000			

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).

	Component: Positive odour awareness	Odour attention	Negative odour awareness	Odour recognition
Q1	,773			
Q2	,814			
Q3	,609			
Q4		,445		
Q5	,421			
Q6	,441			,465
Q7				,669
Q8				,780
Q9				,607
Q10		,691		
Q11		,852		
Q12		,712		
Q13		,680		
Q14	,514			
Q15			,808	
Q16			,633	
Q17			,466	
Q18	,454			,592
Q19			,584	
Q20			,789	

Rotated Component Matrix(a) Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.



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 odors revive strong or vivid memories in you?
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 on new clothes because of the smell?
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 female and 53.3% were male.
- Mean total score was 36.0 +-12.1(between 16.0-80.0)

N = 111	Positive odour awareness	Recognition and differ.	Odour attention	Negative odour awareness
Mean	7.9	9.4	10.0	8.8
Std. Deviation	3.1	3.8	3.8	3.7
Minimum	4.0	4.0	4.0	4.0
Maximum	20.0	20.0	20.0	20.0

	Minimum	Maximum	Mean	Std. Deviation
Age	19.0	62.0	36.6	9.1
Packyear smoking	10.0	600.0	221.5	177.8
BMI	16.5	37.3	25.3	4.1

	Sex	N	Mean	Std. Deviation	P*
Positive OA	Female	53	7.34	2.4	0.055
	Male	58	8.45	3.5	
Odor recognition/differentiation	Female	53	8.64	3.5	0.062
	Male	58	10.02	4.1	
Odour attention	Female	53	9.13	3.6	0.028
	Male	58	10.71	3.8	
Negative odour awareness	Female	53	8.70	3.6	0.810
	Male	58	8.86	3.6	
Age	Female	53	35.53	9.2	0.262
	Male	58	37.48	9.02	
Pack-year of smoking	Female	12	117.33	98.03	0.009
	Male	22	278.27	187.3	
BMI	Female	53	24.12	4.5	0.003
	Male	58	26.41	3.5	
Chemical exposure year	Female	53	122.36	212.1	0.201
	Male	58	78.42	144.5	
Chemical exposure level (0-3)	Female	53	1.58	1.2	0.003
	Male	58	.91	1.2	
Dust exposure level (0-3)	Female	53	1.85	1.1	0.255
	Male	58	1.62	1.1	

		Positive OA	Odour rec/differ	Odour attention	Negative OA	Age	Pack-year	BMI	Chemical Exp. Year
Positive OA	Pearson Correlation	1							
	Sig. (2-tailed)								
Odor recognition/differentiation	Pearson Correlation	,621(**)	1						
	Sig. (2-tailed)	,000							
Odour attention	Pearson Correlation	,582(**)	,590(**)	1					
	Sig. (2-tailed)	,000	,000						
Negative odour awareness	Pearson Correlation	,619(**)	,639(**)	,600(**)					
	Sig. (2-tailed)	,000	,000	,000					
Age	Pearson Correlation	,070	,031	-,004	,010	1			
	Sig. (2-tailed)	,468	,750	,965	,914				
Pack-year of smoking N=34	Pearson Correlation	-,351(*)	,159	,278	,197	,361(*)	1		
	Sig. (2-tailed)	,042	,369	,112	,263	,036			
BMI	Pearson Correlation	-,142	-,108	-,133	-,140	,292(**)	,244	1	
	Sig. (2-tailed)	,137	,260	,166	,142	,002	,165		
Chemical exposure year	Pearson Correlation	-,033	-,134	-,065	,019	-,253(**)	,053	,178	1
	Sig. (2-tailed)	,734	,162	,500	,846	,007	,766	,062	
Chemical exposure (0-3)	Pearson Correlation	-,039	-,292(**)	-,108	-,030	-,045	,106	-,032	,585(**)
	Sig. (2-tailed)	,688	,002	,258	,753	,636	,551	,741	,000
Dust exposure	Pearson Correlation	-,283(**)	-,281(**)	-,238(*)	-,192(*)	-,113	,124	-,014	,119
	Sig. (2-tailed)	,003	,003	,012	,043	,237	,483	,887	,213

A significant inverse correlation between cigarette package-year and positive odor awarenes and a significant negative correlation between exposure to chemicals and odor recognition was found. All domains of odor scores were affected in the people who were exposed to dust

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-differentiation (rho: -0.257; p:0.007)
- negative significant corelation between level of dust exposure and positive odor awareness (rho: -0.27; p:0.004)
- Negative significant corelation between level of dust exposure and odor recognition(rho: -0.27; p: 0.05), attention(rho:-0.23; 0.02), negative odor awareness(rho:-0.19; 0.041)

Discriminant validity

- By categorizing the scores of four different domain in factor analysis as being below or over the mean, multivariate logistic regression analysis was performed for evaluating the effects of age, sex, working with chemical agents accorging 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

positive odour		B	S.E.	Wald	df	Sig.	Exp(B)	95,0% C.I.for EXP(B)	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Step 1(a)	sex(F)	-1,211	,649	3,481	1	,062	,298	,083	1,063
	Age	,035	,034	1,092	1	,296	1,036	,970	1,106
	Chemical exposure (1)	-,705	,678	1,081	1	,298	,494	,131	1,867
	Dust (1)	**1,438**	**,689**	**4,356**	**1**	**,037**	**4,212**	**1,091**	**16,253**
	smoking(1)	-,912	,657	1,924	1	,165	,402	,111	1,457
	Constant	1,415	1,304	1,177	1	,278	4,116		

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

Logistic regression analysis results for odour attention

odour attention		B	S.E.	Wald	df	Sig.	Exp(B)	95,0% C.I.for EXP(B)	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Step 1(a)	sex(1)	-,391	,423	,858	1	,354	,676	,295	1,548
	Age	-,004	,023	,038	1	,846	,996	,952	1,041
	Chemical expo.(1)	,005	,457	,000	1	,992	1,005	,410	2,459
	Dust expo.(1)	**1,125**	**,460**	**5,989**	**1**	**,014**	**3,080**	**1,251**	**7,584**
	Smoking(1)	**,979**	**,439**	**4,969**	**1**	**,026**	**2,663**	**1,126**	**6,299**
	Constant	,576	,912	,398	1	,528	1,778		

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 odour recognition/differentiation

odour recogn./differ		B	S.E.	Wald	df	Sig.	Exp(B)	95,0% C.I.for EXP(B)	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Step 1(a)	**sex(1)**	**,261**	**,440**	**,353**	**1**	**,553**	**1,298**	**,548**	**3,073**
	Age	**,011**	**,024**	**,227**	**1**	**,634**	**1,011**	**,965**	**1,060**
	Chemical expo.(1)	**,792**	**,492**	**2,589**	**1**	**,108**	**2,207**	**,841**	**5,789**
	Dust expo.(1)	**,792**	**,467**	**2,877**	**1**	**,090**	**2,208**	**,884**	**5,512**
	smoking(1)	**,785**	**,457**	**2,955**	**1**	**,086**	**2,193**	**,896**	**5,370**
	Constant	-,918	1,031	,794	1	,373	,399		

Logistic regression analysis results for negative odour awareness

negative OA		B	S.E.	Wald	df	Sig.	Exp(B)	95,0% C.I.for EXP(B)	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Step 1(a)	sex(1)	-,382	,429	,793	1	,373	,683	,295	1,581
	Age	-,017	,023	,566	1	,452	,983	,940	1,028
	Chemical expo.(1)	-,071	,462	,024	1	,878	,931	,376	2,305
	Dust expo.(1)	,118	,455	,067	1	,796	1,125	,461	2,745
	smoking(1)	,268	,430	,387	1	,534	1,307	,562	3,037
	Constant	1,394	,987	1,995	1	,158	4,030		

10 of Last 12 questions	1-never	2-seldom	3-sometimes	4-often	5-always
Does odour affect your mood?	1.8	1.8	18.0	35.1	43.2
Is someone with unpleasant odour unattractive?	1.8	4.5	19.8	33.3	48.5
Is someone with pleasant odour attractive?	12.6	7.2	27.0	31.5	21.6
Are you bothered with not smelling when you get cold?	6.3	27.9	19.8	10.3	35.1
How important is it to you that your sheets smell fresh?	1.8	3.6	13.5	17.1	64.6
How important is it to you that your partner has a pleasant smell?	1.8	0.9	0.1	27.0	62.2
Do you find it important that flowers are fragrant?	6.3	3.6	18.0	23.4	48.6
How important are odours to you in everyday life?	1.8	6.3	18.9	22.5	50.5
Do you look for another seat in public place if someone close to you has an unpleasant smell?	3.6	2.7	11.7	24.3	57.7
Is bad smell a reason for you to not returning a workplace?	6.3	9.9	69.4	14.4	-

How do workers assess their own odour perception

	Much less sensitive than others	Less sensitive than others	Equally sensitive to others	More sensitive than others	Much more sensitive than others
Percentage(N=111)	1.8%	9.0%	22.5%	35.1%	31.5%
Means of ;					
Positive odour awareness	6.5	14.8	14.6	16.3	17.8
Odour attention	5.5	10.7	12.4	14.3	16.3
Odour recognition/differentiation	4.5	11.9	13.7	15.7	15.5
Negative odour awareness	5.5	12.3	13.8	15.3	16.2

Which do you much prefer not happen/miss most	%
See with glasses	19.8
Loss of your little toe	5.4
Loss of hearing in one ear	33.3
Loss of smell	29.5
No answer	12.0

When this preference question is analysed; there was no difference among odour awareness scores of responders with preferences of not seeing with glasses, not loosing little toe or not loosing 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/differantiation scores lower than mean
- These findings might be interpreted that the odour scale does its job

- When questions of odour related behaviours are evaluated, odour attention scores was found to be most influential on daily life and can be used for repeated evaluations
- Odour attention fields questions of this scales can be studied with comparative practical odour tests
- We keep on using this scale in various populations and conditions

Strenghts

- 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, mising 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)

Thanks for your attention