The relationship between perception of breathlessness and magnitude of PEF response in workers with occupational asthma

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Abstract

Some workers with occupational asthma appear to tolerate regular falls in lung function better than others. We hypothesise that this relates to their ability to perceive changes in airflow obstruction. Perception of breathlessness was assessed by measuring perceived breathlessness on a visual analogue scale (VAS) 4 times during a methacholine test. The slope of the regression line of percent fall in FEV1 vs. changes in VAS were used to divide 81 workers with objective evidence of occupational asthma (from serial PEF plots) into tertiles of high, intermediate and low perceivers. Changes in airflow obstruction at home and work were assessed using 2-hourly plots of PEF for at least 3 weeks. The Oasys plotter was used to calculate the differences in mean daily PEF and area under the curve for 2-hourly PEF between days at and away from work. Mean diurnal variation in PEF on workdays was also calculated.

There was a significant correlation between VAS score and % fall in FEV1 (p=0.015) There was no relationship between the index of perception and baseline FEV1 % predicted, atopy or smoking. High, Intermediate and low perceivers had similar responses to occupational exposure; mean daily work-rest PEF (19;21;16 l/min), area under the 2-hourly PEF curve (268;316;203 l/min/day) and diurnal PEF variation on workdays (15;19;16 %mean). There was no significant correlation between the PEF variables and the perception index when all workers were considered together.

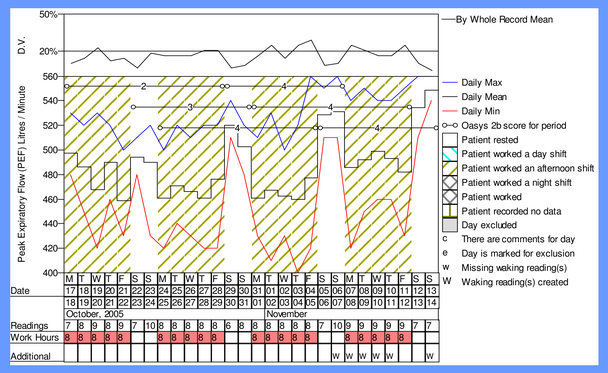
Conclusion: Perception of breathlessness as assessed during methacholine challenge was unrelated to the magnitude of PEF changes during tolerated work-exposure in a group with occupational asthma.

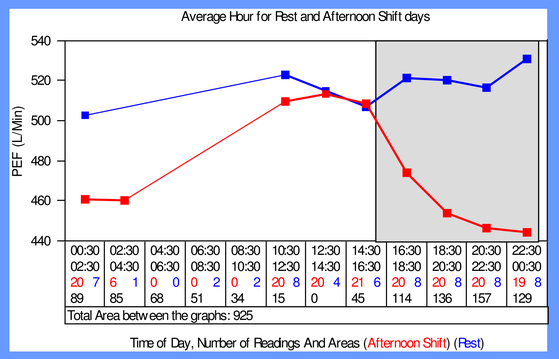
Aims

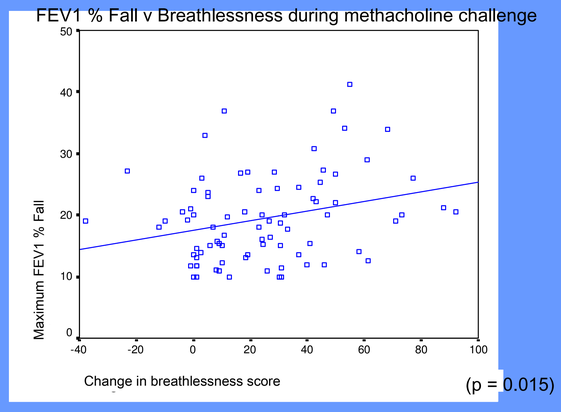
- To determine if the serial PEF response in workers being investigated for occupational asthma is related to their perception of breathlessness.
- To determine whether high and low perceivers of breathlessness differ between phenotypes based on exhaled breath Nitric Oxide (FE_{NO})

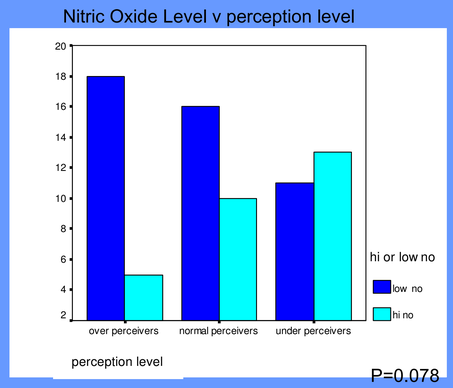
Methods

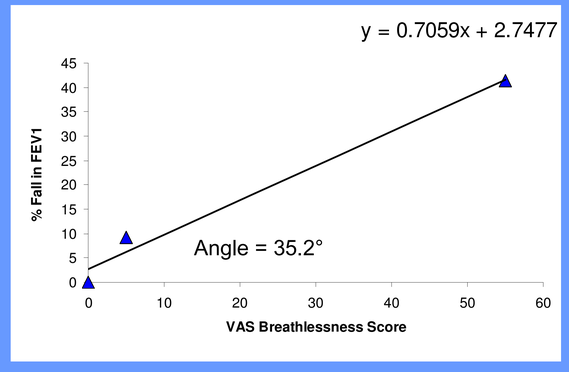
- Consecutive patients being investigated for occupational asthma in the Occupational Lung Disease Clinic between September 2004 and January 2006
- Subjects were asked to complete a visual analogue scale (VAS) for breathlessness 4 times during methacholine challenge.
- Subjects also completed serial PEF measurements at home and work, every 2 hours for a total of 4 weeks and had FE_{NO} measurements taken while in the clinic.
- Percent fall in FEV1 was plotted against change (from baseline) in breathlessness score.
  - Subjects with <10% fall were removed from analysis
- The slope of the regression line was used to divide workers by 33rd and 66th percentiles creating high, intermediate and low perceivers.
- Serial PEFs were analysed by Oasys.
  - differences in mean daily PEF, area under the 2- hourly curve and mean diurnal variation in PEF on workdays were calculated.

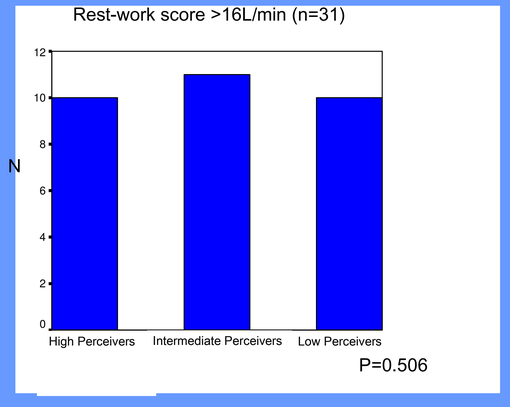












Results

- 81/129 workers had >10% Fall in FEV1 during methacholine challenge and were included in the analysis

Table 1- Demographics & Relationships/Differences between groups with Perception Index

	High perceivers	Intermediate perceivers	Low perceivers	P value
% males	80	93	89	0.38
Mean Age (SD)	47.1 (8.8)	48.7 (6.9)	48.9 (9.0)	0.82
Mean % pred FEV1 (SD)	96.4 (17.2)	90.9 (16.1)	91.0 (20.4)	0.57
% Atopic	56	63	59	0.94
% high, low, no steroids	20, 8, 72	22, 8, 71	15, 11, 74	0.95
% current, ex, never smokers	28, 20, 52	37, 30, 33	26, 33, 41	0.63

Table 2 – Relationships between Breathlessness Perception Level, PEF parameters, NO & Latency

Parameter	High perceivers	Intermediate perceivers	Low perceivers	P value
Mean Daily rest-work PEF (L/min)	19.2 (20.8)	21.3(28.2)	16.1(15.9)	0.96
Area between 2-hourly work & rest curves (L/min/day)	268 (328)	316 (445)	203 (229)	0.88
Diurnal Variation at work (% mean)	14.8 (8.3)	19.0 (9.6)	15.6 (7.0)	0.18
Nitric Oxide level (ppb)	29.3 (38.1)	31.5 (33.8)	31.3 (27.7)	0.23
Latency (years first exposure to first symptom)	12.5 (9.5)	13.9 (10.4)	15.2 (11.4)	0.70

Conclusions

- Breathlessness score is related to percent fall in FEV1 during methacholine challenge.
- Breathlessness perception was unrelated to the magnitude of PEF changes tolerated during work-exposure.
- (Nitric Oxide level and time to symptom onset was unrelated to breathlessness perception).

Diurnal Variation

	By Whole Record Mean		
	Min	Mean	Max
Whole Record	4	**16**	29
Work Days	10	**19**	29
Day Shift Days	0	**0**	0
Afternoon Shift Days	10	**19**	29
Night Shift Days	0	**0**	0
Rest Days	4	**9**	18

Scores

Definite occupational asthma (psb)	
Oasys 2b score	**3.70**
Oasys 2b score, Highest 3 consecutive quality complexes	**4.00**
Mean Rest - Mean Work	**42 l/min**