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RELATIVE HUMIDITY, TEMPERATURE AND SUBJECTIVE PERCEPTION OF "DRY AIR"

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Abstract

108 persons working in four large offices reported their subjective perception of temperature and humidity on visual analogue rating scales. The temperature and relative humidity were measured with an Assman psychrometer. Within the temperature and humidity spans of respectively 20.4 - 24.3 °C and 15 - 36 percent there was observed a tendency to decreasing humidities with increasing temperatures at the workplaces of the men, but not at those of the women. For the women, the relative humidity correlated negatively with the subjective evaluation of humidity. At the current conditions, the subjective sensation of "dry air" seems mainly to depend on other conditions than the water content of the air.

Introduction

The subjective symptoms associated to "sick building syndrome" often include a sensation of "dry air", and the air is often humidified in order to prevent the complaints. Here, the correlation between, i.a., the subjective sensation of "dry air" and the relative humidity in indoor environments has been studied.

Material and methods

The employees at four large offices were interviewed with regard to complaints coupled to the work place. Either the whole staff (in two moderatly large offices) or a randomized part of the staff (in two large offices) were interviewed. In total, 108 persons (32 men and 76 women) and their work environments were examined.

The interviews were standardized and included questions about irritative symptoms from the skin, eyes and respiratory tract. The symptoms were regarded as work-related if they commenced at work and disappeared within 1 - 2 days after interruption of work. Immediately after the interviews, the test subjects reported their subjective judgement of, i.a., temperature and humidity on visual analogue rating scales (7). At the same time, the temperature and relative humidity were measured with an Assman psychrometer.

Statistical analysis was done with regression analysis and two-sided t-test.

Results

Table: Temperature and relative humidity in the work zones of men and women with office work, and their subjective evaluation of temperature and humidity on visual analogue rating scales.

		Men (n = 32)	Women (n = 76)
Temperature at the workplace	Range	20.4 - 23.5	20.6 - 24.3
	M ± SD	22.4 ± 0.76	22.7 ± 0.68
Rel humidity at the workplace	Range	15 - 35	15 - 36
	M ± SD	26.2 ± 5.28	27.3 ± 5.71
Subj evaluation of temperature	Range	40 - 77	5 - 93
	M ± SD	55.1 ± 9.19	58.1 ± 16.13
Subj evaluation of humidity	Range	8 - 78	0 - 69
	M ± SD	37.9 ± 15.56	31.1 ± 16.41

As appears from the table, there was an inconsiderably but significantly lower mean temperature in the work zones of the men than in those of the women ($p < 0.05$). Corresponding difference with regard to the relative humidity was non-significant ($p > 0.15$). In the total material, the correlation between these two variables was non-significant with a correlation coefficient (r) of only 0.002. However, the relative humidities in the work zones of the men (Figure 1) tend, as was expected, to decrease with increasing temperature ($r = -0.37$; $p < 0.05$), while corresponding correlation in the work zones of the women (Figure 2) was non-significant ($r = 0.13$; $p > 0.02$).

The scores for the subjective evaluation of the temperature varied between 5 to 93, ("0" represents extreme chilliness and "100" extreme warmth). The difference between the mean scores of men and women was non-significant ($p > 0.3$), as were the correlations between temperature and the evaluation scores for both men and women ($p > 0.1$).

The scores for the subjective evaluation of the humidity varied between 0 to 78, ("0" represents extreme dryness and "100" extreme moisture). The mean score is somewhat higher for men than for women, and the difference is at the borderline of statistical significance ($p \approx 0.05$). For the men (Figure 3), the correlation between the relative humidities and the evaluation scores was non-significant ($r = 0.20$; $p > 0.2$). However, for the women (Figure 4) there was a significant ($r = 0.33$; $p < 0.01$) tendency to increasing scores with decreasing relative humidities.

The correlation between the combined effects of temperature and relative humidity and the subjective evaluation of humidity is non-significant ($r = 0.19$; $p > 0.2$) for men (Figure 5). For women, however, (Figure 6) there is a weak but significant ($r = 0.33$; $p < 0.01$) tendency to increasing sensation of "dry air" with increasing sum of temperature (°C) and relative humidity (%).

Discussion

The studied climatologic conditions are typical for office environments in Sweden during the cold season and caracterized by relatively high temperatures and low relative humidities. Within the current temperature and humidity spans, the expected tendency to decreasing relative humidities with increasing temperatures was observed only at the workplaces of the men, but not at the workplaces of the women. A possible, but hypothetical, explanation might be that women often have more flowers and water-emanating pot plants at their workplaces than men.

On a group basis, the women experience a more intense sensation of "dry air" than men at equivalent humidity and temperature conditions, but there are no simple correlations between this subjective sensation and the relative humidity. For women also the combined effect of high humidity and high temperature associated with a tendency to increased sensation of "dry air".

"Sick building syndrome" is usually more prevalent among women then among men (3, 8). It seems to be correlated to social conditions such as marital status (1) and educational attainment level (3), and it has sometimes been regarded as a mass psychogenic illness (3). The complaints probably have a multifactorial pathogenesis and they are obviously influenced also by environmental factors (1). However, irrespective of their cause they could result in serious consequences, such as increased absenteeism (6).

It is difficult for humans to evaluate the relative humidity both in work environments (5) and in climate chamber tests (2), and it is common that humidification of indoor air does not result in a decreased prevalence of irritative discomforts in nose and eyes in groups working in "sick buildings" (4). Our results are on line with these observations.

"Sick houses" are often characterized by moisture (10), and it is obvious that the sensation of "dry air" often depends on other conditions than the water content of the air. When there is a high frequency of complaints due to "dry air" in centrally heated indoor environments, the primary measure ought not to be humidification of the air but adjustment of the temperature to about 20 - 21° C combined with recommendations to adjust the dress to prevent any discomforts due to cold.

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FIGURE 1 : Men

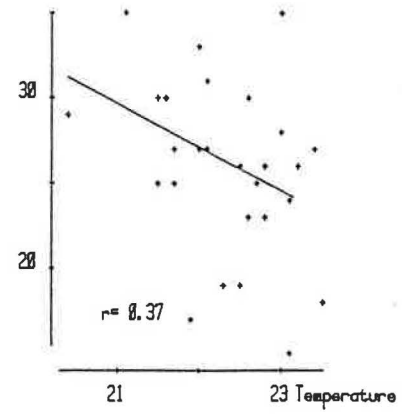

FIGURE 2 : Women

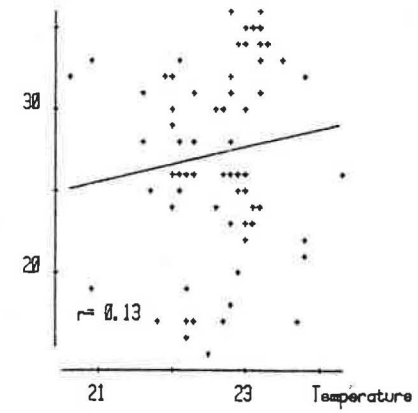

FIGURE 3 : Men

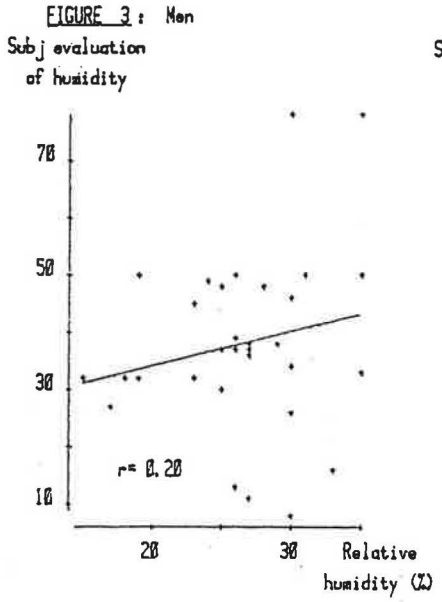

FIGURE 4 : Women

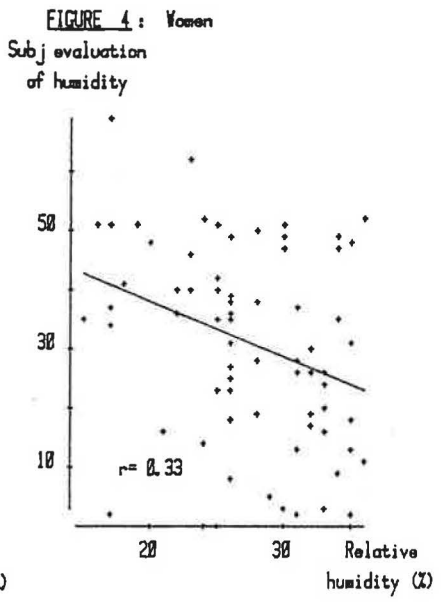

FIGURE 5 : Men

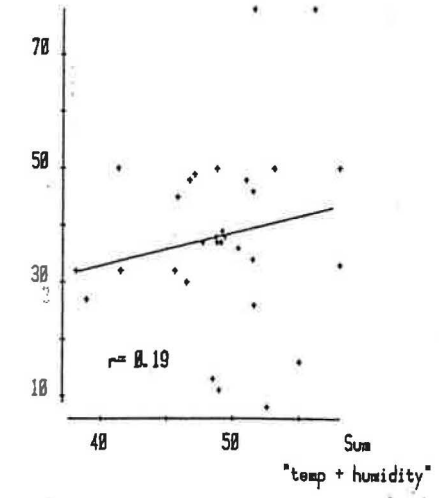

FIGURE 6 : Women