

# Self-assessed occupational health and working environment of female nurses, cabin crew and teachers

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## Self-assessed occupational health and working environment of female nurses, cabin crew and teachers

*Aim:* The aim of this study was to describe and compare the self-assessed occupational health among female nurses, cabin crew and teachers, in relation to their working environment.

*Background:* Similarities between the three occupations, i.e. predominantly female and service-oriented, render them interesting in comparison with respect to health and working environment.

*Methods:* The participants were female Icelandic cabin crew, nurses and elementary school teachers. A questionnaire including items on socio-demographics, working environment (addressing work pace, job security, monotonous work, assistance, physically strenuous work and physical environmental factors) and a symptom list was used for data collection. Factor analyses on the symptom list resulted in five symptom scales: Musculoskeletal, Stress and exhaustion, Common cold, Gastrointestinal and Sound perception scale. A total of 1571 questionnaires were distributed. The response rate was 65.7–69%, depending on occupation. Data were collected in 2002.

*Results:* Cabin crew reported worse gastrointestinal, sound perception and common cold symptoms than nurses and teachers. Cabin crew and teachers reported worse symptoms of stress and exhaustion than nurses ( $p < 0.05$ ). When compared with teachers and nurses cabin crew reported less job security and more physically strenuous and monotonous work. Nurses were likelier to seek assistance from co-workers or patients as well as to take care of an older relative than teachers and cabin crew. Regression analysis found that within each occupation distress from environmental factors resulted in higher score on all the symptom scales.

*Conclusions:* Nurses experience less stress and exhaustion than teachers and cabin crew. In comparison with one or both of the other occupations nurses are more likely to assist each other with their work, experience job security, reporting physically complex work and take care of older relatives. This should be highlighted as positive aspects of nurses' work praised as displaying responsibility and interconnectedness of nurses'.

**Keywords:** occupational health, women's health, cabin crew, teachers, nurses.

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## Introduction

In the Western world the labour participation of women outside the home increased markedly during the second half of the twentieth century; today in Iceland women make up 47% of the workforce (1). However, women are concentrated in particular sectors of the economy, mainly service-related jobs and selected areas of manufacturing (2). In Iceland, 85.2% of women when compared with

55.9% of men held service-related jobs in 2002. Of the women 24.6% worked in the health and social services and 12.2% in education compared with 4.1% and 4.4%, respectively, of the male percentage (1). The majority of service-related jobs are performed indoors and studies have associated some indoor environmental conditions with increased risk of non-specific, flu-like symptoms, e.g. headache, nausea, congestion, drowsiness, dizziness and general respiratory distress and impaired performance (3–5). Moreover features of the workplace that have documented effects on health include characteristics of the task itself (e.g. workload, pacing, deadlines and repetition), of the organization (e.g. decision control and job ambiguity), interpersonal relationships with co-workers and supervisors and physical and environmental hazards (6).

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In this paper we study the self-assessed health of female nurses, cabin crew and elementary school teachers. These occupations are service-oriented and predominantly and traditionally female. Their members meet the individual needs of their clients often in stressful situations and their clientele (passengers, students and patients) may request total attention at the same time as the worker is tending to multiple needs of other clients. The three occupational groups all work indoors, their work is physically strenuous, and nurses and cabin crew also work irregular hours. A number of studies have addressed the conflicting demands made on members of these professions and their psychological and physical consequences. The emphases in these studies have, however, differed between these three occupations.

Among nurses and teachers, stress and stress symptoms, with a specific focus on identifying stressors and their associations with well-being, are highly studied variables (7–14). Depression (15, 16), burnout (15, 17, 18), absenteeism (19, 20) and violence (21, 22) have all been associated with stress and stressful environment in the classroom. For nurses on the other hand, workload (23), leadership/management style (24), professional conflict (25), the emotional toll of caring (26), organizational and managerial characteristics of the work (11, 27, 28), lack of reward and shift work have been found to be major sources of stress (12, 29).

It has been suggested that the indoor air in the classroom induces serious health threats for teachers due to special pollutant sources (like dust and particles of chalk) used in art rooms, science laboratories and vocational laboratories (4, 30). Voice disorders, including symptoms of soreness, hoarseness, weak voice and sore throat are occupation-related symptoms that have been described among teachers and related to the classroom environment (31, 32). On the other hand, musculoskeletal symptoms have received similar attention among nurses and nursing personnel (33–35). Studies have addressed the health and well-being of cabin crew from a different perspective. There the focus has been on the association between cabin crew job duties and the cabin environment (36) and on cabin air quality and its health effects and radiation exposure with its effect on cancer incidence and reproductive outcome (37–41). We found few studies on symptom experience among cabin crew, but general complaints or symptoms reported in those studies include symptoms from upper and lower airways and from the musculoskeletal system (39, 42, 43); stress-related symptoms (44); psychological distress (45) and sources of stress (46); irritation of skin, eyes and throat (39, 42, 47, 48); digestive disturbances (49); sleeping problems (42, 48) and infection (50).

The only study found where occupations were compared in a similar way as is done here is a study conducted by Whelan et al. (41) on prevalence of work-related symptoms between cabin crew and teachers. Their findings

were that cabin crew reported significantly more chest illness than teachers (32.9% and 19.3% respectively) during 3 years prior to the study, but the prevalence of other respiratory symptoms, e.g. wheezing, nose, throat, flu and cold symptoms, did not differ between the two occupations.

A recent multi-country study, conducted by the World Health Organization (51) on the international migration and mobility of nurses, found that inadequate working conditions are one of the main factors driving nurse migration. It seems important to describe these conditions and other factors related to the work of nurses. Comparing these factors with other female dominated occupations, such as teachers and flight attendants, gives an even fuller description of the nurse's work.

Because of the gender distribution of members of these occupations as well as their service-oriented work it is of interest to study their occupational environment.

### *Aim*

The specific aim of the present study was to describe the self-assessed occupational health among female nurses, female cabin crew and teachers in relation to their working environment. Specific research questions are:

- 1 What is the difference in self-assessed occupational health between female nurses, cabin crew and teachers?
- 2 What is the difference in self-assessed working environment between female nurses, cabin crew and teachers?
- 3 What are the simultaneous effects of the working environment and social-demographics on self-assessed occupational health within the three occupational groups?

## **Materials and methods**

### *Design*

A correlation-descriptive design was used, with a postal questionnaire and one phone call reminder and one postal follow-up reminder. Data were collected in 2002.

### *Participants*

The population of this study were all working female nurses registered with the Icelandic Nurses Association (INA), all female members of the Icelandic Cabin Crew Association (ICCA) with at least 2 years' working experience, and all female school teachers registered with the Association of Teachers in Primary and Lower Secondary Schools (ATPLSS). According to information from the ICCA, the cabin crew participating in this study worked on both domestic and international routes. The longest flight they have is about 8 hours, while the most common length of time in the air is 3 hours. The aircraft type is Boeing 757 and on commercial flights the flying altitude is 370 000–

390 000 ft. Approximately 94% of the nursing work force in Iceland including nurses working in higher and middle management are members of the INA, approximately 83% of all working cabin crew meeting the criteria are members of the ICCA, and all working elementary school teachers, except for teachers working in upper and middle management, are members of the ATPLSS.

### Procedure

In April 2002 a questionnaire was sent to all those who fulfilled the criteria of the study, with the exception of those who were on the board of the ICCA, as they had been involved in the preparation of the study and had scrutinized the questionnaire beforehand. In June all those who had not answered the questionnaire and could be reached, received a reminding phone call and in August the questionnaire was re-mailed to those not yet responding. A total of 371 cabin crew received a questionnaire and 255 (68.7%) returned it completed. A random sample of 600 nurses was taken from the registry of the INA of a total of 2312 nurses who met the criteria. The nurses' response rate was 65.7% (n = 394). A random sample of 600 teachers was taken from the registry of the ATPLSS of a total of 3368 teachers who met the criteria. The teachers' response rate was 69% (n = 415).

### Instrument

Data were collected with a questionnaire called Women's Health: A Questionnaire about Health, Well-Being and Working Conditions of Female Nurses/Cabin Crew/Teachers. The questionnaire is divided into nine chapters: (i) Background and socio-demographic information (13–15 questions depending on the profession answering the questionnaire); (ii) Reconciliation of work and family life (five questions); (iii) Health and lifestyle (17 questions); (iv) Sleeping habits (19 questions); (v) Gynaecology and reproductive life (20 questions); (vi) Health prevention, symptoms, treatment (20 questions); (vii) Work-related factors (five questions); (viii) Harassment in the workplace (seven questions) and (ix) Working conditions (18 questions).

The questionnaire was based on a number of questionnaires that have been used in different studies in Iceland (10, 52–55).

### Ethical considerations

The National Bioethics Committee approved the study (VSN 01-26) and the Data Protection Commission was informed as per law. Participants were given written information and informed that all participation was voluntary, that all information would be treated confidentially

and they were given the option of contacting the researchers if they had any questions.

### Data analysis

In the analysis the emphasis was on demographics, working environment, and occupational health. *Demographic* variables, including age in years, marital status (in cohabitation or not in cohabitation), number of children under the age of 18 in the custody of the participant, and caring for aged parents/relatives (very little or not at all/somewhat or very much) were assessed. *Working environment* included questions on control of work pace, job security, the degree of physical monotony of the work, assistance from co-workers or clientele (students/passengers/patients) in performing work, physical difficulty of the work, physical exhaustion after work and ability to work comfortably and a list of 15 environmental risk factors developed by Kuorinka et al. (52) and Lindström et al. (54). Control of work pace was addressed with a five faceted question with responses being rarely or never (i), seldom (ii), sometimes (iii), often (iv), very often or always (v). Participants were asked how secure they were of their job with responses ranging from 1 to 4 with 1 indicating high security and 4 indicating low security. Degree of physical monotony/diversity of the work was assessed with responses being very diverse (1), rather diverse (2), rather monotonous (3) and highly monotonous (4). Assistance from co-workers or clientele was addressed by the question: Do you consciously try to reduce physical strain at work by asking others like passengers (other nurses, other teachers) to assist you? Responses ranged from 1 to 4 with 1 indicting that they always do ask for assistance and 4 that they never do. Questions addressing physical difficulty of the work, physical exhaustion after work and ability to work comfortably were combined into one variable, labelled *Physical strenuous work* (Cronbach's  $\alpha$  was 0.79). Higher score on this variable indicates less strenuous work. Participants were also asked to assess, by marking on a scale, if any of a list of 15 environmental risk factors had caused them distress often (1), sometimes (2) or never (3). Factor analyses were carried out in order to assess the environmental risk factors relevant to each occupation. Three factors emerged with eigenvalues greater than 1, together accounting for 53.7% of the variance. A varimax rotation, using Kaiser normalization, was performed. The results are summarized in Table 1. Only one factor, *Physical environment scale*, is included in further analyses. Higher score on this scale indicates less distress caused by the environmental factors. Factor 2 was excluded since there was no theoretical link between the three items and the internal reliability of factor 3 was not acceptable.

*Occupational health* was assessed using a list of 38 symptoms. This symptom list is based on symptom checklists that measure various health-related items (32, 56). In

**Table 1** Factor analyses of items indicating environmental risk factors: brief item description and factor loading

Items	Factor 1	Factor 2	Factor 3
Factor 1 – physical environment			
Stuffy air	<b>0.79</b>	0.20	0.06
Dry air	<b>0.75</b>	0.32	0.06
High temperature	<b>0.70</b>	0.24	0.03
Uncomfortable odour	<b>0.63</b>	0.12	0.34
Close quarters	<b>0.61</b>	0.37	0.26
Too much cold	<b>0.52</b>	0.47	0.19
Static electricity	<b>0.51</b>	0.29	0.30
Noise	<b>0.49</b>	0.36	0.21
Draft	<b>0.45</b>	0.24	0.35
Factor 2			
Burns caused by ventilated ovens	0.23	<b>0.84</b>	0.11
Ventilated ovens	0.19	<b>0.83</b>	0.21
Dust and dirt	0.37	<b>0.43</b>	0.391
Factor 3			
Sticky floors	0.13	0.14	<b>0.76</b>
Smoking	-0.00	0.14	<b>0.64</b>
Slippery floor	0.32	0.33	<b>0.60</b>
Lighting	0.30	0.09	<b>0.33</b>
Eigen values	6.134	1.264	1.188
Percentages of variance	38.3	7.9	7.4
Cronbachs	0.84	0.74	0.36

Extraction method: principal component analysis rotation method.  
Rotation method: Varimax with Kaiser normalization. Loadings in bold indicate items contributing to each factor.

addition the ICCA suggested symptoms specific for cabin crew. Participants were asked to answer as to each symptom if they had never (1), sometimes (2), often (3) or constantly (4) experienced it during the last 12 months. In order to reduce the data for further analysis we started by carrying out factor analysis on the symptom list. Ten factors emerged with eigenvalues greater than 1, together accounting for 54.2% of the variance. A varimax rotation, using Kaiser normalization, was performed. The results are summarized in Table 2.

Factors were mostly interpreted based on factor loading above 0.4. Five symptom factors were easily interpretable and had satisfactory Cronbach's  $\alpha$ . These were: *Musculo-skeletal scale*, *Stress and exhaustion scale*, *Common cold scale*, *Gastrointestinal scale*, and *Sound perception scale*. Seventeen symptoms did not load highly on the interpretable factors. However, symptoms that were of theoretical relevance and increased the internal consistency of each factor were included into relevant factor scales. By adding the symptoms increased urination, nausea or vomiting and fainting spells or dizziness into the *Stress and exhaustion scale*, its Cronbach's  $\alpha$  increased from 0.8081 to 0.8240. Similarly, by adding the symptom stomach ache into the *Gastrointestinal scale* its Cronbach's  $\alpha$  increased from 0.6844 to 0.6966. The number of symptoms in the *Stress and exhaustion scale*

are therefore 11, not 8 as shown in Table 2, and in the *Gastrointestinal scale* 3 instead of 2 as shown in Table 2.

In order to detect significant differences between the occupational groups with regard to the study variables, analysis of variance was performed. Regression models were used to estimate the simultaneous effects of the working environment variables and social-demographics on health indicators within the three occupational groups. Independent variables were included into the equation using the 'enter method'.

The analysis of data was performed using the Statistical Package for the Social Sciences 7.5.1 software (57).

## Results

### Socio-demographics

The mean age of the sample, number of children and other characteristics of the sample, including mean scores of the variables under study and significant differences between the three occupational groups, are summarized in Table 3. While looking at the data presented in Table 3 as well as in Table 4 it should be kept in mind that there is an inverse relationship between scores on the *Physical environment scale*, the *Physical strenuous work scale* and the *Work pace* variable when compared with the other working environment variables and to the symptom subscales. On average the participants were in their early 40s, cohabited (90% of flight attendants and 92% of teachers and nurses) ( $\chi^2(2) = 0.226$ ;  $p = \text{n.s.}$ ) and had two children.

Twenty-seven per cent of nurses, 21% of teachers and 23% of flight attendants took some care of an elderly relative. The difference was not significant ( $\chi^2(2) = 2.286$ ).

### Difference in self-assessed occupational health between the three occupational groups

The groups assessed their health differently as the significant difference between the occupational groups in four of the five symptom scales reflects (Table 3). Cabin crew scored significantly higher on the *Gastrointestinal scale* and the *Sound perception scale* than nurses and teachers, and nurses scored significantly lower on the *Stress and exhaustion scale* than cabin crew and teachers. Cabin crew scored significantly higher than teachers and nurses on the *Common cold scale*, with teachers also scoring significantly higher than nurses on that scale.

### Difference in self-assessed working environment between the three occupational groups

There was a significant difference between the occupational groups with regard to all the working environment variables (Table 3). Cabin crew were significantly more likely than nurses and teachers to report less job security,

Items	F.1	F.2	F.3	F.4	F.5
Musculoskeletal symptoms (F.1)					
Pain or stiffness in arms or legs	<b>0.82</b>	0.11	0.01	0.06	0.02
Swollen or painful muscles or joints	<b>0.78</b>	0.16	0.02	0.07	0.02
Difficulty with feet and legs when standing for long periods	<b>0.68</b>	0.07	0.02	0.12	0.10
Backache	<b>0.64</b>	0.19	0.13	0.08	0.05
Persistent numbness/tingling in some body part	<b>0.64</b>	0.22	-0.02	0.01	0.03
Stress and exhaustion symptoms (F.2)					
Headache	0.35	<b>0.29</b>	0.31	0.18	0.02
Depression	0.10	<b>0.76</b>	0.03	0.06	0.03
Anxiety or tension	0.15	<b>0.70</b>	0.06	0.10	0.05
Tiredness	0.46	<b>0.63</b>	0.09	-0.02	0.04
Rapid mood changes	0.1	<b>0.60</b>	0.15	0.13	0.08
Periods of severe fatigue or exhaustion	0.47	<b>0.59</b>	0.08	-0.01	0.11
Much sweat or trembling	0.12	<b>0.39</b>	0.00	0.13	-0.07
Fever, chills and aching all over	0.31	<b>0.36</b>	0.23	0.23	-0.03
Common cold symptoms (F.3)					
Cough	0.01	0.09	<b>0.74</b>	0.12	-0.02
Cold or flu	0.04	0.07	<b>0.74</b>	0.06	0.07
Soreness	0.08	0.10	<b>0.73</b>	-0	0.11
Hoarseness	0.01	0.04	<b>0.58</b>	-0.03	-0.05
Hay fever or sinus trouble	0.09	0.13	<b>0.38</b>	0.05	0.35
Gastrointestinal symptoms (F.4)					
Constipation	0.14	0.15	0.06	<b>0.82</b>	0.03
Trouble digesting food	0.16	0.23	0.12	<b>0.66</b>	0.14
Sound perception symptoms (F.5)					
Hearing impairment/loss of hearing	0.04	0.07	-0.01	0.01	<b>0.81</b>
Ringing or buzzing in ears	0.11	0.06	0.17	0.09	<b>0.8</b>
Eigen values	7.885	2.350	1.951	1.635	1.514
Percentages of variance	20.22	6.02	5.00	4.19	3.88
Cronbachs $\alpha$	0.8195	0.8081	0.7099	0.6844	0.6599

Extraction method: principal component analysis. Rotation method: Varimax with Kaiser normalization. Loadings in bold indicate items contributing to each factor.

discomfort from their physical working environment, and they found their work physically more strenuous than the other groups. Cabin crew found their work more monotonous than teachers, who differed significantly from nurses who were the occupational group reporting greatest complexity in their physical work. Nurses were significantly more likely than cabin crew and teachers to consciously try to reduce physical strain by asking co-workers or patients to assist them. Teachers were however more likely to ask for help than cabin crew and were significantly more likely to be able to control their work pace than both nurses and cabin crew.

#### *Simultaneous effects of the working environment variables and social-demographics on health indicators within the three occupational groups*

In Table 4 the self-assessed symptom scales were regressed on the working environment variables and social-demo-

**Table 2** Factor analyses of symptoms: brief item description and factor loading for the five factors that are used in data analysis

graphic characteristics (the bivariate correlations between the scores on the symptom scales and the working environment variables and social-demographic characteristic variables are shown in Appendix 1). This was done separately for each group. Therefore, while Table 3 shows comparison between the occupational groups, Table 4 shows the effect of the environmental variables and the socio-demographics within each occupational group.

For all the occupations there was a positive relationship between experiencing their physical environment badly and assessing their symptoms worse. This applied to all five symptom subscales after the other independent variables had been taken into consideration.

The occupations differed somewhat with respect to the effect of the other working and socio-demographic variables. Nurses that reported physically strenuous work on the average also assessed their musculoskeletal symptoms and gastrointestinal symptoms worse than nurses who found their job less strenuous, net of the other

**Table 3** Comparison by use of analyses of variance between the occupational groups with socio-demographic characteristics, symptom scales and working environment variables

	Cabin crew			Teachers			Nurses			Possible range	ANOVA
	n	Mean	SD	n	Mean	SD	n	Mean	SD		
Socio-demographic characteristics											
Age in years	254	40.9	10.6	406	43.3	10.0	379	43.6	9.6	21–70	F(2,1036) = 6.470; p = 0.002
Children (1 = 0, 2 = 1, 3 = 2, 4 = 3)	253	2.1	1.0	406	2.2	1.1	392	2.2	1.0	1–4	F(2,1048) = 0.715; n.s.
Symptom Subscales											
Gastrointestinal scale	233	4.8	1.7	369	4.3	1.5	351	4.4	1.5	3–12	F(2,950) = 9.393; p < 0.001
Sound perception scale	240	3.6	1.3	371	2.7	1.1	355	2.5	1.1	2–8	F(2,963) = 60.968; p < 0.001
Stress and exhaustion scale	221	17.4	4.1	328	17.3	4.5	331	16.1	3.6	11–44	F(2,877) = 10.110; p < 0.001
Common cold scale	232	9.1	2.2	359	8.6	1.9	343	7.9	1.9	5–20	F(2,931) = 24.965; p < 0.001
Musculoskeletal scale	232	9.1	3.0	357	8.5	3.2	348	8.6	3.1	5–20	F(2,934) = 2.991; n.s.
Working environment variables											
Physical environment scale	209	17.1	3.9	364	21.5	3.6	337	21.5	4.1	9–27	F(2,907) = 107.422; p < 0.001
Physically strenuous work	245	6.4	1.6	398	8.5	1.7	381	8.3	1.8	3–12	F(2,1021) = 130.377; p < 0.001
Work pace	253	2.8	1.3	412	3.2	1.7	386	2.9	1.2	1–5	F(2,1048) = 9.022; p < 0.001
Job security	252	2.3	0.6	413	1.7	0.7	389	1.6	0.6	1–4	F(2,1051) = 89.802; p < 0.001
Physically monotonous work	252	2.5	0.6	410	2.1	0.8	386	1.9	0.7	1–4	F(2,1045) = 35.053; p < 0.001
Seek assistance	253	2.5	0.8	406	2.2	0.7	379	1.7	0.7	1–4	F(2,1035) = 87.622; p < 0.001

There is an inverse relationship between scores on the Physical environment scale, the Physical strenuous work scale and the Work pace variable when compared with the other working environment variables and the symptom subscales. Therefore higher scores on these variables indicate less discomfort from the environment, less strenuous work and greater control over work pace.

independent variables. Older nurses were more likely than younger nurses to report worse musculoskeletal symptoms and gastrointestinal symptoms, while younger nurses were likelier than the older ones to report symptoms of common cold. Finally among nurses there was a positive relationship between reporting the work physically monotonous and scoring higher on the *Sound perception scale*.

Teachers reporting physically strenuous work also assessed their musculoskeletal, stress and exhaustion and common cold symptoms worse than teachers who found their job less strenuous, controlling for the other independent variables. Older teachers were more likely than younger teachers to report worse sound perception and musculoskeletal symptoms while younger teachers were likelier than the older ones to report symptoms of common cold and of stress and exhaustion. Taking care of older relatives had negative effect on stress and exhaustion and not living in cohabitation also had negative effect on stress and exhaustion as well as on musculoskeletal symptoms among teachers.

Finally, cabin crew reporting physically strenuous work assessed their musculoskeletal and stress and exhaustion symptoms worse than cabin crew who reported their job less strenuous, controlling for the other independent variables. Older cabin crew were more likely than younger cabin crew to report worse musculoskeletal symptoms while younger cabin crew were likelier than the older ones to report common cold and gastrointestinal symptoms. Finally, cabin crew with fewer children

reported worse musculoskeletal symptoms than cabin crew with more children and reporting the work to be physically monotonous had negative effect on gastrointestinal symptoms.

## Discussion

A major finding of this study is that nurses tend to assess their working environment in somewhat more positive way and report less severe symptom experience than cabin crew and teachers. Most notable, in comparison with the other occupations, nurses report their job as physically diverse, they work as a team, as reflected in the finding that they seek assistance from others in their work environment, and they experience less stress and exhaustion. The finding that nurses scored significantly lower than cabin crew and teachers on the *Stress and exhaustion scale* came as a surprise, as a number of studies have reported on the stressful and exhausting aspect of the work done by nurses (11, 26, 27, 29) and internationally there are repeated reports on the stressfulness of the nurse's job (12). This has resulted in conclusions regarding the troubled and stressful work environment of nurses. Overly negative portraits of the nurses job may result in fewer young people entering the nursing profession, thereby adding to the international crisis of nurse's shortage described vividly recently (58). Our study, however, compares nurses with two other female dominated occupations and finds that nurses are doing better. This should be high-

**Table 4** Work environment indicators regressed on symptom scales and socio-demographic characteristics within occupational groups

Independent variables		Stress and exhaustion scale				Common cold scale				Gastrointestinal scale				Sound perception scale			
		Nurses	Teachers	Cabin crew	Cabin crew	Nurses	Teachers	Cabin crew	Cabin crew	Nurses	Teachers	Cabin crew	Cabin crew	Nurses	Teachers	Cabin crew	
<b>Working environment variables</b>																	
Physical environment scale	-0.13**	-0.12*	-0.13*	-0.21**	-0.27**	-0.23**	-0.07*	-0.14**	-0.10*	-0.07**	-0.08**	-0.08*	-0.05*	-0.08**	-0.05*		
Physical strenuous work	-0.60**	-0.53**	-0.63**	-0.16	-0.61**	-0.65**	0.00	-0.15*	-0.16	-0.18**	-0.07	-0.13	-0.03	-0.01	-0.07		
Work pace	0.12	-0.04	0.16	-0.12	0.06	0.02	-0.09	-0.12	-0.12	0.01	-0.06	-0.07	0.02	-0.04	-0.09		
Job security	-0.10	0.06	-0.47	0.65	0.53	0.03	0.13	-0.03	0.15	0.10	0.08	-0.22	-0.20	-0.07	0.00		
Physically monotonous work	0.17	0.25	0.39	0.35	0.05	0.64	0.11	-0.07	0.10	0.10	0.19	0.35*	0.21*	-0.08	0.11		
Seek assistance	-0.29	0.34	-0.42	-0.49	-0.13	-0.43	-0.06	-0.03	0.28	-0.10	0.02	-0.20	-0.17	-0.03	0.18		
<b>Socio-demographic characteristics</b>																	
Age	0.06**	0.02	0.06**	-0.04	-0.09**	-0.05	-0.03*	-0.03**	-0.05*	-0.01	-0.02	-0.03*	0.02**	0.02*	-0.01		
Take care of elderly	0.35	0.53	-0.13	-0.20	1.30*	-0.38	0.03	0.01	0.51	-0.05	0.06	0.20	0.02	-0.17	0.07		
Cohabitation	-0.13	-0.87*	0.84	-0.67	-1.66*	-0.70	-0.51	-0.34	-0.15	0.16	-0.40	-0.23	0.03	0.00	-0.13		
Children	0.27	-0.01	-0.42*	0.37	0.29	0.01	0.14	0.12	-0.02	0.00	0.06	-0.15	0.02	-0.04	-0.06		
Adjusted R <sup>2</sup>	0.169	0.150	0.252	0.153	0.197	0.154	0.063	0.151	0.123	0.094	0.080	0.123	0.056	0.046	0.059		
Constant	13.29**	14.09**	13.17**	24.41**	31.95**	28.69**	11.39**	15.23**	12.57**	7.47**	7.55**	9.06**	3.13**	4.53**	4.97**		
N	394	415	255	394	415	255	394	415	255	394	415	255	394	415	255		

\*p < 0.05; \*\*p < 0.01 (two-tailed test). The table reports unstandardized regression coefficients from ordinary least squares regression. There is an inverse relationship between scores on the Physical environment scale, the Physical strenuous work scale and the Work pace variable when compared with the other working environment variables and the symptom subscales.

lighted and nurses told about the positive aspects of their work. Keeping this in mind it cannot be disregarded that studies on stress among nurses have reported different levels of stress among them depending on workplace, i.e. hospital vs. community health and on position managerial vs. staff nurse. It is suggested that besides the nursing itself, organizational and managerial characteristics influence the stress nurses experience at work (24, 25, 28). In this analysis we did not differentiate between the different workplaces of participants and the positions they held. It is therefore possible that the more varied workplaces and positions nurses held, in comparison with both teachers and cabin crew may have influenced the findings. Still, it should be highlighted that this also reflects the reality for these occupations, which is that the work opportunities for nurses in general are much more varied than for teachers and cabin crew. Additionally, the daily teamwork of nurses, with other nurses and other professionals, may serve as a buffer against stress and exhaustion.

However, the findings regarding stress and exhaustion in teachers and cabin crew cannot be overlooked. The working environment of teachers and cabin crew has been described as highly stress-provoking. Concerns in the working environment of cabin crew are violent passengers, the responsibility that the cabin crew bears during flight (50) and the increasing dread of terrorist attack. Cabin crew are responsible for safety and are the ones having to handle emergencies that can occur during a flight, be it a medical problem, violent passengers, a fire, a terrorist attack, etc. (59). There are no published Icelandic studies on sources of stress among cabin crew, but a qualitative Italian study of female cabin crew found isolation and solitude, interaction with passengers, and lack of protection by employers with respect to workplace exposure and air rage, to be sources of stress among them (46). Our study was conducted 1 year after the terrorist attack of 11 September 2001 and it should be noted that Icelandair was the first foreign airliner granted permission to enter USA air space after the attack. These factors may contribute to the high score on the *Stress and exhaustion scale* among the cabin crew.

Among teachers studies on sources of stress have focused on burnout and violence (15, 17, 21). In modern societies demands made by parents and society in general are constantly increasing and are becoming unrealistic given the resources the teacher has (18, 60). The findings of an Icelandic study indicate that sources of burnout and stress are found in the working environment and relate to role conflicts, professional isolation, lack of support, ineffective teaching aids, student disciplinary and behavioural problems, inadequate working conditions and general lack of respect for the teacher's role (60). A German study found that besides high numbers of pupils in one class, teachers regard destructive and aggressive behaviour of pupils as the primary stress factor (61). All of these factors may

contribute to the high score on the *Stress and exhaustion scale* among teachers. However further research is needed in order to clarify factors in the working environment of different occupations that may contribute differently to stress productions in member of the occupations.

Another major finding of the study is that in comparison with nurses and teachers, cabin crew members assess their health worse and experience their working environment as more demanding. They report a higher score than teachers and nurses on the *Physical environment scale* and on three out of the five symptom subscales, i.e. the *Common cold scale*, the *Gastrointestinal scale* and the *Sound perception scale*, and higher score than nurses on the *Stress and exhaustion scale*. In comparison with the other occupations, cabin crew are also more likely to experience less job security, their work as being more physically strenuous and monotonous, and are less likely to seek assistance from their co-workers or from passengers. In comparison with teachers, cabin crew experience less control of work pace. To explain the differences found between cabin crew and nurses and teachers, one must look at the cabin environment and the responsibility cabin crews have in the air. Cabin crew worldwide, as well as in Iceland, have repeatedly asked questions about their working environment and its effect on their health (62). Prevalence of various respiratory symptoms, hearing impairment and gastrointestinal symptoms has been reported among cabin crew (43, 49, 50), although the associations with the cabin crew environment have not been validated. Our findings indicate that the cabin environment might affect general well-being. Cabin environment is in many aspects unique and has been described as a cocktail of problems, the major ones being the continual air recirculation which prevents flushing of contaminants from the aircraft's internal environment, humidity, carbon dioxide, ozone levels, various chemical contaminants and cabin pressure (50). Studies on cabin crew health and comfort in airline cabins (36, 63) indicate that various complaints and symptoms reported by cabin crew appear to be associated with their job duties and the cabin environment. However, a relationship between complaints and possible exposure to the cabin environment has not been proven and the complaints can be attributed to other factors (36). Our study does not include objective measurements of the working environment of our participants or of their health status. We are, however, comparing women in three occupations and the cabin crew differs from the other two occupations. The most likely explanations for the difference are cabin air quality, cabin pressure, humidity and possibly disruption of circadian rhythm and longer flights, as these have all been suggested as causative in symptom production among cabin crew (36, 49). Nevertheless, more studies are needed in order to confirm this.

A third major interesting finding is that within each occupation the physical environment and, to a different

extent, the experienced physical strain had the most significant effect on symptom reporting. This finding indicates that across occupations the physical environment and bodily comfort are highly rated when it comes to providing a healthy environment for workers.

Finally our finding that teachers report higher respiratory distress than nurses supports theories about the influence of the classroom environment on respiratory symptoms, but the indoor air in the classroom has been suggested to induce serious health threats with special pollutant sources used in art rooms, science laboratories and vocational laboratories (pollutants like dust and particles of chalk) (4, 30). It can also be speculated that the closeness to school children may predispose teachers to common cold symptoms. For example, it is known that school children are carriers of certain pathogens and that nasal carrier of specific pathogens like *Streptococcus pneumoniae* are presumed to play a role in the transmission of it to adults (64, 65). Finally, it should be mentioned that two of the symptoms that loaded on to the *Common cold scale*, i.e. soreness and hoarseness, relate to the voice of the teacher. This would be consistent with the findings of a number of studies that have confirmed that teachers are at high risk for disability from voice disorders (31, 32).

The main weakness of this study is the well-known limitations of questionnaires with possible bias from rating behaviour, and the possibility of recall bias (66). This limitation may especially be at work here as in Iceland nurses in general have greater knowledge of postal questionnaires than the other two occupations, which might account for the difference found between them and the other occupations. Another limitation is the number of participants, but less than 70% of the samples of each occupation responded despite extensive methods in order to improve response rate.

## Conclusion and recommendation

The study highlights difference in self-assessed occupational health and working environment among three groups of working women. Nurses seem to assess their health and working environment in a more positive light than teachers and cabin crew. In particular nurses reported less stress and exhaustion, greater complexity with their physical work, more cooperation with their co-workers and being better able to control their work pace. Thus it seems that teachers and cabin crew deserve special attention in further studies. However, within each occupation the physical working environment and how physically strenuous the work was found to be had a negative effect on the occupational health assessment net of the other independent variables. It is recommended that employers take these factors into account when they conduct workplace risk assessment.

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**Appendix 1**

**Appendix 1** Pearson correlations between work environment variables, socio-demographic characteristics and the symptom scales

	Sound perception scale			Stress and exhaustion scale			Common cold scale			Gastrointestinal scale			Musculoskeletal scale		
	Nurses	Teachers	Cabin crew	Nurses	Teachers	Cabin crew	Nurses	Teachers	Cabin crew	Nurses	Teachers	Cabin crew	Nurses	Teachers	Cabin crew
<b>Working environment variables</b>															
Physical environment scale	0.153**	0.224**	0.253**	0.363**	0.343**	0.335**	0.233**	0.346**	0.258**	0.297**	0.267**	0.267**	0.286**	0.214**	0.272**
Physical strenuous work	0.120	0.139*	0.173*	0.265**	0.185*	0.241**	0.125	0.219**	0.127	0.288**	0.173*	0.133	0.294**	0.136	0.254**
Work pace	-0.032	-0.040	-0.144*	-0.210**	-0.074	-0.113	-0.112	-0.134*	-0.132*	-0.161**	-0.119*	-0.192**	-0.164**	-0.162**	-0.121
Job security	0.051	0.037	-0.069	-0.144**	-0.121*	-0.069	-0.014	0.003	-0.128	-0.113*	-0.039	-0.046	-0.026	-0.036	0.017
Physically monotonous work	0.124*	0.000	0.106	0.061	-0.034	0.199**	0.026	-0.077	0.122	0.046	0.076	0.239**	-0.003	0.049	0.114
Seek assistance	-0.065	-0.051	0.089	-0.086	-0.010	-0.102	-0.007	0.029	0.116	-0.045	0.004	-0.061	-0.038	0.060	-0.097
<b>Socio-demographic characteristics</b>															
Age	0.114*	0.124*	-0.021	-0.204**	-0.172**	-0.146*	-0.1889**	-0.176**	-0.213**	-0.109**	-0.087	-0.138*	0.098	0.119*	0.260**
Children	-0.019	-0.065	-0.079	0.115*	0.060	-0.024	0.079	0.070	-0.010	0.027	0.009	-0.100	0.012	-0.049	-0.266**

There is an inverse relationship between scores on the Physical environment scale, the Physical strenuous work scale and the Work pace variable when compared with the other working environment variables and to the symptom subscales.

\*p<0.05

\*\*p<0.01