

Workplace aesthetics: impact of environments upon employee health as compared to ergonomics

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Abstract Associations between self-reported needs for *aesthetic* and *ergonomic* improvements were studied to analyse a possible impact of aesthetic needs on job performance as compared to ergonomic needs in 11 occupational groups. Employees at Swedish broadcasting company were invited to participate in a cross sectional study. 74% (n=1961/2641) fulfilled the inclusion criteria. Demographic data from company files and a pre-validated questionnaire were used. 'High rank' and 'low rank' aesthetic and ergonomic needs were compared. The perceived needs for aesthetic and ergonomic improvements showed significantly different distributions ($p < 0.001$). Aesthetic needs were more frequently reported. No gender related differences were observed. Differences between occupational groups were shown ($p = 0.006, 0.003$). 'High rank' needs for *aesthetic* and *ergonomic* improvements were similarly associated to psychological demands, stress, pain and age. 16/24 factors showed significant differences between 'high and low rank' aesthetic needs, whereas 21/24 between ergonomic needs. Sick leave was stronger related to ergonomics. The study results show a relation between not only work place ergonomics but also work place aesthetics to health and well-being. Future work health promotion and prevention may benefit from the inclusion of workplace aesthetics.

Keywords: Aesthetics, ergonomics, work environment, musculoskeletal pain, low back pain, occupational health, stress, sickleave

1. Introduction

There is little empirical evidence of the influence of design and workplace aesthetics on employees and the distance between ergonomic, psychological factors, and the architectural design process can be considerable [10, 11, 19, 31].

Already in 1972 Maslow and Mintz [28] described the effect of *aesthetics* of workers levels of energy and their overall well-being. Mintz 1972 also studied the effects of aesthetic surroundings by prolonged and repeated experience in "beautiful" and "ugly" room [31]. Similar studies have been made in hospital environments [7, 12, 13, 44]. Dilani [13,14] studied work environment's influence on hospital staff, and Caspari et al [8] studied patient's opinion of healthy hospital

environments. *Recent studies on aesthetics on other workplaces are rare.

Ergonomics, an integral part of workplace design, is related to occupational health, safety, and job satisfaction [1, 3, 5, 16, 29, 33, 35, 41]. Leather et al 1998 [22] includes effects of sunlight in the work-place on employees and the stress item. Perceived environmental attributes, neighbourhood and workplace design characteristics are associated with well-being and job satisfaction [10, 32]. In addition to ergonomics and work organisation an aesthetically supportive and harmonious physical environment may influence employees' views of their workplaces and their own health [11, 14, 26, 27]. According to Helander 2005 [19] the work

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chair's design, aesthetics and comfort might be as important as its ergonomic advantages.

Aesthetic and ergonomic factors, with or without psychosocial effects can be perceived to overlap [19, 22, 25, 41, 42, 43]. In the clinical praxis ergonomic problems are often focused on. The question arises if the comprehension of aesthetic needs only reflects the ergonomic needs. To differentiate between those two is important in prevention of work place problems.

2. Study design

The present study is a part of an employee survey performed at the Swedish Public Service Broadcasting Company (Swedish Television) and the Radio Symphony Orchestra (Swedish Radio) regarding employees' needs for *aesthetic* and *ergonomic* improvements. A cross-sectional design was employed.

Two hypotheses were tested:

1. there will be no significant associations between perceived *aesthetic* improvements and occupational position, work environment and organisation, health and demographic variables set ups
2. the distribution of responses to the perceived need for *aesthetic* improvements will not be significantly different to the need for *ergonomic* improvements.

3. Method

3.1 Participants

All employees at the Public Service Broadcasting Company for Television Swedish Television) and at the Radio Symphony Orchestra (Swedish Radio), who had been employed for the previous 12 months and were not on leave for more than 6 months (e.g. for studies, childbirth, sickness or work abroad), were asked to participate in a survey. The inclusion criteria were fulfilled by 2641 employees and 1961 of them agreed to respond to the questionnaire giving a response rate of 74%. Occupational position, age, gender, and sick leave for the previous 12 months were collected from company files. The sick-leave for the total television company was 3.6% at the time for the current study as compared to the national average 5.6%, as measured the same way the same period. The sick-leave rate in the study population was even lower due to the inclusion criteria (long term sick-listed excluded) [37, 39].

The participants worked in a wide variety of environments. The Swedish Television and the Swedish Radio have access to occupational health

similarly to the praxis in other larger companies. Work-stress due to re-organisation and tight deadlines is common in these work settings.

3.2 Survey

The questionnaire distribution was performed by mail. Two reminders were sent if needed. The questionnaire design was chosen in accordance with company consent, time efficacy and in- accordance to Ruguliers [26, 36]. The questions used in this survey had earlier been used by Statistics Sweden [37], in their repeated national studies on living conditions, and by the Standardised Nordic Questionnaire [21] all of which are pre-validated questionnaires. Scales were either visual analogue (VAS 0-10) [30], or Likert-type [24].

A four-week test-retest for repeatability of additional questions was performed within the study. Of the 40 persons randomly selected for this purpose 32 participated (80%). The test-retest correlations were significant ($p < 0.001$ to 0.007, Spearman's correlation test). The correlation mean was $r = 0.74$ with median $r = 0.71$ (upper 25% = 1 to 0.83; middle 50% = 0.82-0.58; lower 25% 0.57-0.47).

The groups of variable set ups included demographic data, work environmental and health factors (such as sick-leave, stress-related symptoms and musculoskeletal pain).

Questions on perceived need for *aesthetic* and *ergonomic* improvements were included among other questions and did not therefore induce a specific response bias. The questions were: 1) 'Do you consider that your workplace aesthetic environments need to be improved?' - the response alternatives were: 'yes, definitely', 'yes, to a high degree' (dichotomized to 'high rank'); 'yes, to some degree', and 'no, not at all' (dichotomized to 'low rank') and 2) 'Do you consider that your workplace ergonomic environments need to be improved?' The response alternatives were: 'yes, definitely', 'yes, to a high degree' (dichotomized to 'high rank'); 'yes, to some degree', and 'no, not at all' (dichotomized to 'low rank'). The *aesthetic* and *ergonomic* needs for improvements were outcome variables. The definition of workplace aesthetics varies [10, 11, 13, 19, 40]. In this survey we asked for the subjectively perceived needs to obtain data for future more detailed studies. The ergonomic needs were equally handled e.g. no definition was given.

4. Data Analysis

The McNemar test was used to compare the response distribution of the needs for "aesthetic" and "ergonomic" improvements respectively within

the total group, and the 'sign test' between occupations [2].

The responses to the aesthetic needs and ergonomic needs were dichotomized to 'high rank' and 'low rank'. The other 'Likert-type' scales were dichotomised to "yes" and "no".

Responses to the questions on pain in the neck, shoulder, upper or low back (VAS 0-10) were summed as the variable "total sum of pain" (score 0-40) and with other musculoskeletal pain (VAS 0-10) included (score 0-50). Similarly the questions on the pain relatedness to stress (scale 0-3, score 0-12) and to work posture/load (scale 0-3, score 0-12) were summed and dichotomized (0=No; ≥ 1 = Yes).

Comparisons of means were performed with Student's independent t-test, and one-way analyses of variance. ANOVA with post hoc tests were used to compare means between groups. The Chi-square test was used to compare differences in distribution between ordered groups with more categories than two. The comparison were corrected for multiplicity according to the "least significant difference" (SPSS Base 9.0). Age was adjusted for.

Post hoc analysis were performed separately for aesthetic needs and for ergonomic needs respectively between occupational groups. Bon Ferroni corrections were included.

All analyses were made with a confidence interval of 95%. The two-tailed p-value < 0.05 was regarded as significant when no other comment was given.

The study was approved by the Ethical Research Committee North at Karolinska Institutet (Dnr 02-199). All participants gave informed consent.

5. Results

The total number of participants in the survey was 1961. This corresponds to a participation rate of 74% (70-86% in occupational subgroups). Seventy-two % responded to the separate question on *aesthetics* (n=1905) and 73% (n=1917) to the question on *ergonomics*. The mean age was 47.67 yrs (range 21-67, \pm SD 10.5), 42% were women and 58% men. There were no significant differences between participants and drop-outs with regard to age, gender or occupation; nor were there any differences in participation rate between employees at headquarters or those stationed elsewhere in Sweden. Educational background and occupation groups are described in Table 1.

According to the company's sick-leave register, 53% of the study participants had no sick-days at all (47% of the women, and 58% of the men). Those with no sick-days were younger 46.5 yrs (SEM 0.36) than those with sick-days 48.8 yrs (SEM 0.32). The mean difference was 2.3 yrs ($p < 0.001$).

The distribution of the responses to the question on need for *aesthetic* improvements was: yes, definitely 27%; yes, to a high degree 19%; yes, to some degree; 36%; no, not at all 18 %. Thus, 46% ranked 'high need' for aesthetic improvements, Table 2. There were no significant gender related differences.

The distribution of the responses to the question on need for *ergonomic* improvements was: yes, definitely 16%; yes, to a high degree 18%; yes, to some degree 49%; no, not at all 17%. Thus, 34% ranked 'high need' for ergonomic improvements, Table 2. There were no significant gender related differences.

5.1 Occupational groups

The distribution of responses to *aesthetic* need for improvements was significantly different distributed between the 11 occupational groups ($p < 0.001$; Qui-square=85.0), Table 3 and Figure 1. Seven out of 15 were similar as for ergonomic needs.

Also the distribution of responses to *ergonomic* need for improvements was significantly different distributed between the 11 occupational groups ($p < 0.001$; Qui square=58.5), Table 3 and Figure 1. Seven out of 13 were similar as for aesthetic needs

There were no significant gender related differences.

Table 1
Educational background and occupational groups (n=1961).

Education	% of total
Compulsory school (9 yrs)	4.8
Upper-secondary school or professional education (16 yrs)	19.9
More specific professional education	17.2
College/University BA (16 yrs)	31.3
University MSc (>16 yrs)	7.2
Missing information	19.6
<i>Total</i>	<i>100.0</i>
Occupational groups	% of total
1. Administration	16.3
2. Persons with high executive position	4.3
3. Chief persons reporting to (2)	3.6
4. Studio and work room professionals (e.g. masks-, wigmakers, carpenters, painters, costume-makers, tailors and assistants)	3.9
5. Picture/sound/light technicians	9.7
6. Cameramen & "video" editors	7.3
7. Persons working directly with TV productions	19.0
8. Reporters, programme leaders and editorial staff	25.8
9. IT staff	1.8
10. Research and development technicians	4.0
11. Symphony orchestra	3.8
Missing information	0.3
<i>Total</i>	<i>100.0</i>

Table 2
Distribution of the responses to the two questions: "Do you consider that your workplace aesthetics/ergonomics, respectively, need to be improved?"

	Aesthetic needs →	Yes definitely	Yes, to a high degree	Yes, to some degree	No, not at all	Total
Ergonomic needs ↓						
Yes definitely		190	46	56	13	305
Yes, to a high degree		116	84	104	32	336
Yes, to some degree		167	200	398	173	938
No, not at all		32	36	117	135	320
Total		505	366	675	353	1899

¹ 1092 / 1899 (58%) responded differently with a significant difference between the response distribution to the two questions' four separate response alternatives (p<0.001).

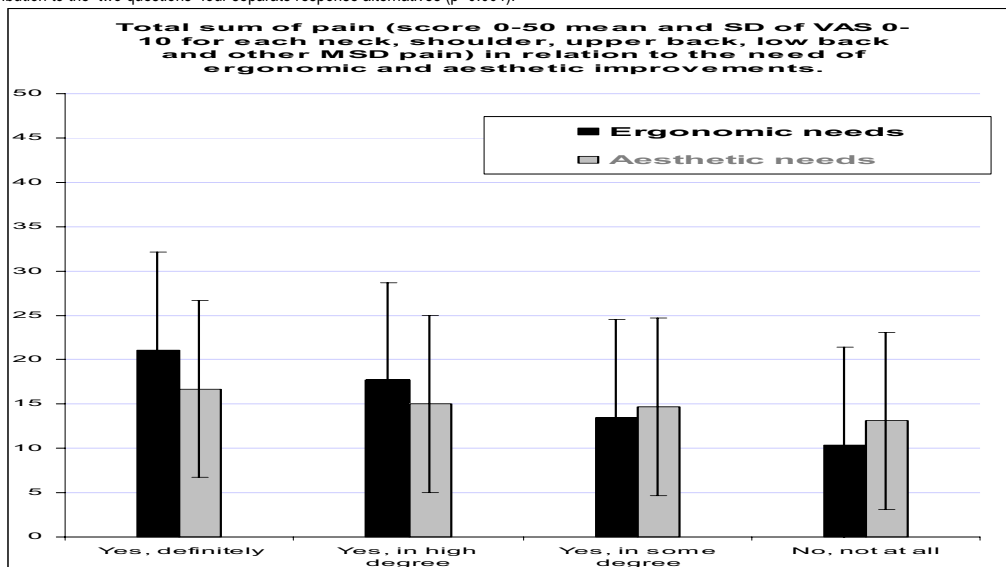


Fig 2. Mean values and SD of total sum of pain (score 0-50 e.g. VAS 0-10 for each of neck-shoulder-upper/low back and other musculoskeletal pain) distributed by response alternative of need for aesthetic and ergonomic improvements.

Table 3

Distribution of 'high rank' need responses for *aesthetic* and *ergonomic* improvements in 11 occupational groups (n=1961). Aesthetics: between occupational groups Qui-square=85.0; p <0.001. Ergonomics: between occupational groups Qui square=58.5; p<0.001 adjusted according to Bon Ferroni. Significant p-values between separate occupational groups are given.

Occupational groups	Aesthetics: high rank need for improvements %	Ergonomic: high rank need for improvements %	Aesthetics post hoc between groups	Aesthetics between groups p-value	Ergonomics post hoc between groups	Ergonomics between groups p-value
1. Administration	33.5	26.1				
2. Persons with high executive position	24.0	13.2	1 vs 5	<0.001	1 vs 6	0.002
3. Chief persons reporting to 2)	41.5	28.6	1 vs 7	<0.001	1 vs 7	<0.001
4. Studio and work room professionals (mask, costume- makers, tailors and assistants, wigmakers, carpenters, painters)	41.7	39.4	1 vs 8	<0.001	1 vs 9	0.006
5. Picture/sound/light technicians	-	-	1 vs 11	<0.001	2 vs 4	0.016
6. Cameramen & "video" editors	-	-	2 vs 4	0.028	2 vs 5	<0.001
7. Persons working directly with TV productions	-	-	2 vs 5	<0.001	2 vs 6	<0.001
8. Reporters, programme leaders and editorial	53.5	43.9	2 vs 7	<0.001	2 vs 7	0.004
9. IT staff	-	-	2 vs 8	<0.001	2 vs 8	<0.001
10. Research and development technicians	40.1	47.4	2 vs 11	<0.001	5 vs 10	0.004
11. Symphony orchestra	50.9	36.0	5 vs 10	0.016	6 vs 9	0.003
Missing information	-	-	6 vs 11	0.003	6 vs 10	0.001
Total	46	34	7 vs 10	0.028	6 vs 11	0.032
			8 vs 10	0.004	8 vs 11	0.017
			9 vs 11	0.006		
			10 vs 11	<0.001		

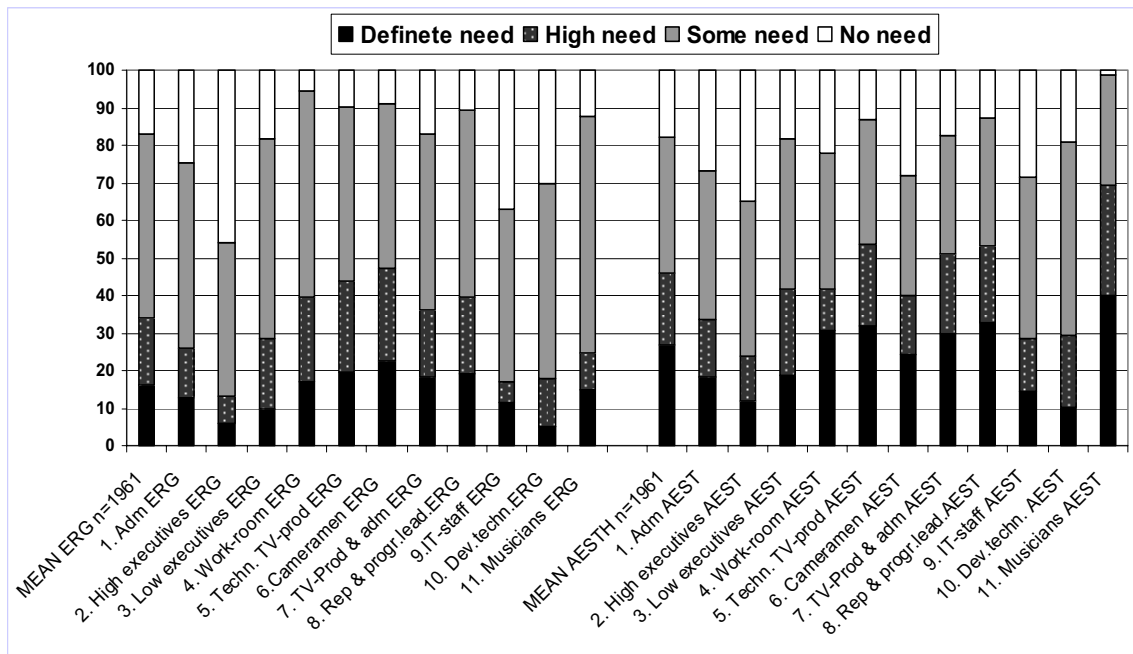


Fig 1. Distribution of responses to 'need for ergonomic improvements' and aesthetics respectively in 11 occupational groups

Table 4

Differences between 'high rank' and 'low rank' need for *aesthetic* improvements with regard to demographic data, work environment and organisation, and health factors in 1905 employees. ^{1/}

Variable	High rank need for aesthetic improvements n= 874 (46%) % or mean (\pm SD)	Low rank need for aesthetic improvements n= 1031 (54%) % or mean (\pm SD)	p-value
Demographics			
Gender: Female / Male	44.3 / 47.0	55.7 / 53.0	0.254
Education: Less high/High ¹	43.0 / 49.7	57.0 / 50.3	0.008
Negative stress outside work, yes ²	50	44	0.004
Physical training (Yes/No): yes 30 min twice/weekly or more	47.7	44.9	0.232
General living conditions (VAS 0-10; from low to high)	7.1 (\pm SD 1.79)	6.9 (\pm SD 1.87)	0.075
Age (yrs)	46.3 (\pm SD 10.7)	48.8 (\pm SD 10.3)	<0.001
Work environment and organisation			
Negative work stress, yes (Yes/No) ²	78.5	70.3	<0.001
Problems at work, yes (Yes/No) ²	63.8	58.2	0.012
Perceived pain relatedness to stress, yes (neck-shoulder-upper and low back) ⁴	70.6	64.1	0.003
Perceived pain relatedness to work posture/load, yes (as above) ³	82.8	78.3	0.014
Disturbing noise, yes (Yes/No)	58.4	41.6	<0.001
Irregular working hours, yes ⁴	59.8	51.4	<0.001
Psychologically demanding work (Yes/No)	75.8	62.8	<0.001
Physically demanding work (Yes/No)	22.2	23.1	0.656
General influence on own work (VAS 0-10; end points "from low-high")	4.96 (\pm SD 2.46)	5.41 (\pm SD 2.47)	<0.001
Dissatisfaction with work circumstances (VAS 0-10; end points "from low-high")	5.82 (\pm SD 2.72)	5.01 (\pm SD 2.78)	<0.001
Health factors			
Sick-leave occurrence for any reason, yes (yes/no - company file)	45.9	47.7	0.423
Sick leave for stress/depression, yes (yes/no)	9.7	7.4	0.080
Sick leave for musculoskeletal pain, yes (yes/no; neck-shoulder-upper and low back)	8.5	6.6	0.113
Sleep disturbances, yes (yes/no) ²	57.7	49.9	0.001
Anxiety, yes (Yes/No)	60.1	58.1	0.495
Worry for own health lately, yes (yes/no)	65.8	70.6	0.145
Pain occurrence in neck-shoulder-upper and low back, yes (yes/no) ⁵	88.3	84.7	0.024
Pain level in neck-shoulder-upper and low back (VAS 0-10; score 0-40) ⁵	13.28 (\pm SD 9.79)	11.87 (\pm SD 9.74)	0.002

^{1/} Table 4 and 5 Response alternatives: 1 Less high education level (9 -12 yrs, and specific occupational education <16 yrs); High education (\geq 16 yrs college/university) 1 Yes, definitely; Yes often; Rarely; No, not at all (dichotomized: Yes/No)3 Working evenings and/or weekends once a week or more (Yes/No)4 No, not at all, Yes, to some degree, Yes, to a high degree; Yes, definitely (scale 0-3, score 0-12; dichotomized No=0; Yes \geq 1)5 Pain in neck, shoulder, upper and low back (VAS 0-10; score 0-40; No=0; Yes \geq 1)

Table 5

Differences between 'high rank' and 'low rank' need for *ergonomic* improvements with regard to demographic data, work environment and organisation, and health factors in 1917 employees. ¹⁾

Variable	High rank need for ergonomic improvements n= 874 (46%) % or mean (\pm SD)	Low rank need for ergonomic improvements n= 1031 (54%) % or mean (\pm SD)	p-value
Demographics			
Gender: Female / Male	35 / 33	65 / 67	0.331
Education: Less high/High ¹	33 / 35	67 / 65	0.470
Negative stress outside work, yes ²	52	44	<0.001
Physical training (Yes/No); yes 30 min twice/weekly or more	45	47	0.518
General living conditions (VAS 0-10; from low to high)	6.83 (\pm SD 1.89)	7.13 (\pm SD 1.78)	0.001
Age (yrs)	46.3 (\pm SD 10.7)	48.8 (\pm SD 10.26)	<0.001
Work environment and organisation factors			
Negative work stress, yes (Yes/No) ²	83.0	69	<0.001
Problems at work, yes (Yes/No) ²	68.7	56.3	<0.001
Perceived pain relatedness to stress, yes (neck-shoulder-upper and low back) ⁴	78.4	61.3	<0.001
Perceived pain relatedness to work posture/load, yes (as above) ⁴	90	75	<0.001
Disturbing noise, yes (Yes/No)	65	42	<0.001
Irregular working hours, yes ³	59	53	0.033
Psychologically demanding work (Yes/No)	76.5	64.5	<0.001
Physically demanding work (Yes/No)	30.8	18.6	<0.001
General influence on own work (VAS 0-10; end points "from low-high")	4.67 (\pm SD 2.4)	5.47 (\pm SD 2.46)	<0.001
Dissatisfaction with work circumstances (VAS 0-10; end points "from low-high")	6.29 (\pm SD 2.53)	4.90 (\pm SD 2.78)	0.003
Health factors			
Sick-leave occurrence for any reason, yes (yes/no - company file)	50.3	45.0	0.027
Sick leave for stress/depression, yes (yes/no)	9.4	6.5	0.023
Sick leave for musculoskeletal pain, yes (neck-shoulder-upper and low back)	11.0	7.3	0.005
Sleep disturbances, yes (yes/no) ²	63	49	<0.001
Anxiety, yes (Yes/No)	64	57	0.002
Worry for own health lately, yes (yes/no)	60.4	72.6	<0.001
Pain occurrence in neck-shoulder-upper and low back, yes (yes/no) ⁵	93	83	<0.001
Pain level in neck-shoulder-upper and low back (VAS 0-10; score 0-40) ⁵	16.22 (\pm SD 10.24)	10.59 (\pm SD 8.98)	<0.001

5.2 Demographics

There were significant differences between 'high rank' and 'low rank' responders in need for aesthetic improvements regarding the following variables: education, stress outside work and age ($p < 0.001-0.008$). The results are shown in Table 4.

There were significant differences between 'high rank' and 'low rank' responders in need for ergonomic improvements regarding the following variables: stress outside work, general living conditions and age ($p < 0.001-0.001$). The results are shown in Table 5.

There were no gender nor physical training related differences between 'high rank' and 'low rank' responders in any of the studied groups, Table 4 and 5.

5.3 Work environment and organisation

There were significant differences between 'high rank' and 'low rank' responders in need for aesthetic improvements in nine out of ten work environmental and organisational variables

($p < 0.001-0.014$), of which the following can be mentioned in specific: work stress, disturbing noise, irregular work hours and psychologically demanding work ($p < 0.001$). The results are shown in Table 4.

There were significant differences between 'high rank' and 'low rank' responders in need for ergonomic improvements in ten out of ten work environmental and organisational variables ($p < 0.001-0.033$). The magnitude of the differences were more obvious than in aesthetics. The results are shown in Table 5.

5.4 Health factors

There were significant differences between 'high rank' and 'low rank' need for aesthetic improvements in three out of eight health variables. Those were: sleep disturbances, pain occurrence and pain level ($p < 0.001-0.024$). The results are shown in Table 4.

There were significant difference between 'high rank' and 'low rank' need for ergonomic

improvements in all health variables ($p < 0.001 - 0.027$). The results are shown in Table 5.

The level of total sum of neck-shoulder-back pain and other musculoskeletal pain on one hand, and need for aesthetic and ergonomic improvements respectively according to all four response alternatives on the other hand, are given in Fig 2.

5.5 Comparison between aesthetic and ergonomic response distributions

The distribution of all four response alternatives to each of the questions 'need for aesthetic and need for ergonomic improvements' differed significantly ($p < 0.001$). The numeric of 1092 out of 1899 (58%) responded differently, Table 2. After dichotomization there were 46% 'high rank' responses to need for aesthetic improvements and 34% 'high rank' responses to need for ergonomic improvements ($p < 0.001$) in the total study group. The distribution of dichotomized responses according to occupational groups are shown in Table 3.

5.6 Main findings

The main finding in the current study was that there were significant differences between 'high rank' and 'low rank' responses to need for aesthetic improvements with regard to demographic, work environment and organisation, and health factors. Thus the first study hypothesis was rejected.

The responses to aesthetic and ergonomic needs for improvements showed significantly different distributions in the total group as well as between occupational groups. The reported need for aesthetic improvements showed a higher frequency of 'high rank' responses than the need for ergonomic improvements did. The second hypothesis was rejected too.

6. Discussion

The current study is a large survey on a working population. The cross-sectional design and use of questionnaire have known limitations. Self-reporting is a method called into question by Heinrich et al [18] for measuring work load, whereas it is recommended by Dane et al [9] as very useful for studies of ergonomic exposure. According to Rugulies et al [36] the questionnaire as a study method for large population groups is superior. Linton reported in 2005 [25] that cross-sectional and prospective questionnaire studies showed similar results. In this explorative study the purpose was to capture subjective evaluations and

therefore the aesthetics and ergonomics were not defined in detail. The decision to leave respondents to judge what was meant by work-place aesthetics [8, 11, 13, 40] and ergonomics should be considered when interpreting the results.

Differences between 'high rank' and 'low rank' responses to need for aesthetic improvements with regard to demographic, work environment and organisation, and health factors were significant. These differences in health and disease were fewer and weaker, than for ergonomics.

Psychologically demanding work and irregular working hours were slightly more articulated for aesthetics than for ergonomics, whereas sleep disturbances, disturbing noise, pain and pain relatedness to stress and to work posture/load were articulated for both. Psychologically demanding work is earlier shown to be related to work environment and health factors [20, 23, 25, 33, 41, 42, 43]. The aesthetics' relation to psychologically demanding work in the current study might represent an additional work environmental factor with possible influence on productivity and health. Sleep disturbances, which are shown to be associated to several psychosocial factors, health, demand, control, and emotional support in accordance to Nordin et al 2005 [34] and Fahlén et al 2006 [17] include adverse consequences of effort-reward imbalance to sleep. Our findings might cautiously indicate that sleep disturbances also could be associated with work place aesthetics.

Disturbing and high noise level is documented as a risk factor for hearing damage. Danielsson [10] reported disturbing noise as a negative factor in open office environments. In stressful jobs, editorial open surroundings and office landscapes, which are often forecoming in the current study population, the subjectively perceived "ugly" work places might increase.

Stress at work and outside work and pain factors were associated to both 'high rank' aesthetic and ergonomic needs, though less so to aesthetics. These factors' relations to ergonomics are earlier documented [1, 25, 32, 41, 43]. The current results indicate that stress and pain might influence perceived need for aesthetic improvements too.

'High rank' responders of both aesthetic and ergonomic needs for improvements were significantly younger, in numeric values slightly, though. The results might point to a higher sensitivity among younger persons to be considered in work health prevention [29].

There were no significant gender differences, neither differences with regard to regular physical training, which activity is considered to support well-being and health according to some studies [6, 38], and thus could have been expected to increase

positive responses. However, there is also contradictory review documentation by Hamberg-van Reenen H et al in 2008 [15]. Our findings seem to be in line with the last mentioned.

Sick-leave, physically demanding work, worry for own health and anxiety were significantly associated to ergonomic needs which is in accordance with earlier studies [1, 16, 25, 32, 33].

The current study group, with persons on long term sick-absenteeism excluded, represents a healthy, normal-employee population [1, 37, 39]. Still, differences were found in the studied variables representing negative occupational health factors [1, 4, 16, 23, 26, 32, 33, 34] between 'high and low rank' responders to need for aesthetic improvements.

The reported need for aesthetic and ergonomic improvements overlapped only partially. This finding indicates an independent role of "aesthetic" needs as an important work-environmental factor. In specific this was seen among musicians: nearly 70% of them reported need for aesthetic improvements, whereas less than 25% of them reported need for ergonomic improvements. Differences were also reported between several other occupational groups. In the independent post hoc tests only partial overlapping was shown between occupational groups. More numerous significant differences between occupations were found for aesthetic needs.

Whether or not the studied population is more sensitive to aesthetics than professional employees in general is beyond our judgement. The high ranking by musicians is of interest, though. In the current study, which was a first step in studying work place aesthetics, we looked for differences which might be of functional relevance. It can be pointed out that for instance psychologically demanding work, pain, stress, sleep disturbances and disturbing noise were significantly correlated to higher aesthetic demands. Their relation to work health is earlier well documented [10, 17, 20, 25, 26, 33, 34]. The current study shows a relation between work place aesthetics and health & well-being, work environments and demographic conditions. Thus, the inclusion of work place aesthetics in work environment improvements and health promotion is an issue to consider.

7. Future implications

Empirical research of the role of "aesthetics" in work places and of it's impact on productivity is

limited. Capturing the subjective evaluations of perceived aesthetic need for improvements and the differences between 'high rank' and 'low rank' groups on work environment and health might constitute a base for further studies. The perceived need for "aesthetic" improvements was independent from that for "ergonomic" improvements, which indicates that health management may benefit on-the-job-productivity if expanded to target workplace "aesthetics".

8. Conclusion

'High rank' perceived need for aesthetic improvements as compared to 'low rank' showed associations to stress, sleep disturbances, problems at work, psychologically demanding work, musculoskeletal pain, and age. Gender and physical training did not differ between 'high and low rank' responders, whereas occupational status did.

The independently tested associations were similar to, but fewer than those for ergonomic needs with regard to the variable set ups: demographics, work environment and health. Sick leave and pain was stronger related to ergonomics. The response distribution of need for aesthetic improvements was differently distributed from the need for ergonomic improvements. Future work health promotion and prevention might benefit from the inclusion of an assessment of workplace aesthetics.

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