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Occup. Environ. Med. 2006;63;141-144
doi:10.1136/oem.2005.019737

ORIGINAL ARTICLE

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Occup Environ Med 2006;**63**:141–144. doi: 10.1136/oem.2005.019737

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Accepted 26 August 2005

Objectives: To examine the relation between perceived organisational justice and cardiovascular reactivity in women.

Methods: The participants were 57 women working in long term care homes. Heart rate variability and systolic arterial pressure variability were used as markers of autonomic function. Organisational justice was measured using the scale of Moorman. Data on other risk factors were also collected.

Results: Results from logistic regression models showed that the risk for increased low frequency band systolic arterial pressure variability was 3.8–5.8 times higher in employees with low justice than in employees with high justice. Low perceived justice was also related to an 80% excess risk of reduced high frequency heart rate variability compared to high perceived justice, but this association was not statistically significant.

Conclusions: These findings are consistent with the hypothesis that cardiac dysregulation is one stress mechanism through which a low perceived justice of decision making procedures and interpersonal treatment increases the risk of health problems in personnel.

A growing body of evidence shows that experiencing organisational injustice affects the health and well-being of employees.[1 2] The term "organisational justice" refers to the extent to which employees perceive that they are treated fairly at their workplace.[3] Organisational justice involves a procedural component and a relational component. The former indicates whether decision making procedures have included input from affected parties, have suppressed bias, and are accurate, correctable, ethical, and applied consistently.[4] The relational element refers to polite and considerate treatment of individuals by supervisors.[5 6]

Perceived organisational injustice has been associated with job dissatisfaction, retaliation, and lower work commitment.[3 7 8] Previous research also suggests that low perceived justice may be related to factors that influence susceptibility to illness, such as raised unfavourable serum lipids and negative emotions.[9 10] Recent work from a study of Finnish hospital personnel has shown how low procedural justice is associated with an increased risk of psychiatric disorders, sickness absence, and poor self rated health status.[11–13]

Evidence on potential mechanisms through which perceived injustice may impact health has also begun to emerge. According to Elovainio and colleagues,[2] both procedural and relational justice evaluations are associated with self reported stress reactions. Moreover, prospective studies suggest that low perceived justice is a strong predictor of psychological distress[12] and that sleep problems partially mediate the relation between perceived injustice and increased morbidity.[14] In other studies, psychological distress and sleep problems—as components of a state of prolonged stress—have been found to increase the risk of coronary heart disease and predict myocardial infarction.[15 16] Wager and colleagues[17] showed that working under a less favourably perceived supervisor was associated with a significant increase in blood pressure compared with working under a more favourably perceived supervisor.

It has been suggested that impaired cardiac and vascular regulation is a shared feature of prolonged stress.[18] Quantitative markers of such dysregulation include heart rate variability (HRV) and systolic arterial pressure (SAP) variability. Although cardiac activity is intrinsic to various pacemaker tissues, heart rate and heart rate variability are largely under the control of the autonomic nervous system. The parasympathetic modulation of the heart rate is mediated via release of acetylcholine by the vagus nerve; the sympathetic modulation is by the release of adrenaline and noradrenaline.

High frequency (HF) HRV has been consistently shown to have meaningful physiological and biological relevance (Task Force of The European Society of Cardiology and the North American Society of Pacing and Electrophysiology, 1996). Previously HF HRV has been found to be reduced in several psychological and physiological stress states such as depression, anxiety, and obesity.[19–21]

Low frequency (LF) SAP variability has been demonstrated to measure changes in sympathetic activity,[22] and according to Virtanen and colleagues,[23] anxiety and hostility are related to increased LF SAP variability. Their results suggest that decreased parasympathetic outflow to the heart may increase blood pressure variability through an increased sympathetic predominance. A recent population based study showed that an increase in blood pressure variability is associated with an increase in cardiovascular mortality.[24]

In the present study we investigated whether perceived organisational injustice is associated with cardiac and vascular autonomic dysregulation, as indicated by non-invasive measures of high frequency heart rate variability and low frequency systolic arterial blood pressure variability.

METHODS

Study sample

This study is part of an ongoing project on wellbeing among employees working in long term care homes, coordinated by the Finnish Institute of Occupational Health and the National Research and Development Centre for Welfare and Health. In 2001, all 334 healthcare employees working in a large elderly care institution (24 work units) were asked to respond to a

Abbreviations: HF, high frequency; HRV, heart rate variability; LF, low frequency; SAP, systolic arterial pressure

questionnaire on organisational justice, workload, and other variables. Of the 222 respondents (66%), 60 were randomly selected to take part in physiological tests. Fifty seven of them responded to the organisational justice questionnaires; they had no major diseases affecting cardiovascular functioning (determined by a medical check up). They formed the final sample for this study. None had managerial responsibilities or were on antihypertensive treatment. All were Finnish and had Finnish as their mother tongue.

Survey measures

We assessed the components of organisational justice by a questionnaire.

The procedural justice scale (7 items, $\alpha = 0.80$) requested the degree to which respondents considered the procedures used at the workplace to be designed to collect accurate information necessary for making decisions, to provide opportunities to appeal or challenge the decision, to generate standards so that decisions could be made with consistency, and to hear the concerns of all those affected by the decision.[3]

The relational justice scale (6 items, $\alpha = 0.90$) requested whether respondents thought that their supervisors were able to suppress personal biases, to treat subordinates with kindness and consideration, and to take steps to deal with subordinates in a truthful manner. In both scales, responses were given on a five point scale ranging from 1 = strongly disagree to 5 = strongly agree. Both justice indices were the mean of response scores.[3]

Covariates were measured in standard ways: age, socioeconomic status, smoking status (current smoker versus not), sedentary lifestyle (less than half an hour of fast walking per week),[25] and body mass index (weight in kilograms divided by the square of the height in metres).

Physiological recordings

After instrumentation, subjects lay quietly on a bed for a minimum of 10 minutes. This was followed by a 5 minute paced breathing measuring period. The ECG was recorded with standard lead II configuration (Medicro oy, Finland) and the arterial pressure waveform was continuously recorded using a Finapres device (Ohmeda, USA). The analogue signals were sampled at 500 Hz and stored offline. From the autoregressive spectral analysis of RR interval and SAP variability, autonomic indices were subsequently computed offline using WinCPRS software (Absolute Aliens, Finland). The parameters extracted from the variability spectra were low frequency (LF) SAP power (0.04–0.15 Hz) and high frequency (HF) HRV power (0.15–0.50 Hz).

Statistical analysis

We used logistic regression analysis to estimate the strength of the association of organisational injustice on reduced HF HRV and increased LF SAP variability. The cases of low HRV were those having HF power less than 110 ms^2 (the lowest quartile). The cut-off point of increased LF arterial blood pressure variability cases was 10 mm Hg^2 (the highest quartile). Organisational justice variables were treated as continuous variables and the cut-off points for high and low level referred to +1 SD and −1 SD, respectively. We adjusted the odds ratios and their 95% confidence intervals for demographics (age and socioeconomic status) and behavioural factors, such as smoking, sedentary lifestyle, and body mass index.

RESULTS

Of the respondents 25 (44%) were classified as reduced HF HRV cases and 15 (26%) as increased LF SAP variability cases. Four subjects had both reduced HF HRV and increased LF SAP variability. Table 1 shows the basic characteristics of the participants as well as the distribution of organisational justice scores and outcome (LF SAP and HF HRV) cases for different age, socioeconomic status, and health behavioural groups. The mean age of the subjects was 41.4 (SD 10.7) years. More than 30% had a sedentary lifestyle, and about as many were current smokers and were overweight (body mass index $>$ 27 kg/m^2). Procedural justice and relational justice were not related to socioeconomic status ($r = 0.02$, $p = 0.884$, and $r = 0.04$, $p = 0.798$, respectively), smoking ($r = 0.03$, $p = 0.800$, and $r = 0.09$, $p = 0.509$), body mass index ($r = 0.12$, $p = 0.394$, and $r = 0.10$, $p = 0.484$), or sedentary lifestyle ($r = 0.09$, $p = 0.426$, and $r = -0.03$, $p = 0.851$). As expected, higher age and smoking were related to reduced HF HRV and increased LF SAP variability, but only the findings on HF HRV reached statistical significance ($\chi^2 = 5.22$, df = 1, $p = 0.022$). Socioeconomic status was not related to HF HRV or LF SAP variability.

Table 2 shows the results for the associations between justice variables and HF HRV and LF SAP variability. Both of the justice variables were related to LF SAP variability. The risk of reduced HF HRV was higher (OR 1.80) in employees with low procedural justice than in employees with high procedural justice, but this association did not reach

Table 1 Characteristics of the participants and distribution of organisational justice scores and outcome (n = 57)

Variables	n	Procedural justice score Mean (SD)	Relational justice score Mean (SD)	Increased SAP variability n (%)	Reduced HF heart rate variability n (%)
Age					
⩽41 years	28	2.7 (0.2)	2.5 (0.2)	5 (18)	8 (29)
>41 years	29	2.9 (0.2)	2.9 (0.3)	10 (34)	17 (59)
Socioeconomic status					
White collar	19	2.8 (0.2)	2.6 (0.2)	5 (26)	7 (37)
Others	36	2.9 (0.2)	2.7 (0.3)	10 (28)	18 (50)
Current smoking					
No	39	2.8 (0.2)	2.6 (0.2)	11 (28)	7 (18)
Yes	18	2.9 (0.2)	2.7 (0.3)	4 (22)	18 (100)
Sedentary lifestyle					
No	37	2.7 (0.2)	2.6 (0.2)	8 (22)	17 (46)
Yes	20	3.0 (0.3)	2.8 (0.3)	7 (35)	8 (40)
Body mass index					
⩽27 kg/m^2	39	2.8 (0.2)	2.6 (0.2)	9 (23)	17 (44)
>27 kg/m^2	18	2.9 (0.3)	2.8 (0.3)	6 (33)	8 (44)

Table 2 Odds ratios (95% CI) for levels of organisational justice, n = 57

Job characteristic	Odds ratio (95% CI) Unadjusted	Adjusted*
Outcome: increased SAP variability (15 cases)		
Procedural justice		
High	1	1
Low	3.81 (1.05 to 14.29)	4.22 (1.03 to 16.45)
Relational justice		
High	1	1
Low	5.75 (1.42 to 23.17)	7.24 (1.49 to 29.96)
Outcome: reduced HF heart rate variability (25 cases)		
Procedural justice		
High	1	1
Low	1.80 (0.59 to 5.47)	1.71 (0.55 to 5.58)
Relational justice		
High	1	1
Low	0.87 (0.29 to 2.51)	0.92 (0.29 to 2.81)

Cut-off points for levels refer to +SD and −SD.
Health habits are smoking, body mass index, and sedentary lifestyle.
*Adjusted for age, socioeconomic status, and health habits.

statistical significance. Relational justice was not related to HF HRV.

The risk of increased LF SAP was 3.88–5.75 times higher in employees with perceived low justice than in employees with perceived high justice (table 2). Adjustment for age, socioeconomic status, smoking, sedentary lifestyle, and body mass index increased these odds ratios, probably because higher justice tended to be associated with older age in this cohort.

DISCUSSION

Only a few studies have been performed on the association between justice related phenomena and cardiovascular heart disease risk. Wager and colleagues[17] reported that working under an unfavourable supervisor was related to high ambulatory blood pressure. In line with this, we found that both procedural and relational justice were related to increased low frequency systolic artery pressure variability. This is consistent with the hypothesis that unfair treatment at work is stressful and that inability to cope with this stress may cause pathogenic physiological changes, including impaired autonomic cardiac regulation.

Prior evidence on the relation between contextual factors and systolic arterial pressure variability has been inconsistent and there are only a few studies assessing blood pressure variability in the resting situation in other than hypertensive populations. Fauvel and colleagues[26] studied the influence of subjective perception of professional strain (high demand and low latitude) on blood pressure, and found no association between strain and the spectral components of blood pressure variability during rest or stress. However, recent studies have shown that low frequency systolic arterial pressure variability is associated with stress provoking entities, such as anxiety and hostility.[23] Systolic artery pressure variability increase is also seen with ageing and hypertension.[27]

A recent study provided empirical evidence of separable peripheral and central sympathetic response components. These results suggested that blood pressure variability reflects changes of central sympathetic control, which was suggested to be relatively independent of the peripheral autonomic nervous system activity. Blood pressure and heart rate variability indices may thus be differentially sensitive to environmental stressors.[28]

In the present study, we did not find a statistically significant association between organisational justice and heart rate variability. However, although relational justice had no effect on heart rate variability, low procedural justice nearly doubled reduced low frequency heart rate variability. The reasons that this result did not reach statistical significance might be due to the small sample size, which is responsible for the low statistical power. There are several potential explanations for the lack of an association between relational justice perceptions and high frequency heart rate variability. All the participants in this study were women. According to previous studies, the effects of relational justice on sickness absence and on other health outcomes have been stronger among men than women.[12] Furthermore, relational justice perceptions have been suggested as more important in high status occupations than in low status occupations. In our study, all of the participants worked in mid or low status occupations.[11]

Mechanisms through which stressful psychosocial factors, such as organisational injustice, may affect health have been suggested previously by Elovainio and co-workers.[14] According to their results, a lack of perceived organisational justice was related to sleeping problems even when adjusting for demographics and poor health behaviours, such as heavy alcohol consumption, which has been shown in previous studies to contribute to sleeping problems.[29] Sleeping problems is one of the most common indicators of prolonged negative emotional states and pathophysiological changes. Longitudinal studies have shown that having trouble in falling asleep is related to coronary events even after adjusting for age and various coronary risk factors.[30 31]

The present results offer some physiological evidence on the relation between organisational injustice and stress. Impaired autonomic regulation was assessed with a non-invasive approach, based on multiparametric evaluation. This evaluation considers indices derived from frequency domain analysis of heart rate variability and systolic arterial pressure variability simultaneously to tap multiple aspects of information about cardiac and vascular control. It must be noted, however, that the present study can provide only an indirect measure of autonomic nerve activity to the heart or blood vessels, although the indicators used are clinically significant measures. Previous studies have suggested that increased blood pressure variability is independently associated with carotid artery cross-sectional area, a measure of arterial hypertrophy[32] and even of cardiovascular mortality.[24]

Although the cross-sectional design of this study is an important intrinsic limitation, the present study is consistent with the hypothesis that perceived organisational injustice may cause physiological health problems for employees. It should be noted, however, that our data do not confirm causality or temporal order in the relation between justice perceptions and cardiovascular regulation. Moreover, the present study cannot rule out the possibility that both increased LF SAP and high self-reported injustice could both be the product of a third factor for which we have not been able to control. Such factors may include pre-existing morbidity or personality factors, such as hostility, which may affect both the perception of justice and physiological outcomes.[33] Because of the small sample size, these results should be considered as preliminary. Further research is needed to strengthen our findings. Ideally, such research should use longitudinal designs and different occupational groups, and include men, as the effects of different components of justice have been suggested to differ between sexes.[11] Furthermore, it would be preferable to use more precise measures of potential confounding factors, such as pack-years for smoking.

Conclusions

The findings reported here suggest that organisational justice at the workplace may be an aspect of the psychosocial

Main messages

- There is an association between perceived organisational justice and employee health.
- Results show that one potential mechanism through which this association may operate is stress related alterations in cardiovascular regulation.

environment that affects people's health through stress and stress related alterations in cardiovascular regulation. These results may not only increase our understanding of psychosocial risks at work but also suggest new priorities for workplace promotion of health and wellbeing.

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Funding: The Finnish Work Environment Fund (FWEF) (project 103314 and 103432) and the Academy of Finland (project 105195) for MK, and the FWEF (projects 96052 and 801639) for ME

Competing interests: none declared

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Policy implications

- Results suggest that in addition to well established psychosocial factors, such as job control and work overload, fairness of decision making and managerial procedures may be important workplace determinants of health.
- Modification of decision making and managerial procedures may be a key factor in attempts to minimise psychosocial risk at work.

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