Psychological Medicine, 1997, **27**, 693–701.

Hostility and registered sickness absences: a prospective study of municipal employees

J. VAHTERA,[1] M. KIVIMÄKI, M. KOSKENVUO AND J. PENTTI

From the Turku Regional Institute of Occupational Health; the Finnish Institute of Occupational Health, Department of Psychology, Helsinki; and the Department of Public Health, University of Turku, Finland

ABSTRACT

Background. Prior evidence on the relationship between hostility and minor health problems is limited to cross-sectional self-report studies. In the present study, this relationship was examined prospectively.

Methods. Hostility of 1077 municipal employees was measured by a questionnaire survey and minor health problems by using 4-year register-based absence data including medically certificated diagnoses.

Results. High hostility predicted a high total number of long-term sickness absence spells among men, but not among women. In separate diagnostic categories (musculo-skeletal, traumas and injuries, respiratory), hostility related positively and linearly to absences due to traumatic causes and curvilinearly (U-shape) to absences due to musculo-skeletal causes. Controlling the effects of health risk behaviour and demographic background did not significantly change these figures. However, health risk behaviour moderated the relations of hostility to overall long-term sickness absences, and to traumatic and musculo-skeletal absences, being significantly stronger in high-risk groups. No association was found between hostility and non-certificated short-term absence spells.

Conclusions. The results suggest that hostility plays a role in the aetiology of minor health problems.

INTRODUCTION

There is growing evidence that hostility may contribute to some major health problems and disease endpoints (Smith & Frohm, 1985; Dembroski *et al*. 1989). In several prospective studies, hostility has been related to hospitalization and mortality in a variety of causes, at least among men (e.g. Barefoot *et al*. 1983, 1989; Shekelle *et al*. 1983; Romanov *et al*. 1994). Studies on coronary heart disease (CHD) have suggested that hostility, representing a component of the Type A behaviour pattern (TABP), is also an important risk factor in CHD (Barefoot *et al*. 1983; Koskenvuo *et al*. 1988). In fact, the association between hostility and CHD has been found even in those studies where the global TABP has not been related to CHD (Koskenvuo *et al*. 1988; Julkunen *et al*. 1994).

While the potential impacts of hostility on severe health problems have been extensively studied, the association between hostility and minor health impairments is not very well known. Up to the present, this association has almost exclusively been investigated by questionnaire studies. The findings have consistently suggested that hostile people report more health problems, daily stress and tension (Houston & Kelly, 1989; Chen & Spector, 1992; Siegel, 1992). However, a major limitation of these studies is the reliance on cross-sectional self-reports, which makes the results vulnerable to common method-variance biases.

The aim of this study was to investigate prospectively the relation of hostility to health impairments as indicated by sickness absence information. We hypothesized that hostility is

[1] Address for correspondence: Dr Jussi Vahtera, Turku Regional Institute of Occupational Health, Hämeenkatu 10, FIN-20500 Turku, Finland.

associated with the number of health problems, at least among men, after the effects of health risk behaviour (i.e. excessive consumption of alcohol, regular smoking, obesity and sedentary life style) and demographics are controlled.

METHOD

Subjects and procedure

In 1990, 1110 identifiable full-time municipal employees of the town of Raisio, in south-western Finland, responded to a questionnaire assessing hostility. The response rate was 95% of the total municipal personnel in Raisio. Three years after the initial survey (i.e. in 1993), a follow-up was conducted to detect the long-term stability of hostility ratings. Data on the absenteeism of the respondents were gathered for 4 years after the base-line survey. Those employees who had replied to the hostility questions and had been at work for at least 6 months after the survey were included in the study cohort of 1077 persons (261 men and 816 women). The total follow-up time was 956 person years for men and 2786 person years for women.

Measures

Hostility

This was measured by a 3-item scale derived from Koskenvuo *et al.* (1988). The items are self-ratings of anger-proneness ('do not get angry easily ... get angry easily'), irritability ('get irritated easily ... do not get irritated easily'), and argumentativeness ('seldom prone to get into arguments easily ... quite often prone to get into arguments'), tapping particularly the affective and behavioural components of hostility. Responses to the items were given on a 7-point Likert-type scale. The construct validity of the scale has proved to be satisfactory (Romanov *et al.* 1994; Strandberg *et al.* 1994). The internal consistency and long-term stability of the scale were moderate in our sample (coefficient alpha reliability 0·77, 3-year test–retest reliability 0·67).

Registered sick-leave absenteeism

The data were gathered from the occupational health care unit's register. This computer-based register contains each sick-leave period of every employee in identifiable form, giving the beginning and end dates of each spell, and the code to classify the main diagnosis, made by the occupational health care specialist. Each sick-leave certificate, irrespective of the place of issue, must be forwarded to the register. For sickness absences of 1 to 3 days, the employees are allowed to complete their own certificate explaining their absence. All the subjects' sickness absence spells between 1 January 1991 and 31 December 1994 were obtained from the register. The records were checked for inconsistencies. Overlapping, consecutive, or duplicate spells of sickness absence were combined. Sickness absence spells were divided into short and long (over 3 days; medical certificate required) ones, taken all together, and long spells separately for the three most common diagnostic categories (International Classification of Diseases, 1977 Revision, WHO, 1977): musculo-skeletal diseases, traumatic causes, and respiratory diseases.

Annual income

Information on annual income was obtained from the employer's register where it was grouped into categories 1 to 17, each succeeding class reflecting an increase of 12000 Finnish marks in annual income.

Health risk behaviour

Self-report items in the survey included measures of health risk behaviour: regular smoking (yes/no), average consumption of units of beer, wine and spirits in a week (cut-off point for low consumption 40 g/week and for high consumption 280 g/week for men, and 180 g/week for women), weight and height to determine body mass index (BMI), and leisure time physical activity. The survey also included a list of 13 chronic diseases diagnosed by a doctor (e.g. asthma, rheumatoid arthritis, osteoarthritis, sciatica, diabetes, cardiovascular disease) and an open question about chronic diseases not included in the list. Three measures were derived from this information: a disease in general (yes/no), and specifically a musculo-skeletal disease (yes/no) and a respiratory disease (yes/no).

Statistical analyses

The analyses of the relationship between the hypothesized determinants and absence spells were conducted according to North *et al.* (1993). For each employee, the number of sickness

Table 1. *Mean hostility scores of potential predictors of sickness absence, standard error of mean (SEM), the significance for the difference* (F-*value, degrees of freedom* (*df*)), *and absence rate*/100 *person years* (*py*) *for long spells of absence. High hostility gives high scores*

	N	Mean hostility	S.E.M.	*F* (df)	Long spells/100 person years age, gender adjusted
Men	261	8·9	0·22	1·61 (1,1076)	42·49
Women	816	9·3	0·14		50·86**
Age				2·88 (2,1076)	
⩽ 33	258	9·6	0·25		43·53
34–48	560	9·2	0·16		50·59
> 48	259	8·8	0·22		64·36***
Income level				2·71 (2,1071)	
High	382	9·6	0·21		25·15
Average	440	9·1	0·18		45·25
Low	250	8·9	0·22		65·70***
Marital status†					
Men				2·96 (1,260)	
Married	211	9·1	0·25		42·60
Single	50	8·2	0·46		44·86
Women				1·26 (1,815)	
Married	646	9·2	0·15		50·23
Single	170	9·6	0·31		52·06
Alcohol consumption				1·90 (2,1056)	
Low	507	9·1	0·17		53·50
Average	449	9·0	0·17		47·03
High	101	9·8	0·42		50·11*
Smoking				10·77 (1,1075)**	
No	866	9·0	0·13		47·12
Yes	210	10·0	0·27		68·64***
Physical activity				0·35 (2,1051)	
Sedentary lifestyle	85	9·5	0·41		68·85***
Moderate	897	9·1	0·13		48·97
Vigorous training	70	9·1	0·51		59·51
Body mass index†					
Men				3·61 (2,258)*	
< 23 kg/m²	56	7·9	0·41		31·52
23–27 kg/m²	139	9·2	0·31		42·78
> 27 kg/m²	64	9·4	0·46		56·04***
Women				1·19 (2,807)	
< 23 kg/m²	381	9·4	0·20		38·65
23–27 kg/m²	277	9·4	0·23		56·63
> 27 kg/m²	150	8·8	0·30		74·20***
Diagnosed disease				0·46 (1,1073)	
No	491	9·1	0·16		32·41
Yes	583	9·3	0·16		66·36***
Musculo-skeletal disease				0·68 (1,1073)	
No	807	9·3	0·13		42·74
Yes	267	9·0	0·25		77·95***

* $P \leqslant 0{\cdot}05$; ** $P < 0{\cdot}01$; *** $P < 0{\cdot}001$.
† Interaction with gender on hostility significant.

absences was computed and the follow-up period was measured in person years. The number of sickness absence spells is a form of count data and therefore Poisson regression models were applied (McCullagh & Nelder, 1989; SAS, 1993). The assumption for the model is that: log (number of spells) is log (person years) + $b_0 + b_1 x_1 + \ldots + b_n x_n$, where x is the predictor and b the coefficient of x ($i = 1-n$). The rate ratios are derived from the equation: $RR_i =$ spells($x_i = 1$)/spells($x_i = 0$) $= e^{bi}$. When the dispersion of sickness absence spells was greater than that predicted by the Poisson model, a scale parameter (the square root of deviance divided by degrees of freedom) was used to adjust for standard errors.

In the first stage, the associations of demographic variables and health-risk behaviour with hostility, and with absence spells were studied. Interactions with gender were analysed using cross-product term as recommended by Cohen & Cohen (1983), and for variables with significant gender interactions, analyses were conducted separately for men and women (a procedure also used in the subsequent stages).

In the next stage, the relations of hostility to overall absences and to absences with specified diagnostic categories were studied. The results were expressed as absence rates/100 person years and as rate ratios. Absence rates and their corresponding rate ratios were adjusted for age and gender and for the base-line potential confounders found in the first stage. These were the demographic and health-risk behaviour variables which independently predicted absences in a multivariate regression model. Linearity between hostility and absence spells was studied using the linear term applied in the Poisson models. Curvilinear trend was tested using the cross-product term hostility × hostility as recommended by Cohen & Cohen (1983).

In the third stage, the moderated effects of demographic variables and health-risk behaviour on the relationship between hostility and absence spells were studied (Cohen & Cohen, 1983).

All the analyses were performed with the SAS statistical program package and the Poisson regression models were calculated using the GENMOD procedure (SAS, 1993).

RESULTS

Three of the studied demographic and health risk behaviour variables were associated with hostility (Table 1). Smokers were more hostile than non-smokers irrespective of gender. In men, high BMI was related to high hostility, whereas in women such an association was not found. For marital status, the association was stronger for men than for women, suggesting that married men reported a higher hostility score than single men.

All the studied demographic and health risk behaviour variables, except marital status, predicted long absence spells (Table 1). For example, smoking and sedentary life-style predicted an over 40% and high BMI an 80% increase in absence spells.

Hostility predicted the total number of long absence spells, but only among males (Table 2). Men with a high hostility had 78% more such spells than men with a low hostility. The linear trend was highly significant. In separate diagnostic categories, hostility predicted absences due to traumas and musculo-skeletal disorders irrespective of gender. The linearly increasing trend showed that the number of long absence spells due to traumatic causes was two times higher in the high hostility group than in the low hostility group. For musculo-skeletal disorders, the relation was U-shaped, the highest rates being among the least and the most hostile employees and those in between having 40% lower absence rates. This curvilinear trend was highly significant.

Adjustment for all the potential confounders in addition to age and gender (i.e. marital status, income level, alcohol consumption, smoking, sedentary life style, obesity, baseline diagnosed diseases) had only a modest impact on the relationship between hostility and absence (Table 2). Hostility was related neither to absences due to respiratory causes (not shown in the tables) nor to short absence spells (Table 2).

Finally, we studied whether demographic or health risk behaviour variables moderate the relationship between hostility and absence spells. As indicated by the three-way interactions of moderator × hostility × gender (Table 3), these moderations were in many cases different for males and females, and, therefore, we made the analyses separately for men and women. For demographics, the relationship between hostility and absence due to musculo-skeletal causes was most pronounced when high hostility was associated with low income level (only in women), married marital status (only in men), and absence of musculo-skeletal self-reported diagnosis at the time of baseline measurement (only in men). Age did not moderate the relation between hostility and absence.

The association of hostility with absence spells also depended on health risk behaviour (Table 3). More specifically, the combination of high hostility with high alcohol consumption or sedentary lifestyle (only in men) produced the highest total number of long spells. For absence due to musculo-skeletal causes, the figures were

Table 2. *Sickness absence according to hostility level expressed as absence rates/100 person years (py), and the rate ratios (RR) relative to the rate in least hostile adjusted partially (age, gender) and fully adjusted. Test for linearity and curvilinearity gives χ^2 value and its significance*

	N	Absence rate/ 100 py age, gender adjusted	RR age, gender adjusted	RR fully adjusted	Linear trend χ^2 (df = 1)	Curvilinear trend χ^2 (df = 1)
Short spells						
Hostility					7·25**	0·83
3–5	185	79·16	1·00	1·00		
6–7	223	76·71	0·97	0·97		
8–9	188	79·23	1·00	1·00		
10–12	260	93·32	1·18	1·18		
13–21	221	93·84	1·19	1·21		
Long spells						
Men, hostility					12·90***	7·40**
3–5	44	32·74	1·00	1·00		
6–7	59	39·10	1·19	1·08		
8–9	44	49·51	1·51*	1·39		
10–12	66	38·58	1·18	0·87		
13–21	48	58·42	1·78***	1·41*		
Women, hostility					2·44	6·12*
3–5	141	53·18	1·00	1·00		
6–7	164	47·93	0·90	0·94		
8–9	144	43·33	0·81*	0·90		
10–12	194	50·70	0·95	1·00		
13–21	173	56·50	1·06	1·06		
Musculo-skeletal spells						
Hostility					0·03	13·90***
3–5	185	18·05	1·00	1·00		
6–7	223	12·65	0·74**	0·73*		
8–9	188	11·14	0·62***	0·67**		
10–12	260	12·88	0·71**	0·66**		
13–21	221	17·57	0·97	0·89		
Traumatic causes						
Hostility					9·31**	0·43
3–5	185	3·46	1·00	1·00		
6–7	223	4·64	1·34	1·29		
8–9	188	5·46	1·58	1·61		
10–12	260	5·20	1·50	1·40		
13–21	221	7·23	2·09**	1·87**		

Note: For long spells gender × hostility interaction significant.

Fully adjusted models include in addition to gender and age for long spells and musculo-skeletal spells income, smoking, physical activity and BMI; and for traumatic causes gender × marital status interaction, alcohol consumption, smoking and physical activity.

* $P \leqslant 0{\cdot}05$; ** $P < 0{\cdot}01$; *** $P < 0{\cdot}001$.

elevated when high hostility was combined with high alcohol consumption, sedentary lifestyle or high BMI (only in men). The combination of high hostility with sedentary lifestyle or regular smoking (only in men) yielded the highest number of absences due to traumatic causes.

DISCUSSION

In support of our hypothesis, hostility was associated with health problems indicated by absenteeism. The present results suggest, consistently with recent survey studies (Houston & Kelly, 1989; Chen & Spector, 1992; Siegel, 1992), that hostility may contribute to minor health impairments among men and women. These main findings remained constant after the effects of health risk behaviour and demographic background were partialled out.

More detailed analyses showed that the relation of hostility to health problems was dependent on gender and diagnostic category. While the total number of health problems, as indicated by medically certificated absence spells, was predicted by hostility only in men, traumas and injuries were predicted by hostility in both

Table 3. *The moderators of the hostility–sickness absence relation in hierarchical Poisson regression analyses. The age adjusted rate ratios of sickness absence in high* versus *low hostility* (*ho*) *at different levels of moderators, and the improvement of the model when entering the moderator × hostility and the moderator × hostility × gender interaction term* (χ^2 *value and in parentheses the degrees of freedom*)

		Long spells		Musculo-skeletal spells		Traumatic causes	
Moderator	ho low	Men ho high	Women ho high	Men ho high	Women ho high	Men ho high	Women ho high
Income level							
High	1·00	1·57	1·42	1·51	0·47	0·51	1·64
Average	1·00	1·30	1·00	0·74	0·71	2·16	2·36
Low	1·00	1·07	1·09	0·13	1·33	1·80	1·06
× ho		NS	NS	NS	10·2(2)**	NS	NS
× ho × gender		NS		6·0(2)*		NS	
Marital status							
Married	1·00	1·67	1·15	1·33	1·19	1·82	1·72
Single	1·00	0·84	0·91	0·18	0·76	1·55	0·97
× ho		4·9(1)*	NS	13·7(1)***	NS	NS	NS
× ho × gender		NS		6·7(1)**		NS	
Alcohol consumption							
Low	1·00	0·81	1·00	0·31	0·94	1·74	1·48
Average	1·00	1·35	1·14	0·84	1·13	1·00	1·44
High	1·00	2·05	2·20	1·54	10·5	2·59	1·31
× ho		8·5(2)*	11·5(2)**	6·4(2)*	15·9(2)***	NS	NS
× ho × gender		NS		NS		NS	
Smoking							
No	1·00	1·26	1·06	1·03	0·95	0·88	1·45
Yes	1·00	1·76	1·05	0·62	1·33	3·84	1·18
× ho		NS	NS	NS	NS	11·5(1)***	NS
× ho × gender		NS		NS		8·7(1)**	
Physical activity							
Sedentary lifestyle	1·00	3·59	1·60	3·15	2·08	4·29	1·90
Moderate	1·00	1·14	1·06	0·51	1·08	1·57	1·17
Vigorous training	1·00	0·98	0·95	0·41	0·04	0·73	4·40
× ho		18·9(2)***	NS	16·0(2)***	28·3(2)***	6·3(1)*	6·5(1)*
× ho × gender		NS		11·0(2)***		7·9(2)*	
Body mass index							
< 23 kg/m²	1·00	1·06	1·26	0·75	1·10	0·87	1·50
23–27 kg/m²	1·00	1·18	1·09	0·57	1·05	1·52	1·37
> 27 kg/m²	1·00	1·91	0·93	1·67	1·19	2·43	1·33
× ho		NS	NS	5·8(2)*	NS	NS	NS
× ho × gender		7·6(2)*		NS		NS	
Musculo-skeletal disease							
No	1·00	—	—	1·75	1·21	—	—
Yes	1·00	—	—	0·50	1·01	—	—
× ho				10·3(1)**	NS		
× ho × gender				6·4(1)*			

* $P \leqslant 0{\cdot}05$; ** $P < 0{\cdot}01$; *** $P < 0{\cdot}001$.

sexes. As an exception to our expectations, the relationship between hostility and musculo-skeletal problems appeared to be U-shaped, with the most problems found among those men and women expressing the lowest and highest levels of hostility.

Recently, a focus of increasing interest has been the processes by which hostility leads to adverse health outcomes. According to one view, a linking mechanism may be accident-prone behaviour. This assumption is based on findings that accidental deaths are more frequent among hostile men (Romanov *et al*. 1994). It has been concluded that a substantial subgroup of the casualties is caused by accident-prone behaviour, although accidents may sometimes be a

result of the harmful behaviour of someone else or a hazardous environment. The present results regarding injuries among hostile individuals gave additional support to this hypothesis.

It is also hypothesized that hostile individuals are at greater risk of disease due to poor health habits (e.g. poor self-care, regular smoking, over-weight, sedentary life-style, and heavy alcohol consumption, Koskenvuo *et al*. 1988; Leiker & Hailey, 1988; Scherwitz *et al*. 1992; Siegler *et al*. 1992). The present findings were not consistent with this mediating role of poor health habits. However, strong support was found for their moderating role. It emerged that especially the combination of high hostility and poor health habits proved to be a risk factor for increased health problems and injuries. Moreover, important gender differences emerged. For example, high hostility was associated with high body mass index among men but not among women, corresponding with the findings by Scherwitz *et al*. (1992). In addition, our findings indicate that the interaction between hostility and body mass index may explain the number of health problems only in men. However, complementary evidence for this finding is largely lacking because much of the prior research on hostility and health has been done with all-male or largely male samples (Smith, 1992).

Hostility may also contribute to health problems through increased psychosocial vulnerability via high levels of interpersonal conflict and negative life-events, and low levels of social support (Darley & Fazio, 1980; Williams *et al*. 1980; Smith & Frohm, 1985; Smith *et al*. 1988; Appelberg *et al*. 1991). In our study, musculoskeletal problems accumulated more in hostile married men than in hostile single men. This may reflect the health impact of marital distress and conflicts which have been found to be associated with high hostility in men (Smith *et al*. 1988). Another observation supporting the vulnerability hypothesis was that high hostility in women increased the adverse impact of low socio-economic status on health. Some important factors related to psychosocial vulnerability, e.g. job control, job demands, social support, social conflicts and control beliefs (Cohen & Syme, 1985; Duck, 1990; Karasek & Theorell, 1990; Appelberg *et al*. 1991; Cox, 1991), were measured but not reported in the present study. We will focus on this issue more extensively in a forthcoming paper.

Methodological considerations

In the present study, hostility was measured by the simplest major hostility questionnaire used in this research area. A replication, using other hostility questionnaires, e.g. the Cook–Medley Ho Scale (Cook & Medley, 1954), or the complementary use of, for example, the Hostility Facet Scoring System (Dembroski *et al*. 1989), may provide a more comprehensive measurement strategy. Hostility may also share variance with other individual difference variables such as anxiety and depression (Smith & Frohm, 1985). Thus, it is possible that these variables are partially responsible for the association between hostility and health.

Absence from work is a multicausal phenomenon (Marmot *et al*. 1993; Nicholson, 1993; North *et al*. 1993) and the validity of absenteeism as an indicator of health status may be limited especially when short-term uncertificated absences or self-reported absences are concerned. Thus, the lack of association between hostility and health as indicated by short-term absences may be due to validity problems in the health measure.

In contrast to short-term absence, which is more often voluntary, long-term sickness absences appear to reflect quite accurately the health of employees (Marmot *et al*. 1995). In the present study, the reason for every long absence spell was verified by a physician's medical examination, thus increasing the validity of measurement and minimizing the confounding effects of voluntary absenteeism. Traumatic causes of absence are, by their very nature, particularly objective indicators of an outcome. The fact that hostility predicted injuries even after controlling for potential confounders, e.g. higher exposure to accidents among workers with low socio-economic status or poor health habits, gave additional support to the reliability of the findings.

It should be noted that the present data were more objective than the self-reports which have frequently been used to indicate health problems of hostile individuals in previous studies (Houston & Kelly, 1989; Chen & Spector, 1992; Siegel, 1992). In addition, by using register-

based data, our investigation was not open to common method-variance problems, unlike studies assessing both hostility and health problems by self-reports. Finally, the present absence data reflected minor health problems, information which is not available from the often used morbidity and mortality registers.

Conclusion

This longitudinal study demonstrated the important role of hostility in contributing to health problems both in men and women. Moreover, it showed that the health risk associated with hostility may vary by health outcome, gender, health habits and socio-demographics. The present findings also gave information about potential processes by which hostility may lead to health impairments.

It is evident that continued research on hostility and health problems is needed before any firm conclusions can be drawn. A better understanding of this issue is not only important in terms of promoting health but also because of the substantial costs of sickness absence to employers and society as a whole. If an intervention (e.g. Shaphiro *et al*. 1991) is capable of lowering hostility from the highest level to the second highest level in the present data, the estimated reduction in the total number of long absence spells would be 7·9% in men. When specified into two major areas of health problems in the working population, the reductions in absences would vary between 6·7% (musculoskeletal disorders) and 8·0% (traumas) in both sexes.

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