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Stressful life events, social support, and mortality in men born in 1933

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Abstract

Objective—To examine relations between stressful life events and mortality in middle aged men.

Design—Prospective population study. Data on stressful life events, social network, occupation, and other psychosocial factors derived from self administered questionnaires. Mortality data obtained from official registers.

Setting—City of Gothenburg, Sweden.

Subjects—752 men from a random population sample of 1016 men aged 50.

Main outcome measure—Mortality from all causes during seven years' follow up.

Results—Life events which had occurred in the year before the baseline examination were significantly associated with mortality from all causes during seven years' follow up. Of the men who had experienced three or more events during the past year 10·9% had died compared with 3·3% among those with no life events (odds ratio 3·6; 95% confidence interval 1·5 to 8·5). The association between recent life events and mortality remained true after smoking, self perceived health, occupational class, and indices of social support were controlled for. Many of the deaths were alcohol related, but the number of deaths was too small to allow for analyses of specific causes of death. The association between life events and mortality was evident only in men with low emotional support.

Conclusion—Stressful life events are associated with high mortality in middle aged men. Men with adequate emotional support seem to be protected.

Introduction

Psychosocial factors influence mortality.[1-8] Poor social network,[1-4] low socioeconomic status,[5,6] low social activity,[7] and bereavement[8] have all been associated with increased death rates in prospective studies. The concept of emotional stress enters either implicitly or explicitly into most of this research. When examined in epidemiological and clinical investigations life stress may be defined as the numerical accumulation of major life events.[9] Stress may result either from stressful events in themselves or the person's perception of them. Social support has been suggested to moderate the impact of stress through a buffering effect.[10 11]

Life events as a measurement of external life stress was a predominant feature in the research on the influence of stress one or two decades ago.[12] Early retrospective studies showed adverse life events to be related to various forms of ill health,[13-16] but prospective studies have yielded conflicting results.[17-25] Most studies have been conducted in selected populations, and not many have used mortality from all causes as an end point. In recent years interest has shifted towards other psychosocial factors as sources of stress.

To assess the impact of life events on mortality we have investigated data from a cardiovascular survey in middle aged men. In addition to conventional cardiovascular risk factors, the study protocol included questions on several psychosocial factors. Our main hypothesis was that life events predict mortality. In a secondary analysis we investigated whether the potential effect of life events on mortality varied according to level of social support.

Subjects and methods

STUDY POPULATION

In 1983 a random sample was drawn of half of all men in Gothenburg who were born in 1933.[26] The 1016 men in the sample, all of whom were 50 years old, were invited to a health examination; 776 men (76%) responded.

EXAMINATIONS

Physical and laboratory investigations have been described previously.[26] Before the examination all participants had completed a postal questionnaire dealing with smoking habits, physical activity during leisure time, and psychological stress. The answers were checked by the examining physician. Physical activity in leisure time was coded as sedentary or other (at least regular walking or gardening). Heavy psychological stress (defined as feeling tense, irritable, or nervous because of conditions at work or at home) was considered to be present if graded 5 or 6 on a scale of 1 to 6 (a permanent feeling of stress during either the past year or the past five years).[27]

During the examination the participants completed a detailed questionnaire about social variables. Twenty four men did not fill in the questionnaire and were excluded from further analysis. The questionnaire included 10 different life event items[28] and whether the events had occurred the year before the examination, before the previous year, or never. (See table II for details of the separate events.) Life events occurring during the year before the examination were added into a graded scale of none, one, two, or three events or more.

For the measurement of social support a condensed version of the interview schedule for social interaction was used.[29] This instrument yields two scales describing deep emotional relationships or "emotional support" on one hand and the more peripheral contacts of social networks and "social integration" on the other. For the purpose of the present study both scales were divided into low and high, with low defined as the lowest quarter of the distribution.[30]

The men were also asked about activities during the previous year,[7] self perceived health, and size of household. Activities were divided into activities at home, activities outside the home, and social activities. Activity scales were derived from adding up the responses coded as 0, 1, and 2 (never, occasionally, or often/regularly).[26] Self perceived health was rated on a scale with seven ratings ranging from 1 (excellent, could not be better) to 7 (very poor).

Occupation was coded according to the socioeconomic classification system elaborated by the central bureau of statistics in Sweden. In its aggregated form this classification consists of five occupational classes from 1 (unskilled and semiskilled workers) to 5 (professionals, higher civil servants, executives).[31 32] For the purpose of our study men not classifiable by this system (mostly men with disability pensions) were coded as zero and included in the analyses.

FOLLOW UP PROCEDURES

After a follow up period of seven years, ending on 30 June 1991, mortality was ascertained through official registers. There were 41 deaths among the 752 men who had answered the questionnaire. Five men had emigrated and were considered to be alive. All death certificates were traced. Deaths related to use of alcohol were defined as death from alcoholism, alcohol poisoning, epileptic seizures due to alcohol abuse,

TABLE II—*Mortality from all causes by recent life events during seven years' follow up*

Life event	No of men	% (No) of men who died	Odds ratio (95% confidence interval) (recent event: no event)
Serious illness in family member:			
No	359	4·5 (16)	
Yes, before last year	269	5·2 (14)	2·1 (0·9 to 4·6)
Yes, last year	124	8·9 (11)	
Serious concern about family member:			
No	351	3·7 (13)	
Yes, before last year	159	5·0 (8)	2·3 (1·1 to 4·8)
Yes, last year	242	8·3 (20)	
Death of family member:			
No	195	6·7 (13)	
Yes, before last year	439	5·2 (23)	0·6 (0·2 to 1·8)
Yes, last year	118	4·2 (5)	
Divorce or separation:			
No	593	4·4 (26)	
Yes, before last year	143	9·1 (13)	3·1 (0·7 to 14·4)
Yes, last year	16	12·5 (2)	
Forced to move house:			
No	628	4·5 (28)	
Yes, before last year	94	9·6 (9)	3·3 (1·1 to 10·1)
Yes, last year	30	13·3 (4)	
Forced to change job:			
No	604	4·6 (28)	
Yes, before last year	110	10·0 (11)	1·1 (0·3 to 5·0)
Yes, last year	38	5·3 (2)	
Been made redundant:			
No	656	5·0 (33)	
Yes, before last year	63	9·5 (6)	1·2 (0·3 to 5·3)
Yes, last year	33	6·1 (2)	
Feelings of insecurity at work:			
No	527	4·6 (24)	
Yes, before last year	110	4·5 (5)	2·4 (1·2 to 5·0)
Yes, last year	115	10·4 (12)	
Serious financial trouble:			
No	636	4·9 (31)	
Yes, before last year	64	4·7 (3)	3·0 (1·3 to 7·3)
Yes, last year	52	13·5 (7)	
Been legally prosecuted:			
No	624	4·2 (26)	
Yes, before last year	108	9·3 (10)	7·7 (2·6 to 22·7)
Yes, last year	20	25·0 (5)	

violent death while inebriated, and, in one case, pulmonary embolism in a patient with Wernicke's encephalopathy who was in an institution.

STATISTICAL METHODS

Possible associations between continuous or graded variables, or both, were tested with Pitman's nonparametric permutation test.[33] Odds ratios were obtained by using conventional methods or by logistic regression[34] by using the SAS statistical package (version 5.18).[35]

Results

Life events in the year before the baseline examination were significantly associated with mortality from all causes during follow up (table I). Of the men who had experienced three or more events 10·9% (11) had died compared with 3·3% (11) among those with no life events (odds ratio 3·6; 95% confidence interval 1·5 to 8·5). There were 13 deaths from coronary heart disease, eight deaths from cancer, 11 deaths related to alcohol, and nine deaths from other causes. Of the specific causes of death, none was significantly associated with life events.

Table II shows the impact of separate events on mortality. Death of a family member, having been forced to change job, and redundancy did not in themselves influence mortality. Events significantly associated with mortality included serious concern about a family member, being forced to move house, feelings of insecurity at work, serious financial trouble, and an event prompting legal action.

Table III shows mean number of recent life events and influence on mortality for the many potential confounders of the association between mortality and life events. There were no significant associations between life events and serum cholesterol and triglyceride concentrations, blood pressure, or body mass

TABLE I—*Mortality during follow up by number of recent life events. Figures are percentages (numbers of deaths)*

Cause of death	Coronary heart disease	Cancer	Alcohol related	Other causes	Total
Events:					
0 (n=331)	1·5 (5)	0·6 (2)	0·6 (2)	0·6 (2)	3·3 (11)
1 (n=210)	1·9 (4)	0·5 (1)	1·0 (2)	1·9 (4)	5·2 (11)
2 (n=110)	0·9 (1)	2·7 (3)	2·7 (3)	0·9 (1)	7·3 (8)
3 or more (n=101)	3·0 (3)	2·0 (2)	3·0 (3)	3·0 (3)	10·9 (11)
Odds ratio (95% confidence interval) (0 v 3 or more)	2·0 (0·5 to 8·5)	3·3 (0·5 to 23·9)	5·0 (0·6 to 30·6)	5·0 (0·8 to 30·6)	3·6 (1·5 to 8·5)

*See methods for definition.

index. These variables did not predict mortality, and they are not included in the table. Neither current smoking nor occupational class was associated with recent life events. Both variables were, however, associated with mortality. Men who claimed to experience heavy stress also had more recent life events but not higher mortality. Self perceived poor health was strongly associated with both life events and with mortality. Low social integration was associated with life events but not significantly with mortality whereas low emotional support was strongly associated with mortality but not with life events. Of the activity scales, only a low level of activity at home was associated with both life events and mortality.

In a secondary analysis to investigate whether the influence of recent life events on mortality varied according to amount of social support, mortality was calculated separately for low and high amounts of emotional support and social integration (table IV). The association between life events and mortality was evident only in men with low emotional support. For men with a high amount of emotional support there was no evidence of an effect of life events on mortality. A formal test for interaction was significant (p = 0·008). The number of deaths in each cell, however, was small, and the confidence intervals were accordingly wide.

TABLE III—*Mean number of recent life events and mortality from all causes by social and life style factors during seven years' follow up*

Social and life style factor	No of men*	Mean No of events	p Value for trend	% (No) of men who died	p Value
Smoking:					
No	479	1·0		3·5 (17)	
Yes	272	1·1	0·29	8·8 (24)	0·005
Heavy stress:					
No	647	1·0		5·1 (33)	
Yes	101	1·4	0·002	7·9 (8)	0·35
Occupational class:					
0	58	1·1		8·6 (5)	
1	129	1·0		9·3 (12)	
2	169	1·2		5·3 (9)	
3	108	1·0		6·5 (7)	
4	167	1·1		3·0 (5)	
5	121	0·9	0·33	2·5 (3)	0·007
Physical activity:					
Sedentary	162	1·1		8·6 (14)	
Other	590	1·0	0·84	4·6 (27)	0·08
Self perceived health:					
Fair (1-3)	560	0·9		3·8 (21)	
Average (4)	83	1·3		8·4 (7)	
Poor (5-7)	106	1·6	0·0001	12·3 (13)	0·0006
Living alone:					
Yes	131	1·2		11·5 (15)	
No	604	1·0	0·27	3·8 (23)	0·002
Social integration:					
Low	161	1·3		7·5 (12)	
High	591	1·0	0·001	4·9 (29)	0·29
Emotional support:					
Low	173	1·2		10·4 (18)	
High	579	1·0	0·11	4·0 (23)	0·004
Home activities:					
Low	179	1·2		9·5 (17)	
Intermediate	129	1·2		7·8 (10)	
High	442	1·0	0·054	3·2 (14)	0·002
Outside home activities:					
Low	186	1·1		7·0 (13)	
Intermediate	130	1·2		3·8 (5)	
High	436	1·0	0·061	5·3 (23)	0·55
Social activities:					
Low	214	1·2		6·1 (13)	
Intermediate	227	1·0		8·4 (19)	
High	309	1·0	0·27	2·9 (9)	0·092

*Figures do not always equal 752 because of missing data in a few men.

TABLE IV—*Mortality from all causes by social integration score and emotional support during seven years' follow up in relation to recent life events. Figures are percentages (numbers of men)*

	Social integration		Emotional support	
No of events	Low (n=161)	High (n=591)	Low (n=173)	High (n=579)
0	0·0 (0)	4·0 (11)	1·5 (1)	3·8 (10)
1	9·1 (4)	4·2 (7)	7·7 (4)	4·4 (7)
2	15·4 (4)	4·8 (4)	21·4 (6)	2·4 (2)
>2	12·1 (4)	10·3 (7)	25·9 (7)	5·4 (4)
Odds ratio (95% confidence interval)*	7·0 (1·4 to 35·6)	2·5 (0·9 to 6·7)	15·1 (3·5 to 64·9)	1·2 (0·4 to 3·8)

*Calculated by logistic regression.

TABLE V—*Multiple logistic regression analysis with mortality from all causes as dependent variable*

Variable	β (SE)	p Value
Smoking (yes=1, no=0)	0·82 (0·34)	0·016
Self perceived health (1=excellent, 7=very poor)	0·20 (0·10)	0·054
Emotional support score (1=low, 2=high)	−0·83 (0·34)	0·015
Recent life events (category 0-3)	0·34 (0·15)	0·030

TABLE VI—*Crude and adjusted odds ratio for mortality from all causes by recent life events during seven years' follow up*

No of events	% (No) of men who died	Crude odds ratio (95% confidence interval)	Adjusted odds ratio (95% confidence interval)
0 (n=331)	3·3 (11)		
1 (n=210)	5·2 (11)	1·6 (0·7 to 3·8)	1·6 (0·7 to 3·8)
2 (n=110)	7·3 (8)	2·3 (0·9 to 5·8)	1·8 (0·7 to 4·9)
3 or more (n=101)	10·9 (11)	3·6 (1·5 to 8·5)	3·2 (1·3 to 7·9)
p Value for trend		0·004	0·030

*Adjusted for smoking, emotional support, and self perceived health.

For different levels of social integration there was no evidence of an interaction effect.

In univariate analyses smoking, poor self perceived health, low occupational class, living alone, low emotional support, home activities, and life events predicted mortality. All social variables (occupational class, living alone, emotional support, and home activities) were intercorrelated and were entered separately, together with smoking, self perceived health, and life events, into logistic regression analyses. In all analyses recent life events remained a significant predictor of mortality (p = 0·02-0·03). Table V shows a logistic regression analysis with mortality as the dependent variable and smoking, self perceived health, life events, and emotional support as independent variables. The association between mortality and life events was little influenced by other psychosocial factors and any combination of independent variables gave much the same result. Table VI shows crude and adjusted odds ratios for mortality from all causes in relation to life events. After emotional support, self perceived health, and smoking were controlled for there was a slight reduction in odds ratio for three events or more compared with no events.

Discussion

In previous studies, which have mostly used retrospective case-control designs, life events have been implicated as a risk factor for coronary heart disease,[15 36] injuries in adolescence,[37] breast cancer,[38] and Graves' disease.[39] Life events have also been associated with low social class.[40] Not many prospective studies exist. Some of these have used illness or symptoms as outcome effects.[17 19 20] There are surprisingly few prospective studies on mortality or serious illness. Theorell et al studied several outcome variables in a large population of construction workers and found among other things that being out of work and experiencing a poor financial state predicted near future mortality.[18] A single life event indicator, such as bereavement, has predicted increased mortality in men in several studies.[8 41 42] In survivors of an acute myocardial infarction, Ruberman et al found an association between life stress and subsequent mortality during a three year follow up, particularly in men who were socially isolated.[21] One recent study, however, found no evidence for an influence of life events on mortality.[25] This was not a general population study and men with a poor social network may have been underrepresented.

It could be argued that some of the events of the present scale are not really events, objectively seen. Items such as concern about a relative or feelings of

Public health implications

- Life events have been used retrospectively as a measure of sources of stress in relation to health
- This prospective study looked at whether life events had an impact on mortality in middle aged men
- Life events in the year before baseline examination were significantly associated with mortality from all causes during seven years' follow up
- Adequate emotional support may protect men from the high mortality associated with stressful life events

insecurity at work may be said to reflect worry rather than be truly external events. These variables were also among those which, individually, were the best predictors of mortality during follow up. This is in keeping with our previous findings from a large prospective study of a moderate but independent effect of stress on mortality.[27] This finding was not replicated in the present study, probably because a large sample is needed to detect this relatively modest effect. It is, however, noteworthy that the life events which were most closely correlated with the stress variable in the present study were the same events which individually were the best predictors of mortality. Possibly our measure of life events represents a more continuous than acute harassment from adverse life circumstances. This may explain why life events during the year before the baseline examination had an effect which was measurable during a comparatively long follow up.

An obvious confounder of the association between mortality and life events which we did not measure is alcohol abuse. In our previous study on stress we were able to use classified data on alcohol abuse from the Gothenburg temperance board. The effect of stress on mortality was independent of alcohol abuse measured in this manner.[27] For the present study, data on alcohol abuse could no longer be obtained for legislative reasons. Many of the deaths in the present study were alcohol related, and alcohol related deaths were more common among men with many life events. There was an increase in other causes of death as well, but the lack of baseline data on alcohol in the present study is a serious problem as alcohol abuse increases mortality[43] and may also increase the likelihood of adverse life events. Even so, it is equally possible that adverse life events lead to increased alcohol consumption, in which case alcohol abuse would act as a mediator in the chain of physiological events eventually leading to death.

In conclusion, adverse life events seem to have an influence on mortality for several years. Emotional support may attenuate the impact of adverse life events, although this finding must be interpreted with great caution because of the small numbers concerned. Apart from a possible role of alcohol abuse the exact mechanisms behind the increased mortality among men with many life events remain obscure. Also we cannot explain how men with adequate emotional support may be protected. The findings might be compatible with the "vulnerability hypothesis" proposed by Cassel.[10] Adequate emotional support may strengthen the psychobiological resistance to stress. This study and others[21][44] show the need to examine more carefully the role of interactive patterns for the effects of major life stress on health outcome.

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