Coping iwth noise and its health consequences

Kamp, Irene van

SUMMARY

This thesis describes a study on the psychosocial aspects that play a role in the development of health problems due to environmental noise.

Background of the study
Since the sixties there is a growing interest in the influence of environmental factors on health and well-being. Early studies were aimed at the influence of specific polluters such as air pollution and environmental noise. The primary goal was to search for perfect dose-response curves, in which response was measured in various ways, such as prevalence of essential hypertension, annoyance and the use of tranquillizers. In some studies other variables were statistically controlled for. Results proved to be disappointing: the response could only partly be explained by the physical characteristics of the environmental aspects in question. After this, attention was more directed at individual differences in reactions to the environment. Important questions in this research are:

1   Which risk groups can be identified?
2   In what situations do people need extra protection?
3   Which attitudes do influence the individual reactions and can these attitudes be changed?

Although the policy making value of this type of research can not be denied, it has not improved our insight in the underlying processes by which environmental factors can occur with health problems. What is lacking is a theoretical framework.

A recent development in environmental studies is the use of stress theoretical concepts. In line with this trend the problem of environmental noise and health is in this thesis studied from a perspective based on a theory concerning stress. The central question is: What are the underlying processes by which environmental factors can lead to health problems? The model on stress used is based on an integration of a biological (Ursin, 1985) and a psychological (Lazarus, 1966; 1976) approach to stress. According to this model the relationship between a stressor, in this case noise, and health is mediated by a process of appraisal, coping and accompanying emotional and physiological reactions (activation). Characteristic for this model is, that it is suitable for surveys as well as laboratory research. Moreover it is not exclusively fit for noise studies, but applicable to environmental stressors in general. In the first part of chapter 2 this model is described. Below it is schematically presented, with a short description.
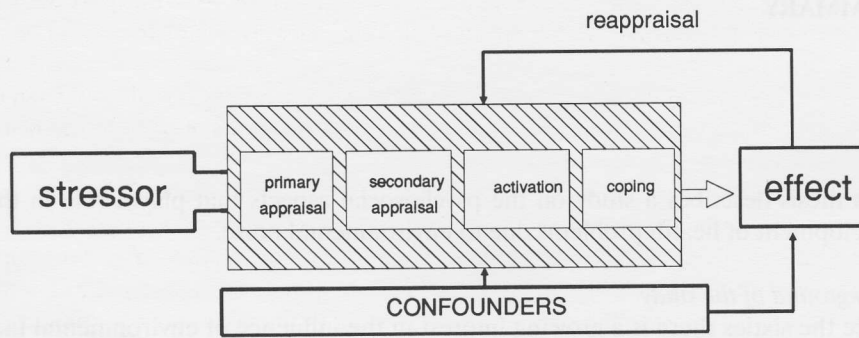
Internal and external stimuli are appraised in terms of threat and control possibilities. When there is a discrepancy between the demands of the situation and perceived control possibilities, this will result in activation on a physiological and subjective level. A change in activation, in its turn, motivates to seek a response strategy (coping) to resolve the discrepancy. The coping strategy either sustains or reduces the activation level. Perceived control and coping are crucial moments in this process: they change the relationship between a stressor and its long-term health effect.

In the second part of Chapter 2 a review is given of recent research on stress in general, environmental studies and specific research on noise. The results are discussed in line with the conceptual model. Step by step we discuss definitions and relevant results on the appraisal of stressors, activation, coping and health effects.

It is concluded that an integrated stress model can be fruitfully applied to the field of environmental noise and health. Results show that noise can indeed be considered as a stressor, that only above certain thresholds has direct health effects. In most cases the relation is mediated by a complex process of appraisal, coping and sustained activation. Other important variables are:

1. Noise specific aspects;
2. Residential situation;
3. The degree in which people experience stress other than noise (Daily Hassles);
4. Biographical characteristics, including work situation.

Method
The method is described in chapter 3. First a pilot study (N=189) was held, aimed at scale construction and evaluation. On the basis of psychometric analysis new measures were adapted or changed. Next an oral interview was held (N=2021) on four locations, stratified according to noise source (Road- versus Air Traffic Noise) and noise level.

The noise metric of Kosten Eenheden (compare Laeq) for Air Traffic Noise and dB(A) for Road Traffic Noise is reduced to six noise classes. Age varies from 18 to 55 years.

After a description of general and specific sample features, a review is given of the major results of psychometric analysis on the instruments used. The following was concluded.

Sample Features. The respondents are fairly equal distributed over locations and noise classes, with an exception of noise class six in the air traffic sample, with relatively few respondents (N=39). Significantly more women than men are interviewed as a result of primarily interviewing in the day time. Therefore the male part of the sample cannot be considered as representative for a normal population (more ill people, more shiftworkers, more unemployed). The samples can, however, be considered as representative for people, who are at home in the daytime and as a consequence are more exposed to noise in the residential area. The distribution of biographical characteristics is comparable in both samples. The road traffic sample contains, however more young people, with a higher level of education. The number of house owners is considerably higher in the air traffic sample. Some variables are confounded with noise class. This implies that we have to control for them (statistically) in further analysis.

Response. The response percentage is relatively low for an oral interview: 55% in the air traffic sample and 44% in the road traffic sample. The length of the interview might be one reason. In addition, in some locations an a priori selection on the basis of age was not possible.

Reliability. The multi-item measures of Annoyance, Coping and Health Complaints are reliable in terms of factor structure, invariance and internal consistency (alpha in range of .65 to .90). The four subsamples give comparable results. An exception is the Perceived Noise Control scale (alpha < .60).

Validity. The correlational pattern of the scales is consistent with the research model. The various Annoyance scales are highly interrelated, as well as the various Health scales. Therefore it is possible to obtain a Total Annoyance and a Total Health score.

Hypotheses

In Chapter 4 the research model is elaborated; themes and alternative sets of hypotheses are formulated. Three classes of models are presented:

1   Simple dose-reponse models;
2   Individual differences models;
3   Models concerning stress.

In the discussion of results we use this distinction as well.

207

Results
In Chapter 5 the results are described step by step. First the relation between Noise and Annoyance and Noise and Health Complaints are presented. The fraction of explained variance of the Annoyance scales varies from 1% to 13%. No significant relation was found between Noise and Health Complaints.

Next the univariate influence of relevant variables (confounders) on Annoyance and Health Complaints are studied. The influence of biographical features on Annoyance is negligible. As one can expect, age and education are indeed related to Health Complaints. Residential Satisfaction is strongly related to Annoyance, while Daily Hassles are highly related to Health Complaints. Finally the univariate relation of the mediating variables — appraisal, subjective activation and coping with Health Complaints — are studied. For all variables we find a significant relation, with Stress due to Noise (subjective activation) as the best predictor (explained variance 12%).

In the second part of Chapter 5 the integrated model of stress is studied step by step with multivariate analysis. An additive model is hereby compared with an interactive model, with the following results:

Stress is predicted by Noise Level, Annoyance and Coping in an additive way. It was concluded that the conceptual distinction between primary appraisal, secondary appraisal and subjective activation is somewhat redundant.

Coping is only partly predicted by Annoyance and Stress due to Noise. Age, sex and education are differentially related to the various coping strategies. Higher educated people score higher on the Problem-oriented Coping scale and the Avoidance scale. Women, lower educated people and elderly people score high on the Comforting Cognition scale.

Health Complaints are primarily predicted by age, education and Daily Hassles. After control for these variables, noise related variables still add 5% to the explained variance. In most cases Stress is the best predictor. Coping also has a significant contribution. Problem-oriented Coping is negatively related to Health Complaints, Avoidance significantly positive. After control for age, education and sex the relationship with Comforting Cognitions is not significant anymore. When we study the interaction between Stress and Coping on Complaints we find a moderator effect of Coping, in which Problem-oriented Coping seems to have a buffer effect between Stress and Health, whereas Avoidence intensifies the relationship.

Finally the influence of combined stressors was studied. The influence of Air Traffic Noise shows to be highly independent of other stressors, while the effect of Road Traffic Noise shows a reversed pattern.

Discussion
Chapter 6 summarizes the major conclusions. Subsequently the theoretical implications of our findings are discussed. These can be described as follows. The integrated model concerning stress is in broad lines supported by the data. There is

some redundancy in respect to the different steps in the model. Subjective activation (Stress due to Noise) is the best predictor of Health Complaints. Does this imply that Stress due to Noise can be considered as a serious health risk? Additional data from a medical survey, a laboratory experiment and follow-up material shows, that we have good reason to believe that Coping and Subjective Health Complaints indeed are related to physiological reactions and medical consumption. As the most appropriate method to further study the relationship between physiological and subjective variables a field experiment is proposed.

31251
―――――
1990