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ACTIVITY INTERFERENCE AND NOISE ANNOYANCE: CONTRADICTORY RESULTS AND POSSIBLE INTERPRETATIONS

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1. INTRODUCTION

Most of our knowledge about the effects of environmental noise on individuals or communities stems from interdisciplinary field studies, using questionnaires mailed to noise exposed residents, or personal interviews with residents. With careful selected sites, dose-response relationships can be established, and most of them show remarkable covariations between acoustic parameters, like L_{eq}, L_{max} or N (number of events) at one side, and effect variables, like ratings of communication disturbance, activity interference, or general annoyance at the other. The questionnaires usually ask for ratings which cover more than just the interview time; they ask for interferences and annoyance in general. We do not know, how the respondents arrive at their ratings, whether they just recall those episodes where they were severely disturbed, whether they integrate a certain period, whether they unconsciously calculate a mean degree of disturbance, or do anything else. In any case, they construct a retrospective judgment.

In contrast to the many retrospective questionnaire studies, we find only a few studies touching upon the question of immediate response to noise, for instance, the laboratory studies wich have taken place in the UK during the fifties and sixties, the famous single event studies (e.g. [1], [2]), or the continuous loudness scaling experiments in recent years [6]. I only know of one study which tried to get protocols of everyday activities at the homes of people living in a noisy neigborhood:

Finke, Guski & Rohrmann [4] got 30 housewifes to complete a noise diary during several days, and they measured the continuous outside traffic noise levels also. Their results show at least that the hourly assessed annoyance does follow the outside noise level in general, but they also show that there are certain hours during the day where

annoyance does not follow the outside noise level (Fig. 1). For instance, during the early morning hours, annoyance is considerably less than could be expected from the noise levels, during the late morning hours, annoyance is considerably greater, and during the late evening hours, annoyance *increases*, although noise levels go down. Unfortunately, the authors do not provide data concerning the relation between diary annoyance scores and retrospective interview annoyance scores.

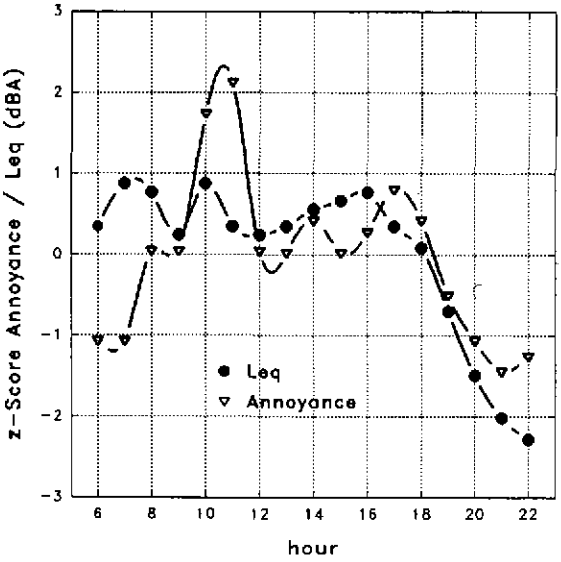

Fig. 1: The relation between actual annoyance and outside noise levels in the diary study of Finke et al. (1980).

2. A FIELD STUDY ON ACTUAL ACTIVITY DISTURBANCES

In 1994 we conducted a field study at 4 traffic and aircraft noise sites in Düsseldorf, Germany [3], which will be presented by Felscher-Suhr at this conference. The mean day noise levels (L_{eq}) at these sites were 61 dB(A) and 68 dB(A) in the street traffic areas, and 55 dB(A) resp. 67 dB(A) in the aircraft areas. The main objective of this study was to test a method for assessing ongoing activities, situational context, annoyance, and cognitive planning processes related to activity disturbances. We choose wireless telephones as a means of commmuncation with the subjects (n=40), and on 8 different days, we called the subjects 10 times a day at irregular intervals, posing questions about the actual location of the subjects, their activity, and the degree of disturbance by environmental noise. The disturbance ratings used a 5-point scale with well known parametric properties, which had been used by Finke et al. [4] before. Meanwhile, the noise levels were registered continuously outside the

homes. Before and after the activity study, conventional personal interviews were applied to all subjects. During these interviews, we got - among other things - ratings of the disturbance of certain activities, and general noise annoyance. The general noise annoyance scale was a 10-point thermometer scale which had been used by Kastka [5] before. Surprisingly, the mean annoyance values were higher during the interviews than during the activity study (Fig.2). For means of comparison, the 5-point scale used during the activity study has been expanded in Fig. 2 to match the 10-point scale of the questionaire study. It was found that the questionnaire annoyance values are considerably higher in the highly exposed areas, but they are also somewhat higher in the less exposed areas.

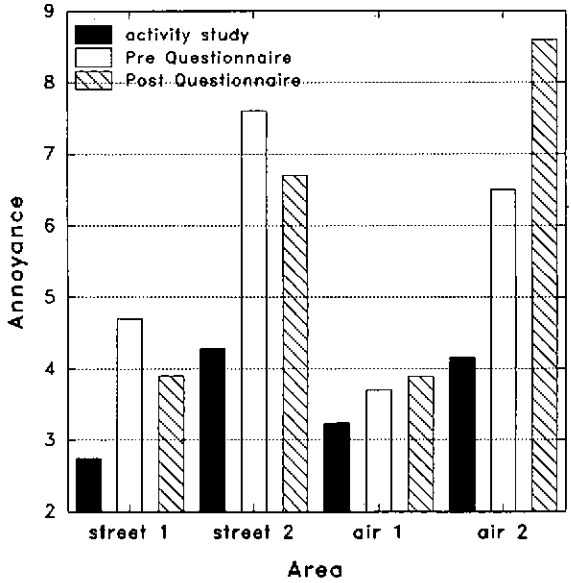

Fig. 2: Discrepancies between actual and questionnaire data in the field study.

3. AN EFFECT OF SCALES, OR AN EFFECT OF METHODS ?

In order to exclude the possibility of a side effect of different scales, we first compared the mean annoyance in our activity study with the mean annoyance in comparable areas in the questionnaire study of [4], because both use exactly the same response scale. The discrepancy, especially in highly exposed areas, was still evident. We then compared the inflated annoyance values of [4] with our questionnaire studies (Fig. 3). We found our questionnaire annoyances to be somewhat higher than those reported by Finke et al., but the differences were well within the dispersion ranges of the scales. We concluded that the difference between retrospective and actual annoyance is not simply an effect of using

different scales.

Another methodological difference between the activity study and questionnaire studies relates to the number of identical questions: In questionnaire studies, the same question usually is posed only once, but in the activity study, the same annoyance question was repeated 10 times a day for 8 days. It may well be that the degree of reported annoyance decreases over time. This potential influence was tested by comparing mean annoyance scores over 8 days, but there was no systematic trend of time. We concluded that the difference between actual and retrospective annoyance was no simple repetition effect.

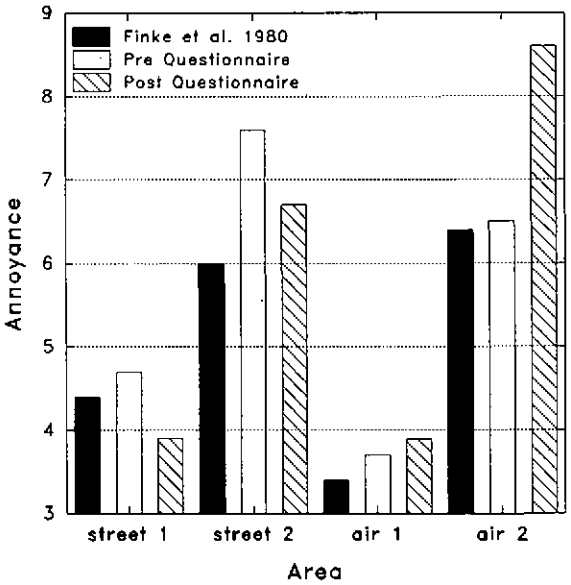

Fig. 3: Mean annoyance values in the questionnaire study of Finke et al. (1980) and our present study.

4. POSSIBLE SYSTEMATIC DIFFERENCES

The difference between actual and retrospective annoyance scores may be systematic, and it may reflect differences in questions, response situations, and strategy of respondents:

(1) Differences in questions:
In questionnaire studies, the respondents usually are asked to give ratings of their disturbance or annoyance "in general". In the activity study, the respondents are asked to give ratings of the "actual" disturbance of the actual activity. We do not know the type and number of situations which respondents will remember during the retrospective interview, but it is probable that they think of past situations of greater disturbance. These situations may not occur too often, and it is

improbable that we meet exactly those situations in an activity study with random sampling of time periods. This will automatically reduce the mean annoyance reported in an activity study.

(2) Differences in response situations:
2.1 In the standardized personal interview, the respondents are asked to reflect the topic of noise and disturbance for a considerable time. In contrast, the activity study concentrated on the activities of the respondents, and the question of disturbance was only one of eight questions. This may have reduced the subjective importance of noise and disturbance during the activity study. With reduced importance, disturbance ratings are expected to be reduced.

2.2 In standardized personal interviews, we try to arrive at a rapport with the respondents, but the success is uncertain. With repeated telephone contacts, this rapport is established very easily. The greater rapport may have acted as a moderating variable between noise impact and noise effect, reducing the disturbance.

2.3 During the personal interview, respondents are asked to rate their noise disturbance only once or two times. In contrast, the activity study asked for this rating 80 times. It may well be that even highly annoyed people hesitate to repeat their disturbances so often; it seems socially undesirable to speak very often about personal complaints. This may also have contributed to the reduction of disturbance ratings.

(3) Differences in the strategy of respondents:
The standardized personal interview was introduced by a letter from the unversity, stressing the importance of science, environment and the cooperation between citizens and science. This may have led the respondents to believe that their answers during the interview may change somehow their noisy life, and they may have used the interview for complaining, stressing the negative aspects of their residential situation. During the activity study, respondents probably did not use a certain strategy.

5. CONSEQUENCES

In order to further analyze differences between actual and retrospective disturbance scores, the subjects of our activity study will be contacted again by telephone and by a personal interviewer. The goals of this additional study are (1) to assess the stability of "one shot" disturbance scales, and (2) to let the respondents speak about possible differences between the interview and the activity study from their point of view.

In addition, a further activity study is planned, which will use small pocket computers instead of portable telephones for posing questions and registrating responses. These computers do not only beep at preprogrammed (randomized) times and ask the respondents, they also allow for a spontaneous input by the respondents, e.g. in cases of disturbances, which would otherwise go unnoticed by the pre-programmed time schedule.

6. REFERENCES

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