

CONTRIBUTIONS TO PSYCHOLOGICAL ACOUSTICS

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The Influence of Noise on Housing Decisions

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Summary

In a longitudinal field study, the influence of environmental quality on housing decisions was investigated. The study is based on conceptual framework which connects perspectives from behavioral decision theory, mobility research and environmental psychology. A set of 12 residential key attributes was considered. With respect to noise, the following questions were analysed: Of which relevance is perceived noise for the evaluation of residential quality, for decisions about moving versus staying, and for the choice of a new residence? Which cognitive changes occur during the search and decision making process?

Although not as important as costs or comfort and state of the dwelling, quietness/noise turned out to be a crucial factor for evaluating and selecting residences, having more significance than other environmental attributes. However, people seem to underestimate the (future) impact of noise exposure when deciding about residences. Altogether, the decision-making process is experienced as a cognitively complex and difficult task. Finally, the possible utilization of the results for applied interests e. g., developing aids or guidelines for housing decisions - is discussed.

Problem

The home of a person or family is the central and an indispensable place of private and social life (Flade and Roth 1987, Tognoli 1987). However, in most industrialized and densely populated countries, millions of citizens live in areas of low environmental quality and suffer from the impacts of environmental stressors such as air pollution, noise, vibrations, smell,

adverse architectural features, etc. Noise seems to be a crucial problem, as for example - data from West Germany show (cf. Umweltgutachten 1987): About 35% of the population are exposed to mean sound levels of $L_m > 55\text{dB(A)}$; more than 40% of residents feel disturbed and annoyed by various noise sources.

The exposed people can either stay (with or without activities against the causes and consequences of such stressors) or they can leave and try to obtain a better residence. Do negative environmental evaluations actually determine migration decision making? This question refers to two kinds of decision processes: Deciding whether to move, and deciding where to move: Excluding cases of forced choice, the mover has to choose between the available housing alternatives. This is usually sequential process, based on the search and inspection of potential new residences.

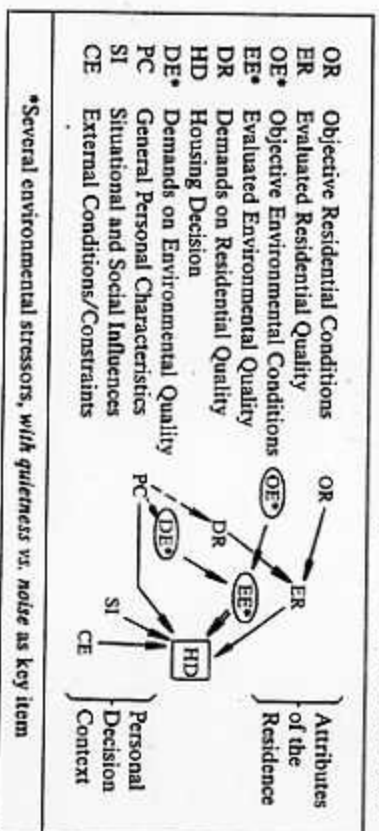
Housing decisions have been studied within mobility research (see, e.g., McHugh 1984, Michelson 1980, Rossi 1980, Weichart 1988) and within decision research (e.g., Aschenbrenner 1977, Borchering 1981, Lindbergh et al. 1987, Winterfeldt and Edwards 1973). The environmental aspects of housing got only moderate attention (Rohrman 1986; Shumaker and Stokols 1982); this is particularly true for noise.

In this context, Rohrman und Borchering (1988) conducted field study in order to clarify the following questions: Of which relevance are the objective and the subjective environmental quality of urban areas and especially environmental stressors including noise - for the assessment of residences, moving decisions, and housing choices? How can the respective evaluations be modeled, and which cognitive changes occur during the search and decision making process?

Theoretical Framework

The investigation is based on a conceptual framework that connects perspectives from migration research (see, e.g., Clark 1986, De Jong and Gardner 1981), behavioral decision theory (e.g., Borchering 1983, Winterfeldt and Edwards 1986) and environmental psychology (e.g., Altman and Werner 1985, Evans and Cohen 1987, Fisher et al. 1984). Box 1 illustrates the assumed structure of the main concepts that are relevant for decisions about residences.

Box 1: Conceptual framework: determinants of housing decisions and the role of noise



The model states that the subjective evaluation of a residence is dependent on its objective characteristics (e.g., costs, size, noise level, shopping facilities, etc.) and on the demands (standards, preferences) which people hold in respect to their housing. Two classes of residential features are separated: Aspects of the apartment/house and its location on the one hand, and aspects of the environment (particularly stressors like noise, or lack of nature) on the other hand. The decision about residences is a consequence of those evaluations, but it is also influenced by various 'internal' factors and 'external' constraints that are not related to the residence, i.e., the personal decision context.

The evaluation of housing options has been modeled in respect to multi-attribute utility theory (MAUT) (Keeney and Raiffa, 1976). (This part of the study will not be covered in the present paper; see Borchering and Rohrman 1989).

Study design

To investigate the issue discussed, empirical data have been gathered in longitudinal approach (see box 2): A group of movers ("M") was surveyed during the search for a new residence. At six subsequent points in time (1: before moving; 12/13/14: during search; 15: after the decision; 16: 4 months later) responses were collected by personal interviews, mailed questionnaires, and telephone interviews. A control group of 'nonmovers' ("N") was

included at two points in time (t1, t6). The respondents were tenants in the city of Darmstadt and surrounding suburban areas.

Box 2: Longitudinal research design

Point in time:	t1	t2	t3	t4	t5	t6
Situation	before moving	search for a new residence	after the decision	4 month later		
SURVEY M: MOVER Sample	M1 92	M2 74	M3 56	M4 28	M5 34	M6 45
SURVEY N: NON-MOVER Sample	N1 71					N6 63
Considered residence:	M: old r. N: old r.		potential residences		new r. old r.	new r. old r.
Survey type:	personal interview		mailed questionnaire (3x)		telephone interview	personal interview

According to this design, 6 questionnaires were to be developed. The set of included variables refers to the conceptual framework shown in Box 1. The main concepts demands, objective conditions, evaluations - were operationalized with respect to 12 housing attributes; five of these are related to features of the apartment/dwelling, three to location criteria, four to environmental aspects (cf. Box 3). Subjective noise ratings were included in each phase of the study. (Objective sound measurements were of part of the investigation but estimates were available). For a detailed description of the project see Rohrmann und Borchering (1988).

In the following, the results of specific data analyses dealing with the relevance of environmental noise are presented.

Findings on the relevance of noise

Three questions will be treated, namely, whether perceived noise influences the evaluation of residential quality, decisions about moving versus non-moving, and the choice of a (new) residence. Box 3 presents a (rather

rough) overview of results, based on data from both movers and non-movers.

Box 3: The relevance of noise within 12 residential attributes

	F	E	D	C	B	A
Costs of the residence	1.	1.	6.	.23	12	3.3
Number of rooms, size	4.	2.	1.	.41	11	3.7
Comfort features, state/repair	2.	4.	3.	.41	9	3.5
Balcony/terrace/garden	7.	3.	/	.40	9	3.1
Type and size of the building	9.	7.	/	.43	6	3.6
Distance to city center	6.	9.	7.	.24	6	4.0
Distance to place of work	5.	5.	4.	.15	8	3.8
Shopping facilities	11.	12.	/	.15	6	3.5
Smell nuisance	11.	10.	/	.31	9	3.7
Noise/quietness	3.	5.	7.	.42	10	3.2
Availability of parks/nature	9.	7.	5.	.33	9	4.0
Aesthetic quality/decayment	8.	11.	2.	.37	5	3.5

Data base: 163 residents (movers and non-movers) [B,C]; 92 movers [D]; 381 dwellings [A]; 207 dwellings (movers only) [E,F].

The relevance of noise for the evaluation of residences

First of all it is interesting to compare the level of satisfaction concerning noise with satisfaction in other dimensions. Therefore 12 attributes were judged on a five-point rating scale. As column "A" in Box 3 shows, the attributes "balcony/terrace/garden" and "quietness/noise" score lowest whereas the quality of the apartment/house and location aspects are evaluated considerably better.

The results of scaling importance weights are given in column "B". Within the considered set of 12 residential attributes, quietness/noise has the third rank of the importance weights (10 out of 100 points). For the evaluation of residences noise seems to be less important than dwelling attributes such as costs and size but more important than the other environmental criteria and also location aspects.

The influence of noise and the other attributes on global residential satisfaction was studied by means of correlation analyses and multiple regressions. Five predictors correlate rather high with the overall evaluation of residences (see column "C"): Building type, noise, size, comfort/state and balcony/garden. Apparently noise is an important facet of subjective housing quality.

The respondents were also asked about their preferences and demands. Concerning acceptable noise exposure of residences, nearly no one is willing to accept "permanent noise disturbance during day and night". 35% would accept "frequent disturbances" but 90% "noise only in peak traffic times". Demands on quietness/noise are stricter than on any other residential attribute. When asked what they hope to get, 2/3 refer to "quiet location, only occasional disturbances" and 1/3 to "noise nuisances only in peak traffic times".

The results reported so far are pretty similar for the samples of movers and non-movers. However, residential satisfaction is not stable in the case of movers. This is particularly true for satisfaction with quietness/noise which is decreasing after some months in the new residence (from 3.8 to 3.3 on the 5-point-scale). This indicates that people underestimate the impact of noise exposure when inspecting dwellings and deciding which to accept.

The relevance of noise for decisions about moving

Considering the generally low satisfaction with the quietness of residential areas (as mentioned above), one could assume that noise is influencing migration behavior. With respect to this question, the mover as well as the non-mover survey yielded interesting data.

Actually about 25% of the surveyed movers list noise disturbance as an important or very important factor in their decision to relocate. However, factors such as apartment size or a change in the household size (both mentioned by every second respondent), occupational reasons, and also requirements about the surroundings of a residence apparently outweigh the importance of noise in motivating moving decisions. (As far as comparable data are available, the respective ranks are given in column

"D" of Box 3). In the actual relocation process behavior is guided more by social influences, e.g. family-related motives, and personal constraints, e.g. job-related motives, than by the noise occurring at a current residence. Interestingly, noise stress gets a higher rank by non-movers as a (potential) reason for a (hypothetical) move than by movers as cause for their actual relocation. Furthermore, the (relative) quietness of one's residential area is a very important argument for the decision to stay in a residence.

Nevertheless, altogether the personal and social factors are by far more influential than the noise aspect. This is in line with evidence from other research on migration decision making (Rohrman 1986).

The relevance of noise for residential choice

To what extent is noise taken into account when movers search for a new home and finally make their decision? One question is which features of a residence get the deliberate attention of people inspecting a dwelling and its surroundings. Nearly all respondents mention costs, size, comfort features, and the availability of a balcony or garden whereas quietness/noise is considered by about 50%, which refers to rank 5 (see column "E" in Box 2) - somewhat less than expected according to the respective (dis)satisfaction with the previous residence.

Due to the longitudinal design of the study, the movers could be asked in several situations which residential attributes most influenced their final decision. The respective results are summarized in column "F". The attribute noise/quietness gets high rank, rated to be nearly as relevant as the features of the dwelling itself (e.g., costs, comfort, state, etc.). Also, again noise is the most important criterion within the environmental variables. A rather similar structure results from discriminant analyses aimed at distinguishing between accepted and not accepted residences.

Finally it should be mentioned that the focus on the environmental attributes is less distinctive in the context of visiting prospective home than before or after that situation. Also, potential movers put higher emphasis on environment-related arguments than actual movers realize in their decision process.

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- environmental quality is more relevant in t6 (lower scores) than in t1 (upper scores);
- attitudes such as environmental concern or local identification have low influence in the evaluation process;
- housing costs are not predictive for residential satisfaction.

Difficulties and constraints of housing decisions

Some further findings on the decision making process shall be summarized briefly (see Rohrman and Borchering, 1988, for details):

- The attention of those inspecting a prospective home is mainly focused on the immediately salient features (such as characteristics of the building and the rooms) whereas environmental and location aspects - which are highly weighted in "principal" considerations - get less interest in this situation.
- Apparently it is difficult to anticipate the consequences and long-term impacts of adverse environmental conditions (particularly those which are not 'prominent' but 'permanent').
- When finally deciding about their future residence, people are often considerably determined by social constraints as mentioned above (e.g., family needs) or external influences (e.g., the availability of an apartment or time pressure).
- In average, the movers visited a dozen houses, spending not more than about 40 minutes for each inspection.
- Due to the manifold (and mostly incomplete) information, the decision problem is experienced as a cognitively complex and difficult task.

Conclusions for research and application

The study has elucidated the significance of noise and other environmental factors for residential judgments and decisions. However, due to the mentioned limitations of the sampling and the variable set of this investigation, presumably the (external) validity of the findings is restricted. In further research the scope should be extended: First of all, larger and more differentiated samples are needed. Relevant issues are regional differences (e.g., urban vs. rural), the role of attitudes and life values within different populations, and the social decision process within

couples/families going to move. Furthermore, additional variables, e.g., assessments/measurements of the physical environment and specific ecological attitudes, should be included. Both would enable a better analysis of the cognitive structure suggested in the theoretical framework (box 1).

Yet the results are instructive not only for theoretical issues, but may also have practical relevance. Prospective users of research findings are, for example, city planners, urban administration, or residence agents. Certainly this applies to the noise issue. Even after thirty years of noise research and noise abatement programs, noise is still an urgent environmental problem, causing difficult decision problems both on the societal and the individual level (Jones and Chapman 1984, Rohrmann 1984).

How about the movers, the actual "problem owners"? Apparently, these decision makers are stressed by their task (as also noted by Weichart, 1988), and they suffer from considerable cognitive overload. Besides various social and economic constraints, the realistic anticipation of future impacts of a housing decision seems to be a crucial difficulty.

If there is a need for "better decisions in moving or choosing house" (McKenzie, 1980), it would be useful to provide movers with judgmental support techniques, e.g., "guideline for assessing and evaluating residences", serving as an aid for people's decision making about their future homes.

Note

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