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## AIR POLLUTION, ANNOYANCE AND COPING

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### INTRODUCTION

This chapter examines an approach to annoyance emphasizing the contextual decision-making processes of individuals when confronted with adverse environmental conditions. More specifically, the present chapter discusses a social psychological framework that could improve our understanding of individual annoyance reactions. After a brief discussion of the relevant theoretical approaches (Leventhal's theory of emotion, Lazarus' work on stress and coping, and Janis and Mann's work on decision-making) we will present the results of a study on public reactions to environmental conditions in a number of industrialized areas in the Netherlands. We will discuss the relationship between annoyance and coping pattern, and differences between people who complain about environmental conditions (via the existing environmental telephone service) and those who do not.

### EMOTION THEORY AND ANNOYANCE

Weinstein (1) put forward the view that annoyance can be identified as a mild form of anger, and noted that anger is the typical reaction to the frustration that occurs when a person is prevented from reaching a desired goal. Interference of one's activities by noise, for example, could lead to a situation in which the more angry a person feels, the more difficult it is to attend to anything other than the noise. This, in turn, further disrupts the activity he or she was engaged in. Although many of the attitudinal correlates of annoyance are predictable if one views annoyance as a mild form of anger (2), one should carefully distinguish these two emotional reactions (anger and annoyance).

Averill (3) mentions a number of differences between episodes of anger and annoyance. As compared with annoyance, anger is a relatively more intense, interpersonal emotion. It is more likely to involve attributions of blame and a desire for 'revenge'. Moreover, anger is typically provoked by an incident regarded as serious and/or personally threatening, and it is accompanied by a strong desire for direct action, this in spite of the fact that this coping response could be inadequate.

In addition to these qualitative differences between annoyance and anger, we have to take into account emotions such as fear, anxiety, or simply aversion, which may be more important under certain circumstances. A more comprehensive approach demands at least a theoretical framework of emotion. Leventhal (4) has

proposed a perceptual-motor theory of emotion which ties emotion to several types of cognition, including sensations, perceptions, images, and ideas. He postulates a hierarchical processing system consisting of at least three levels within the central nervous system.

The lowest level is directly related to the expressive-motor mechanism which may be conceptualized as the basic processor of emotional behavior and experience. Some specific stimulus properties (e.g. loudness) generate a distinctive set of expressive reactions and feelings in the newborn and the developing child. This means that distress or aversion may be the primary emotional reactions to certain auditory or olfactory stimuli.

The intermediate level involves an automatic processing system which can be conceptualized as a record of conditioned emotional reactions. This schematic system combines the subjective feelings and expressive-motor reactions with stimulus inputs and other motor reactions. For example, it is well known that noise of various intensity levels may be closely related to anxiety and fear. This relationship involves both conditioned emotional reactions to certain auditory stimuli and the additive or multiplicative fashion in which these and other components of emotion appear to combine. Experimental data suggest that students who are accidentally exposed to white noise while they are completing an intelligence test, show an increased level of anxiety (5).

The highest, conceptual, level includes a set of abstract propositions or rules about emotional episodes and a set of rules for voluntary responses to emotional situations and emotions. All three processing mechanisms in the central-neural hierarchy and the accompanying bodily machinery are active in emotion-provoking situations. The conceptual system is crucial for developing voluntary control over emotional experience and behavior. Conceptually provoked and controlled emotions can be illustrated with some experimental data reported by Spacapan and Cohen (6). The mere anticipation of task performance under conditions of exposure to loud noise bursts appeared to make students feel nervous, but less so if they got the option of control over the termination of exposure. The mean scores for the students with perceived control over exposure fell between the mean scores obtained in the noise and the quiet conditions.

#### EMOTION, MOTIVATION AND COGNITION

The above findings suggest that subjects use the option of control over termination of exposure as a conceptual rule to achieve some control over their anticipatory anxiety. However, the main effect of this control option seems to be motivational. It is an often neglected fact in these kinds of experiments that subjects have been encouraged by the experimenter to postpone the use of this control option. In response to these demands we may expect them to develop higher

levels of task aspiration; i.e. turning a threat into a challenge (7). As compared to subjects without control, subjects with perceived control appear to be more persistent in task performance after the exposure to noise, and even after the mere anticipation of exposure (6).

The decisional option of control over exposure conditions brings us closer to the emotional blend of Leventhal's three processing levels which may result in feelings of annoyance and anger. Depending on the motivational context this option should make subjects more vulnerable to annoyance in two ways. Firstly, they have to spend more effort in trying to reach their aspired level of performance. This persistence can lead to several psychological and physiological side-effects (8). For instance, subjects who have committed themselves to the task of speaking and listening to each other under noisy circumstances, appear to experience certain negative mood states afterwards (9). Secondly, subjects may find out that their control option does not lead to the outcomes which they had expected. This event resembles the procedure of learned helplessness training. During this procedure subjects are led to believe that they are able to control the exposure to noxious stimuli. Then however, it appears that they are failing, even if they try harder. Presumably they are losing control. Research findings show that subjects tend to perform poorly on subsequent relatively simple tasks and express feelings of anxiety and hostility (10).

The above discussion suggests a number of contextual variables that could be of importance to the study of annoyance. Firstly, with reference to the learned helplessness experiments one could ask to what extent these failures to control are appraised by the subjects as being of personal significance. Similarly, one could ask how the subjects may cope with these apparent uncontrollable situations. By emphasizing these questions, Lazarus and Folkman (11) have drawn attention to the contextualized analysis of the relationship between the person and the environment. Their theory of psychological stress includes cognitive appraisals, commitments, and coping processes. Coping is defined as constantly changing cognitive and behavioral efforts to manage specific external and/or internal demands. Coping may be directed at managing or altering the problem causing distress, and at regulating emotional response to the problem. The way people actually cope depends on their appraisals of available options ("What if anything can be done about it?"), and their resources like knowledge, skills and money (11).

It should be emphasized that this theory of psychological stress is primarily concerned with evaluative processes. These appraisals and reappraisals include contextualized judgments about the acceptability of exposure to certain environmental stimuli like noise and air pollution. Usually, these appraisals will not be of particular concern to the person. This is partly due to the ambient character of these environmental stimuli, i.e. stimuli that can be characterized as

nonurgent, chronic, negatively valued, physically perceptible, and intractable to the efforts of individuals to change them (12). When stimuli become less ambient for the individual, appraisals about the acceptability of exposure become more important. This, in turn, could lead to a decisional conflict for the individual. Janis and Mann's analysis of decisional conflicts seems of particular relevance to the present discussion.

#### MOTIVATION AND DECISION-MAKING

According to Janis and Mann's (13) analysis of decision-making processes, individual coping patterns are determined by the presence or absence of three conditions: (1) appraisal of potential losses for whichever alternative is chosen; (2) hope of finding a better alternative; and (3) belief that there is adequate time to search and deliberate before a decision is required.

As environmental conditions vary, citizens may first of all complacently decide to continue whatever they have been doing, neglecting the potential losses and/or ignoring recommendations to take protective action (unconflicted adherence). If the consequences of continuation are expected to be unfavorable, they may, secondly, adopt whichever new course of action is salient and acceptable (unconflicted change). However, if they are dissatisfied with the options open to them, they have to search for a better solution. Thirdly, when there is insufficient hope of finding a better alternative, people may pessimistically give up searching (defensive avoidance). Fourthly, if there is hope but also time pressure, people may impulsively seize upon a hastily contrived solution (hypervigilance). Only the fifth pattern, vigilance, generally leads to careful search and appraisal of alternatives before a choice is made. These conditions of conflict and hope are also essential for maintaining a vigilant problem-solving approach to environmental issues.

An important contribution of this intrapersonal conflict model is that it stresses the changing relationships between emotions, information search, and the decisional balancing of costs and benefits. Defensive avoidance and vigilance seem particularly relevant to the study of public annoyance reactions. The defensive avoidance pattern can take a number of related forms. Citizens may turn their attention away from the problem to other, less distressing matters by procrastinating, shifting responsibility to someone else (neighbors, experts, authorities) or constructing wishful rationalizations that bolster the least objectionable alternative, minimizing unfavorable consequences or even denying aversive feelings.

When vigilance becomes the dominant pattern, people are usually motivated to learn more about the adverse environmental condition, provided that they retain the hope of being able to cope with it adequately. For example, many citizens who

are confronted with the uncertain consequences of soil contamination in their residential area, display an active search for information with careful evaluation for relevance and trustworthiness. De Boer (14) found that most of their concerns center around fear of chemical exposure, distrust of authorities, and impacts on property values. Citizens' complaints and community actions were related to lack of confidence about the alternatives being considered by the authorities, combined with at least some confidence about finding a more satisfactory alternative. This has often led to a conflict between the decision problem faced by citizens looking after their best interests and that faced by the hazard managers looking after society's best interests (15). Many citizens opted for confrontive action.

Anger with the authorities was nearly as common as fear of the chemicals. In addition, it should be noted that fluctuations from one coping pattern to another are to be expected in any decision maker. Defensive avoidance and hypervigilance were also displayed by citizens in these neighborhoods.

With reference to noise and air pollution these coping patterns may be less articulated. However, some indications of defensive avoidance are mentioned in the literature on air pollution and human behavior. Evans, Jacobs and Frager (16) found that people who were committed to long term living in a smoggy area assessed smog as less of a problem than new migrants. These new migrants were more likely to seek out information about smog, a finding that corresponds to a vigilant coping pattern. Weinstein (17) demonstrated that much of the variability in noise annoyance is due to variations among individuals in the tendency to express critical judgments about their environment. Although his discussion did not include vigilance, it could be argued that these critical tendencies reflect individual differences in the readiness of citizens to respond with vigilance to environmental issues.

This brief discussion of theoretical approaches may be concluded with some remarks about the need to integrate. We have mentioned different levels of emotional processing that can be related to different kinds of environmental stimuli. The basic expressive-motor level is most relevant for auditory and olfactory stimuli. Conditioned emotional reactions and conceptual processes are also relevant for these stimuli, but involve other environmental issues as well. Theoretical approaches to cognitive appraisals, commitments and decision-processes can contribute to our understanding of public reactions to noise, air pollution, contaminated soil, and hazardous waste facilities. This integration could have both theoretical (developing explanatory frameworks) and practical (policy recommendations) benefits. Examples of the latter are the significance of citizen participation, and communication processes in finding a solution to environmental problems. The authorities could improve their handling of these problems by pro-

viding citizens with relevant information and by acknowledging their responsibility for citizen participation. In the next section we will pay some attention to one specific channel of communication between the authorities and the public, namely an environmental telephone service. We will present a brief overview of the results of a recent study on public reactions to air pollution, conducted in three industrialized areas in the Netherlands.

#### SOME EMPIRICAL FINDINGS

The study of which some preliminary results will be described below focussed on the use of environmental telephone services set up by local and regional authorities in the Netherlands. These services accept messages and complaints, give information, and pass on complaints to the authorities that monitor pollution levels, and are responsible for corrective actions. Generally, only a small proportion of the exposed population makes use of these services.

In order to find out the differences between users and non-users we have set up a survey among two samples of individuals. Firstly, in three industrialized, relatively polluted areas, individuals were contacted who were known to have phoned the service in the year 1985. Secondly, we selected a matched sample consisting of individuals who lived close (a few houses down the road) to the people who used the service. Matching refers to both spatial position and household position of the individual who phoned the service. Response rates varied between 78% and 89%. A total of 587 people (36% were male) participated in the study. The samples were fairly representative in terms of SES-variables, with a slight under-representation of the lowest socio-economic level as compared to the total population.

Table I presents an overview of the extent to which the target sample of respondents who complained about environmental conditions and the matched sample of respondents who did not complain, smelled odors from industrial activities near their neighborhood. Results clearly indicate that the target sample more frequently smelled industrial odors (62% indicates that they often notice smells, as compared to 26% of the matched sample).

Table II summarizes the findings concerning the extent to which the two samples were annoyed by industrial odors. Not surprisingly, a total of 64% of the target sample indicates that they find these smells very annoying as compared to only 26% of the matched sample. It should be noted that the 26% for the matched sample gives some indication of the severity of the odor annoyance in the areas where our study took place. Hangartner and Wanner (elsewhere in this volume) refer to the situation in Switzerland where conditions in which more than 20-25% of the affected people report a high level of annoyance, are regarded unacceptable.



TABLE I  
FREQUENCY OF SMELLING ODORS FROM INDUSTRIAL SOURCES

Reported frequency	Target sample* (N = 299)	Matched sample (N = 288)
Never	1%	14%
Rarely	2%	17%
Sometimes	27%	40%
Often	62%	26%
Always	7%	3%
	(99%)	(100%)

\* Target sample refers to respondents who have used the environmental telephone service in 1985. The first column does not add up to 100 due to rounding.

TABLE II  
ANNOYANCE CAUSED BY ODORS FROM INDUSTRIAL SOURCES

Degree of annoyance	Target sample (N = 299)	Matched sample (N = 288)
Not applicable*	2%	15%
Not annoying	-	8%
A little annoying	4%	22%
Annoying	30%	30%
Very annoying	64%	26%
	(100%)	(101%)

\* This category consists of respondents who reported not to have smelled industrial odors or returned incomplete questionnaires.

After this brief overview of the context of the present study and the extent to which local people notice the industrial odors and report annoyance, we would like to turn to a more detailed comparison of the two samples. First we compared the two samples in terms of coping patterns. In order to control for the degree of reported annoyance, each of the two target groups was split up in two sub-groups, i.e., respondents who indicated to be very annoyed and those who were not. Table III summarizes these findings. Respondents were asked how they normal-

TABLE III  
 REPORTED WAYS OF COPING WITH INCIDENTS OF AIR POLLUTION

Coping options	Target sample		Matched sample	
	Very annoyed (N=190)	Not very annoyed (N=109)	Very annoyed (N=75)	Not very annoyed (N=213)
Distraction/minimization				
- ignore, continue activity	28%	41%	52%	58%
- try not to think about it	27%	24%	43%	44%
- just accept it	18%	24%	29%	39%
- presume it is harmless	26%	35%	36%	39%
- try to find ways to minimize annoyance	73%	67%	77%	67%
Vigilance/confrontive coping				
- feel slightly anxious	71%	64%	59%	46%
- wish to know what is going on	83%	85%	83%	61%
- discuss with others	78%	80%	80%	62%
- demanding immediate action	85%	83%	76%	58%
- getting angry	63%	44%	39%	28%

Note: Percentage of respondents indicating that the item applied to themselves. The above order of presentation of items is different from the order in the questionnaire.

ly react to incidents of air pollution by indicating whether each of ten coping options applied to them or not. These ten items were grouped together in two general coping patterns: distraction/minimization and vigilance/confrontive coping. Results indicate that (irrespective the degree of experienced annoyance) the target sample shows less prevalence of distraction/minimization strategies and a higher proportion of people who report more vigilant and confrontive ways of coping.

Similarly, people who indicated to be very annoyed show more vigilant and confrontive reactions than those who are less annoyed. The most striking differences between these groups of respondents concern the level of anxiety and anger. Furthermore, the highly annoyed subsamples and those who complained via the environmental telephone service were more likely to demand immediate action than those who were less annoyed.

In order to further investigate the differences between the target sample (i.e. people who phoned), and the matched control sample we conducted a discriminant analysis (with Wilks' lambda used as a stepwise criterion). The results of this analysis revealed that two aspects most distinguished the two samples i.e. the degree of anger about the situation and the extent to which one demanded to know what was going on. Further inspection of our data revealed that vigilant and confrontive coping styles were positively related to perceived responsibility of citizens and fear for industrial calamities. Finally, this coping style showed a negative correlation with confidence in the relevant authorities.

We also investigated actual and ideal coping patterns. All respondents were not only asked to indicate of each item whether it applied to them or not, but also select the items that in their opinion represented a good way of coping with incidents of air pollution. The analysis revealed a considerable discrepancy between actual and ideal coping style for the matched sample. Respondents practised minimization and distraction but only a small minority evaluated this strategy positively. The target sample used this strategy less frequently, but also indicated a negative evaluation of minimization and distraction. Both samples regarded anxiety and anger as less appropriate reactions (i.e. actual prevalence was significantly higher than ideal prevalence). The best match between actual and ideal coping patterns was obtained for the item 'wishing to know what's going on', but only for the target sample (85% ideal, 84% actual). All in all there seems consensus about how one should react to environmental annoyance, both samples stressed the importance of the provision of information and demands for immediate action.

#### CONCLUSIONS

The present study indicates that people who make use of the environmental telephone service are more affected by incidents of air pollution than those who don't phone, and consequently express the wish that something should be done about the situation. It needs to be noted, however, that there is also a considerable similarity between the coping patterns of the two samples (people who complain via the telephone vs. those who do not). An important finding concerns the need for information. In both samples a considerable majority expresses a wish for information when confronted with incidents of air pollution. The present findings also suggest discrepancies between actual and preferred coping behavior. Our data indicate that a substantial proportion of respondents is dissatisfied with their more defensive ways of coping and reactions such as anxiety and anger.

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## Discussion

Evans: Do you have data on the residential history of the two samples of exposure to air pollution? And are there any data on the health consequences of the different coping patterns?

De Boer: We know how long people are living in the areas of our study, but we do not know whether they have moved from an area with higher or lower pollution levels. Length of residence was not related to the coping patterns. There are no data on health consequences of the different coping patterns.

Miedema: Isn't there a circularity in your study? You selected one group because they did something when they were exposed to pollution: they made a phone call, and the other group did nothing. And you found that the first group said that they preferred to do something, and the second to do nothing.

De Boer: Our study focussed on differences between users and non-users of the telephone service that may improve our understanding of this channel of communication between the public and the authorities. It should be emphasized that complaining is just one way of coping with air pollution. Both users and non-users were dissatisfied with minimization and distraction as reactions to air pollution.