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NOISE AND INATTENTIVENESS TO SOCIAL CUES

SHELDON COHEN is Assistant Professor of Psychology at the University of Oregon. He is interested in the role of cognitive processes in the man-environment interface. His research focuses on the effect of environmental stress on physical and mental health and social adjustment.

ANNE LEZAK is a recent graduate of the Honors Program in Psychology at the University of Oregon, and is now working in an adolescent residential treatment center.

Before 1970, psychologists studying noise were primarily concerned with its effects on human efficiency (cf. Broadbent, 1971; Kryter, 1970). More recently, however, public concern over noise pollution has influenced the direction of noise research. Studies reported during the last few years suggest that noise has deleterious effects on a wide range of behaviors, including child development (Wachs, Uzgiris and Hunt, 1971), interpersonal helping (Mathews and Canon, 1975), and verbal abilities (Cohen, Glass and Singer, 1973; Bronzaft and McCarthy, 1975). This new data indicates that environmental noise affects inter- as well as intrapersonal processes.

AUTHORS' NOTE: The research reported in this paper was supported by a grant from the National Science Foundation (SOC 75-09224). This paper was presented at the Annual Meeting of the American Psychological Association in Washington, D.C., 1976. The authors are indebted to Linda Nathan for serving as experimenter; to Mike Kemp, Al Murphy and Paul Farrar, for technical assistance; to Lyn Judge for helping with statistical analyses; and to Myron Rothbart, Gary Evans, Doug Hintzman and Drury Sherrod for comments on an earlier draft. Requests for reprints should be sent to Sheldon Cohen, Department of Psychology, University of Oregon, Eugene, Oregon 97403.

ENVIRONMENT AND BEHAVIOR, Vol. 9, No. 4, December 1977
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In their attempt to understand the relationship between noise and social behavior, many investigators are using concepts and theories developed to explain the effects of noise on human performance. A concept that seems to be particularly promising in this respect is the well documented reallocation of attention that occurs under stressors such as noise. A wide range of human performance studies report that environmental stressors including noise (e.g., O'Malley and Poplawsky, 1971; Hockey, 1970; Finkleman and Glass, 1970), crowding (Saegert, Mackintosh and West, 1975; Evans, 1975), and task overload (Youngling, 1967; Kanarick and Petersen, 1969) often result in a focusing of attention on aspects of the environment most relevant to task performance (e.g., cues with higher payoff value or higher probability of occurrence) at the cost of less relevant cues.¹ This effect is most often attributed to Easterbrook's (1959) hypothesis that emotional arousal acts to reduce the range of cues an organism uses. Alternatively in a recent paper, Cohen (forthcoming) suggests that attentional focusing is a usual adaptive response to information overload which occurs under conditions of environmental stress. He argues that (1) environmental stressors place an extra demand on attention since the organism is required to monitor a stressor, (2) this extra demand often results in attentional overload, and (3) the usual response to overload is focusing available attention on the cues most relevant to the task at hand. Irrespective of the mechanism, the data cited above support the suggestion that attentional focusing on task relevant cues occurs under noise and other stressors.

The stimuli under consideration in the above mentioned studies have been exclusively nonsocial. Are social cues that are not relevant to an ongoing task similarly ignored under noise and other stressors? A recent analysis of the effects of environmental stress on social behavior suggests that they are. Cohen (forthcoming) argues that the term task relevant may be interpreted as meaning relevant to fulfilling one's own needs and wants (cf. Milgram, 1970). Thus

under stress, one focuses attention on environmental inputs relevant to one's own goals, neglecting other cues, social and nonsocial alike.

Social consequences of attentional focusing under stress include oversimplification and distortion in the perception and evaluation of communications and persons. Thus complex communications may be misunderstood because of the neglect of subtle verbal and/or nonverbal cues. Also individuals (or groups) may be categorized or "stereotyped" since this involves less attention than the evaluation of a wider range of relevant information.

Other social cues that are often neglected when attention is restricted include those which carry information concerning the moods and subtly expressed needs of others. The neglect of such cues results in a lowered probability of helping another, expressing sympathy for another, or reacting appropriately to another's needs. Recent studies, in fact, report that environmental stressors including environmental overload (Korte, Ypma and Toppen, 1975; Sherrrod and Downs, 1974), crowding (Bickman, Teger, Gabriele, McLaughlin, Berger and Sunaday, 1973) and noise (Mathews and Canon, 1975) decrease the probability of interpersonal helping. These experiments support the argument that a person is less likely to offer simple assistance under environmental stress than under ambient conditions. However, none of these studies definitively establish that this decreased sensitivity to the needs of others is due to an attentional deficit. One strong alternative, for example, would attribute these decreases in helping to a negative affective state induced by the stressor (cf. Moore, Underwood, and Rosenhan, 1973; Aderman, 1972).

Another problem in interpreting decreases in helping and other social insensitivities under stress in terms of an attentional deficit is the general lack of independent evidence that social cues are ignored under environmental stress. It is likely that people are more interesting and/or more response-demanding than nonsocial objects. For example, certain social situations may induce sympathy, empathy, or

ity, responses unlikely to be elicited by nonsocial stimuli. Thus social cues may not be attenuated in the same way as nonsocial cues. The purpose of the present study is to test whether focusing of attention on task-relevant cues at the cost of task-irrelevant cues occurs when the ignored cues are social in nature. To give an overview, subjects perform a free recall task in which they are instructed to recall six nonsense syllables presented serially under either noise or quiet. In all conditions slides of social situations are presented just to the right of the nonsense syllables. After stimulus presentation half of the subjects are given the expected recall test for nonsense syllables. The remaining subjects are instead given a recognition memory test for the task-irrelevant social situations. In line with previous research with stimuli of a nonsocial nature, it is expected that nonsense syllables (task-relevant cues) will be remembered equally well under noise and quiet, and social-situation slides (task-irrelevant cues) will be remembered less well under noise than quiet.

To test whether the nature of a task-irrelevant social cue affects whether or not it is processed under conditions of environmental stress, social-situation slides were designed to represent two emotional levels of social behavior, distress and calm. As social cues represent a situation which might elicit a response from a subject, distressing social cues may be more compelling than calm ones. Thus they may be attended to and recalled to a greater extent than calm cues in the quiet condition. No such cue distinction should occur in the noise condition if task-irrelevant cues are not processed at all and therefore not evaluated as calm or distressing.

METHODS

DESIGN

A two-factor, noise (noise, no noise) by social-cue type (calm, distress) design was employed with social-cue type *a* within subject factor and noise *a* between subject factor.

SUBJECTS

Subjects were 47 females and 31 males. Eight were students in an undergraduate psychology course who received credit for their participation in the experiment. Seventy were recruited through an advertisement in the local newspaper and were paid \$1.50 for participating. All subjects were between the ages of 18 and 30.

STIMULUS SLIDES

The task-relevant cues were three-letter nonsense syllables—CVC trigrams with meaningfulness values of 52-67 as determined by Kreuger (1934) clearly printed in black and each centered on a projected slide.

The task-irrelevant social cues were six pairs of color slides depicting a persons or persons engaged in activity. The two slides in pair were nearly identical in composition. One slide of each pair portrayed a person or persons in a distressing situation, and the other depicted the same persons in a calm situation (see Table 1).

NOISE

The noise (same as Glass and Singer, 1972) was a recorded combination of: (a) two people speaking Spanish, (b) one person speaking Armenian, (c) a mimeograph machine, (d) a desk calculator, and (e) a typewriter. These various sounds are superimposed over one another and are not distinguishable. The noise tape was played through the two speakers located at diagonal corners of the room at 95 db (A) \pm 5. The noise was administered on a random intermittent schedule in which both the intervals between bursts (ranging from one to three seconds) and the bursts themselves (ranging from one to eight seconds) were random. The noise began with the presentation of the first experimental slide. All subjects in the noise condition were presented with identical noise schedules.

TABLE 1
Social Cue Slide Pairs

CALM	DISTRESS
MAN RIDING A BICYCLE.	MAN FALLING OFF A BICYCLE.
WOMAN WITH A BAG OF GROCERIES.	WOMAN DROPPING A BAG OF GROCERIES.
TWO MEN SHAKING HANDS	ONE MAN THREATENING ANOTHER WITH
IN FRONT OF A HOUSE.	A KNIFE IN FRONT OF A HOUSE.
WOMAN WALKING IN FRONT	WOMAN ABOUT TO BE HIT BY A CAR.
OF A CAR.	
WOMAN STANDING IN FRONT	WOMAN IN FRONT OF A BUILDING
OF A BUILDING.	HAVING JUST DROPPED PAPERS.
MAN PAYING GAS STATION	MAN HOLDING UP A GAS STATION
ATTENDANT FOR A CAN	ATTENDANT WITH A KNIFE.
OF OIL.	

PROCEDURE

Upon entering the experimental room, subjects were seated in a chair in front of a table on which rested two slide projectors. At the outset of the experiment, subjects were told that the purpose was to test the effects of distraction on memory. The experimenter explained to subjects that they would be given a number of trials, with each trial consisting of a series of six nonsense syllables presented one after another. Following the presentation they were to write down all the nonsense syllables they could remember.

All subjects were told that on given trial they might or might not be presented with pictures to the right of the nonsense syllables. Subjects in the noise condition were further informed that the might or might not be presented with loud noises from the two speakers in the room. The in-

structions emphasized that, irrespective of whether they were presented with pictures, noise, or both, the subject's task was to remember the nonsense syllables in the order of their presentation.

Following the reading of instructions, subjects were given a practice trial in which they were presented with a ready signal for ten seconds, then six nonsense syllables for 3.3 seconds each with a one-second interval between slides. Following presentation of the slides, they were given a card on which to write the nonsense syllables that they were able to recall.

After the practice trial, the experimental trial was begun. Subjects were again presented with a ready signal followed by six nonsense syllables each presented simultaneously with a social-cue slide for all subjects and random intermittent noise for the subjects in the noise condition.

Each subject was shown one of two sets of the social-cue slides, tray 1 or tray 2. Each tray included three distressing and three calm slides and contained one slide of each pair so that no situation was repeated. This procedure insured that subjects' reactions were not specific to a particular set of slides. The order of presentation of the slides was randomized for each subject.

Following the experimental trial, 46 subjects, 23 in the noise and 23 in the quiet condition, were given the expected recall test for the nonsense syllables. The remaining 32 subjects, 16 in the noise and 16 in the quiet condition, were instead given a sheet containing six four-alternative multiple-choice descriptions. For each of the six, one of the four alternatives accurately described a social-cue slide scene in terms general enough to apply to both the calm and the distressing situation of a pair. Upon giving the subject the sheet, the experimenter explained that, although the subject had been instructed that his/her task was to memorize the nonsense syllables, the experimenter was really interested in how many of the distraction (social cue) slides he or she remembered. The subject was asked to read through the multiple choice items, and for each one of

the six to pick the one which most accurately described the pictures he/she had been shown. Subjects were asked to guess at the correct choice even if they did not remember seeing the picture.

Finally, a manipulation check was performed to determine whether people in distress slides were seen as distressed and those in calm slides as calm. Subjects viewed the six social situation slides which had been presented during the experimental trial and rated each on five seven-point scales. The scales included ratings of the stimulus person(s) on extent to which they appeared upset, extent of negative emotion displayed, extent of positive emotion displayed, and ratings of the entire situation on the extent to which the mood was disturbing, upsetting, and calm.

RESULTS

MANIPULATION CHECK

T-tests were done to compare the mean rating of the distressed and calm versions of each social-cue slide. For all slides the individuals in the distressed version were perceived as more upset and displaying more negative emotion and the total situation was perceived as more upsetting and less calm. For four out of the six slides individuals in the distressed version were seen as displaying significantly less positive emotion than those in the calm version.²

MEMORY FOR NONSENSE SYLLABLES

A two-way (noise x tray number) factorial analysis of variance was performed on the number of nonsense syllables recalled correctly (all three letters of the syllable correct). As apparent from Table 2, neither noise nor tray number affected recall of nonsense syllables. An identical analysis examined recall when either two or three of the

TABLE 2
Mean Number of Nonsense Syllables Recalled^a

	THREE LETTERS CORRECT			TWO OR THREE LETTERS CORRECT	
	TRAY 1	TRAY 2	TRAY 1	TRAY 1	TRAY 2
	QUIET	2.23	2.27	3.77	3.45
NOISE	2.27	2.45	3.45	3.45	3.45

a. A possible score of six.

letters in a nonsense syllable were recalled correctly. While memory scores were higher using this method, there were still no differences between experimental conditions.

MEMORY FOR SOCIAL-CUE SLIDES

A three-way repeated measures analysis of variance was performed, with social cue type as a within factor and noise and tray number as between factors. As is apparent from Table 3, cue recognition was higher in the quiet than in the noise condition ($F = 7.88, p < .01$). In fact, memory scores in the noise condition were at chance levels, indicating that under noise, subjects were unable to remember any of the task-irrelevant social cues. There was no difference between recognition of distress versus calm slides, no difference between Tray 1 and Tray 2, nor any significant interactions.

TASK-RELEVANT CUES VERSUS TASK-IRRELEVANT CUES

Memory scores for both task-relevant (nonsense syllables) and task-irrelevant cues (social-cue slides) were

TABLE 3
Mean Number of Social Cue Slides Remembered^a

	CALM	DISTRESS
QUIET	2.13	2.06
NOISE	1.38	1.44

a. A possible score of six.

transformed into standard scores in order to make them comparable. To determine whether subjects reacted differentially to task-relevant and task-irrelevant cues, memory for the two types of cues was compared under noise and under quiet by means of a two-way (noise x cue relevance) factorial analysis of variance. As expected, the analysis indicated an interaction between noise and cue relevance ($F = 4.06, p < .05$). While subjects remember task-relevant cues equally well under noise and quiet, task-irrelevant cues were remembered less well under noise than quiet. Neither of the main effects was significant.

DISCUSSION

The results of this study support the notion that noise exposure results in a focusing of attention on aspects of the environment most relevant to task performance at the cost of less relevant and irrelevant cues. Moreover, they suggest that social cues, regardless of whether they depicted calm or distressed persons, are ignored in the same way as non-social cues.

Memory for task-irrelevant cues in this study may have been impaired in either of two ways. First, subjects in the noise condition may have never perceived the social-cue slides. That is, their attention was focused on the nonsense syllables and therefore they did not attend to the task-irrelevant cues. Inferential data for this interpretation is provided by unsolicited responses of many of the subjects in the noise condition. When the experimenter requested that they try to remember the social slides rather than the nonsense syllables, several exclaimed "what social slides?" as if they were not presented at all.

A second interpretation would suggest that the noise in some way impaired the subjects' ability to maintain the content of the slides in short-term memory. Posner and Rossman (1965) argue that attention is required for rehearsal of items in short-term memory. Since memory for the nonsense syllables was not impaired by noise, this interpretation would need to assume that under noise, available attention was allocated to the rehearsal of nonsense syllables (task-relevant cues) at the cost of the social cue slides (task-irrelevant cues). Thus this analysis also assumes a reallocation of attention under noise.

In a study on noise and helping, Mathews and Canon (1975) found that the presence or absence of a cue suggesting the legitimacy and degree of need for assistance affected helping—aiding a confederate who drops a pile of books—under ambient noise conditions but not under high-intensity noise. Subjects were more likely to assist a confederate with an arm cast under quiet conditions but did not discriminate between a confederate with or without a cast under noise. No such interaction was found in the present study. Subjects did not remember distress cues better than calm cues in either the quiet or noise conditions. It is likely that this difference in results under ambient conditions is attributable to differences in the level of behavior being studied. The present evidence suggests that the nature of the social cue does not affect the likelihood of its being processed—i.e., recognized and remembered. On the

other hand, the Mathews and Canon study suggests that the cue's content can affect the likelihood of its eliciting a response. It is probable that the decision to respond occurs after the cue has been processed; thus under ambient noise conditions, favored helping for a person with a legitimate need is mediated by the decisional rather than the perceptual process.

It is suggested earlier that attentional focusing under stress has been explained by both Easterbrook's (1959) hypothesis that emotional arousal reduces the number of cues utilized, and Cohen's (forthcoming) suggestion that it is an adaptation to information overload. Unfortunately, the present study does not provide any evidence that would allow us to distinguish between these two theoretical perspectives. This distinction is a very difficult one to make under any condition since arousal has been viewed as both a cause and effect of overload (cf. Kahneman, 1973).

While the present study suggests that short-term noise exposure results in a restriction of attention, the implications of these findings for persons suffering prolonged exposure are less clear. Detrimental effects of long-term noise exposure on health and well-being are well established. Everyday eight-hour exposure at sound levels usually employed in laboratory studies (90 decibels or more) can result in hearing damage (Kryter, 1970) and other mental and physical impairments (Cohen, Glass and Phillips, forthcoming). On the other hand, people can adapt and function apparently unimpaired under slightly lower noise levels. It is unclear at this time, however, whether reallocations of attention occur during these prolonged exposures and/or whether other long-term effects of noise stress modify the use of attention.

The results of the present study suggest that the reallocation of attention under stress has serious implications for interpersonal perception. Further research is needed to investigate the effects of environmental stressors on social behaviors whose adequacy depends on sensitivity to the moods and subtly expressed needs of others.

NOTES

1. The literature concerning the focusing of attention under stress has long been plagued by a design confound causing some confusion in interpreting results. Task-relevant cues often fall into the center of the subject's visual field with task-irrelevant cues lying on the periphery. Thus it is often unclear whether attentional focusing is based on spatial criteria or cue relevance criteria. However, studies in which cue value and spatial position are manipulated independently (Kanarick and Petersen, 1969; Hockey, 1973) provide concrete evidence that attentional focusing is based on relevance rather than spatial criteria.
2. For all of the significant T-tests, $p < .05$ level (all but one at $p < .01$). Both nonsignificant comparisons were in the predicted direction with one of the two reaching the $p < .10$ level.

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RESIDENTS' ASSESSMENT OF A NEW ZEALAND PUBLIC-HOUSING SCHEME

PATRICK MULLINS is a Lecturer in Sociology at the University of Queensland, Australia. He is currently completing a Ph.D. in Sociology at the University of Queensland on the social consequences of a freeway.

J. H. ROBB is Professor of Sociology at the Victoria University of Wellington, New Zealand. His current research interest is in medical sociology.

As planned residential environments, public housing schemes are appearing to be failures. Social science research is providing increasing support for the popularistic notion of public housing as both physically inadequate and instrumental in precipitating social and psychological problems. Whether all projects can thus be categorized is questionable, however, and the aim of this paper is to throw some doubts on these assumptions as they apply to public housing in all western countries. The findings discussed in this article, from a study of life in Porirua, one of New Zealand's largest public housing projects, showed residents responding in a largely positive manner to the physical environment of dwelling and residential area and to the social character of the community. These conclusions are particularly at variance with findings from studies of public housing in the United States which have shown residential dissatisfaction centering in the social and physical environments.

AUTHORS' NOTE: Thanks are expressed to the N.Z. State of Advances Corporation and the N.Z. Ministry of Works for providing photographs, plans, and information on state housing in Porirua.

ENVIRONMENT AND BEHAVIOR, Vol. 9 No. 4, December 1977
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