JOURNAL OF EXPERIMENTAL SOCIAL PSYCHOLOGY 15, 295–303 (1979)

Crowding, Contagion, and Laughter

JONATHAN L. FREEDMAN AND DEBORAH PERLICK

Columbia University

Received: April 11, 1978

The phenomenon of contagion is analysed in terms of the intensification explanation of the effect of crowding (high density) on humans. According to the analysis, high density should be expected to increase contagion of a model's behavior. Groups of three subjects and a confederate listen to humorous tapes under low or high density conditions. In half of the groups the confederate smiles and laughs a good deal during the tapes; in the other half, she does not laugh and smiles only a few times. The subjects are filmed and their reactions to the tapes are rated. As predicted, high density combined with a laughing model results in more laughter by the subjects, while the other three conditions do not differ appreciably. The lack of effect of high density when the model does not laugh is seen as supporting the intensification explanation of crowding as opposed to an arousal explanation.

One of the classic phenomena of social psychology is contagion, the spreading through a group of the behavior or mood of one person (Le Bon, 1895). Various explanations have been offered for why this occurs, including deindividuation (Diener, 1976; Festinger, Pepitone, & Newcomb, 1952; Singer, Brush, & Lublin, 1965; Zimbardo, 1969), increased imitation due to restraint reduction (Redl, 1949; Wheeler, 1966), social facilitation (Zajonc, 1965); and normative pressure or conformity (Turner, 1964). Although the evidence for any of these explanations is rather sparse, it seems likely that all of them play some role in contagion.

The research on the effects of crowding on people suggests another factor that might affect the likelihood of contagion occurring. One explanation of the effect of physical density is that it operates by affecting the salience of the other people who are present. As the density of people in a given space increases, a greater proportion of each individual's visual and other sensory fields is taken up by these people. As a result, the actions or

This research was supported in part by a grant from the National Science Foundation. Requests for reprints should be sent to Jonathan L. Freedman, Department of Psychology, Columbia University, New York, N.Y. 10027.

0022-1031/79/030295-09$2.00/0

characteristics of any one of these people are more likely to be noticed and thus to affect the individual's behavior. More simply, people become more salient stimuli in the environment as density increases, and so the individual's responses to them are magnified. This so-called intensification idea has been discussed at considerable length elsewhere (Freedman, 1975). It is consistent with most of the available data on the effects of density, and has received some direct support in several experiments. While it probably does not constitute a full explanation of all effects of density, it does appear to be an accurate description of one process by which increases in density affect people.

If increasing density intensifies responses to the other people, it seems plausible that it will increase the likelihood of contagion. The simplest reason for this is that higher density should make the initial act more salient and therefore more likely to be noticed, a crucial factor since obviously contagion cannot occur unless the action is observed. Thus, merely by making the member of the group more aware of and concerned about the actions of the other members, higher density should increase contagion.

In addition, higher density should magnify all or most of the mechanisms previously suggested as underlying contagion. Since high density is supposed to intensify all responses to the other people, it should intensify the set of responses that produces a sense of deindividuation. It should magnify the releaser effect of the initial act, and thus increase imitation. It should intensify feelings of concern about being evaluated, and if this is the basis of the social facilitation effect, increase that. And it should increase social pressures that lead to conformity. In other words, to the extent that any of these mechanisms are involved in producing contagion, high density, by magnifying their effect should increase contagion.

This analysis highlights an important theoretical issue in the crowding literature: the distinction between intensification theory and the notion that high density produces stress or arousal. According to the former, high density intensifies only responses to the other people. There is no expectation that high density directly affects responses to other aspects of the situation such as the environment in general. In contrast, if high density is arousing, it should increase the magnitude of all responses, including those to external stimuli. The research shows that extremely high densities sometimes do produce physiological arousal (Aiello, Epstein, & Karlin, 1975), but this seems to be the exception rather than the rule. Work on task performance usually indicates none of the effects that would be expected if high density were arousing (Freedman, Klevansky, & Ehrlich, 1971; etc.) though one study did show such an effect for males and not for females (Paulus, Annis, Seta, Schkade, & Matthews, 1976). It seems fair to say that the data available at the moment indicate that high

density per se can sometimes be arousing, but usually is not. However, there is not yet sufficient evidence to draw a definitive conclusion.

The present study offers a situation in which the two formulations make quite different predictions. In terms of intensification, high density should increase contagion of a model's behavior, but should not increase the magnitude of response to an external stimulus; according to the arousal viewpoint, high density should increase contagion, and should also increase response to an external stimulus. Thus the difference between the high and low density conditions without a model provides a test of the two theories.

The behavior chosen for the present study is well known to be affected by the presence of other people: laughter. Canned laughter (i.e., recorded laughter) increases overt humor responses (Chapman, 1973a; Cupchik & Leventhal, 1974; Leventhal & Cupchik, 1975; Leventhal & Mace, 1970; Nosanchuk & Lightstone, 1974) as does the presence of others (Chapman, 1973b; Young & Frye, 1966). In addition, Morrison (1940) found that larger audiences (and, since they were in the same theater, higher densities) produced more laughter. In contrast, Prerost (1975) reported that higher density resulted in lower written evaluations of humor. This is, of course, not a behavioral measure and seems to contradict the other studies. With this possible exception, it seems as if the presence of others generally facilitates laughter.

In the present study, a different prediction is being tested. Based on the analysis in terms of intensification, we expect that when a laughing model is provided, high density will increase contagion of laughter; whereas without a model who laughs, high density alone will have no effect on the amount of laughter. That is, the increase in density should not affect the response to the external stimulus (the humorous material) but will only affect responses to the other people in the situation.

METHOD

Overview

Groups of subjects listened to humorous tapes in either a small (high density) or a large room (low density). In half of the groups, a confederate posing as a subject smiled and laughed quite a bit; while in the other half of the groups, the confederate was relatively subdued, smiling only three times. The behavioral responses of the subjects were recorded on film, and the subjects also answered a series of questions regarding their responses to the tapes and to the experiment as a whole.

Subjects

The subjects were 96 female graduate and undergraduate students between the ages of 17 and 29 at Columbia University in New York City. They were recruited from a pool of students who had previously indicated an interest in participating in experiments for pay. The subjects were randomly assigned to the four conditions and were paid $3.00 for about 45

min of participation. There were eight groups of three subjects in each of the four conditions, for a total of 32 groups.

Procedure

When four subjects, including the confederate, had arrived, they were shown into the experimental room. In the low density condition, the room was 12 feet by 15 feet, and had moveable partitions leaning against three walls. In the high density condition, the room was 7 feet by 7 feet, which was accomplished by appropriate arrangement of the partitions. In both conditions, one wall contained a one-way mirror which was not obstructed. Chairs with padded backs and seats were placed in a circular pattern with three of them facing the mirror. In the high density condition, the distance between adjacent seats was approximately 1 foot (measuring from the front corner of one to the closest front corner of the other) and between opposite seats was about 3 feet. In the low density condition the equivalent distances were 5 feet and 7 feet. (The figures are approximate because subjects would typically move their chairs slightly). In the low density condition, the arrangement of the chairs was more elliptical due to the shape of the room and constraints imposed by the placement of the mirror and camera.

On entering the room subjects were asked to leave their books and coats on a small table that was in the corner in the low density condition or outside the partitions in the high density condition. Subjects were then told to sit "anywhere," but in fact the confederate always managed to sit with her back to the mirror. When the subjects were seated, the experimenter described the study as an experiment on auditory communication and explained that they would be listening to four prerecorded tapes and giving their responses to each. At this point the experimenter passed out clipboards, pencils, and an evaluation form for the first two tapes. These were musical selections (the Allegro from Mozart's Sonata No. 4 for piano and violin and Isolde's "Love Death" from Wagner's "Tristan and Isolde"). These were used to give subjects time to relax and to become familiar with the situation and the procedure. When the recordings were finished, the experimenter returned to the room from the control room, initiated a brief discussion of the music by asking if anyone recognized either of the pieces or their composer, collected the evaluation sheets, and passed out evaluation forms for the next two recordings.

From the control room the experimenter then switched on the humorous tapes and the camera simultaneously. Both tapes were from George Carlin routines: "Words" and "The 11:00 news." They lasted a total of 10 min. Neither recording had an appreciable amount of laughter on the sound track.

Laugh Manipulation

In the laugh condition, the confederate, an attractive woman, began to smile almost from the beginning of the first tape. As the tape progressed, she smiled more and more, until after the first minute she was smiling almost continuously. In addition at five standardized points on each tape, she laughed aloud. Pretest data based on observations of the confederate when she was facing the mirror indicated that she was almost perfectly consistent in terms of the number and spacing of smiles and laughs.

In the no-laugh condition, the confederate smiled exactly three times for each tape, generally in response to a smile directed at her by one of the subjects (pretesting had indicated that refusal to return a smile was interpreted as strange rather than neutral), and did not laugh. In both conditions, the confederate tried to keep eye contact to a minimum, but did not obviously avoid it, again to avoid appearing strange or unpleasant.

During the comedy tapes, the three subjects were continuously filmed through the mirror. The confederate had her back to the mirror and could not be filmed. The camera was a Bolex 16mm, using Tri-X reversal film, and taking four frames per sec. This produced excellent resolution and provided a clear image of all subjects.

After each tape, subjects answered two questions: "How funny was the tape?", answered on a seven-point scale ranging from "Very funny" to "not at all funny," and "How much did you enjoy listening to the tape?," answered on a seven-point scale ranging from "very much" to "not at all." Following the last tape, the experimenter stopped the camera, returned to the experimental room, and passed out questionnaires regarding enjoyment of the experiment, perception of crowding, and other relevant dimensions. All questions provided seven-point scales for answering. No suspicions were voiced in response to a probe. Finally, subjects were told the full purpose of the study, paid, thanked, and asked not to discuss the nature of the study.

RESULTS

Subjects in the high density conditions reported feeling that the room was significantly more crowded [$F(1, 28) = 75.63, p < 0.01$] and that they were more cramped [$F(1, 28) = 40.06, p < 0.01$] than those in the low density conditions. The major dependent measure is the amount of smiling and laughter in each condition. These data were obtained by having two independent judges rate the films. One judge was the junior author; the other was a woman, not involved in psychology, who was hired specifically for this task, and was told nothing about the experiment or our expectations. They rated the subjects' reactions using a scale adapted from Schachter and Wheeler (1962) as follows: 0-neutral, no sign of amusement; 1-smile; 2-big smile; 3-laugh, a smile or big smile accompanied by bodily movements such as shaking shoulders, moving head, etc. The films were played on a movieola which stopped at every 40th frame. Since the camera took four frames per sec, this meant that judges rated each subject at 10-sec intervals for a total of 60 ratings for the 10 min film. The maximum score was 180 for each subject, but all analyses are based on the mean of the scores for the three subjects in a group. All ratings were done with judges blind to confederate condition, though naturally they could see whether the room was large or small. The judges agreed on 98.8% of their group ratings, and in 95% of their ratings of individual subjects (the latter is based on a more extensive analysis of one fourth of the groups).

The mean amount of smiling and laughter for the four conditions is shown in Table 1. The effects of both density and laugh are significant [F's$(1, 28) = 8.37$ and $14.51, p$'s < 0.01]. However, the only meaningful result is the interaction of the two [$F(1, 28) = 7.43, p < 0.02$], because only the high density, laughing confederate condition differs appreciably from the others.

Subjects' ratings of the funniness and their enjoyment of the tapes produced almost identical results, so the two questions were combined and the mean evaluation of the tapes is presented in Table 1. It can be seen that these ratings produced a pattern similar to but weaker than the behavioral measure. The effect of the laughing confederate is significant [$F(1, 28) = 10.28, p < 0.01$] but that of density is not [$F(1, 28) =$

TABLE 1
HUMOR RESPONSES AS A FUNCTION OF DENSITY AND MODEL CONDITION?

	Behavioral response		Self-ratings	
	Model laughs	Model does not laugh	Model laughs	Model does not laugh
High density	32.0_a	7.1_b	5.09_a	3.18_c
Low density	10.6_b	6.5_b	4.16_{ab}	3.53_{bc}

Note. Scores are based on eight groups per cell. Means with common subscripts do not differ at the .05 level as indicated by the Scheffé procedure.

0.53]. The interaction is in the same direction as that of the behavioral measure, but is not significant [$F(1, 28) = 2.62, p < .15$]. A correlation of .60 between the behavioral measure of laughter and the written evaluation indicates that the self-reports are moderately related to actual laughter.

General Questionnaire

Neither the density nor laugh manipulation had a significant effect on rated enjoyment of the experiment, liking for other members in the group, or evaluation of the group as a whole. Subjects in the high density and the laugh conditions rated the experiment as more lively [$F(1, 28) = 8.38, p < .01$ and $15.03, p < .01$, respectively]. Those in the two laugh conditions also considered the experiment a better learning experience [$F(1, 28) = 4.60, p < .05$] and reported more positive mood change from before to after the experiment [$F(1, 28) = 8.58, p < .01$] though it should be noted that this last difference was based on retrospective reports of initial moods, and that on these the laugh subjects rated somewhat lower than the no-laugh subjects. The only other significant finding in the questionnaire was that, despite finding the experience more lively, laughing more, and rating the tapes somewhat higher than low density subjects, those in the high density condition were less willing to participate again in similar experiments [$F(1, 28) = 9.40, p < .01$].

DISCUSSION

The major finding is that high density increases laughter when a laughing model is present, but neither the laughing model alone nor high density alone produces a significant increase in laughter compared to a condition of low density without a laughing model. It is somewhat surprising that the model who laughs does not increase laughter in the low density condition. However, it should be noted that the amount of laughter is considerably higher in the laughing model condition (10.6 vs 6.5) even though the difference does not approach significance.

In contrast, the lack of effect of high density alone appears quite clear-cut. There is only a trivial difference between the high and low

density no-laugh conditions in terms of laughter, and the difference in ratings of the tapes favors the low density condition. This pattern of results clearly is consistent with the intensification explanation of the effects of crowding, and is not consistent with an explanation in terms of arousal. While high density may sometimes be arousing, this should occur only when the other people present would normally produce some degree of arousal under low density as well (for example, if the other people were threatening and would arouse fear). When the dominant response to the other people is fairly neutral, increasing density should not increase arousal unless it causes actual physical discomfort. As was mentioned earlier, most of the evidence is consistent with this view and the present result provides additional support, though more research will be necessary to define the boundary conditions for the generalization.

The present study also demonstrates that density can be a significant factor affecting contagion. Since previous work on contagion has not dealt with density, this research provides one more factor that may help explicate the process underlying this fascinating phenomenon. That high density increases contagion is consistent with the observation that in natural settings contagion often occurs in groups of people who are close together. Whether this relationship holds in a given instance might depend on many factors, including the visibility of the model, since under some circumstances high density might conceal behavior rather than increase its salience. But, assuming that the behavior is observed, intensification theory, as well as the present result, suggest that contagion is more likely to occur under higher density.

Two limitations of the present study should be made explicit. First, it involved only women, both as subjects and model. Previous research has shown that sometimes men and women respond differently to high density (e.g., Freedman, Levy, Buchanan, & Price, 1972; Marshall & Heslin, 1975). Though we can think of no compelling reason to expect such a difference in the present context, it would obviously be desirable to demonstrate the effect using all combinations of male and female subjects and models, as well as with mixed-sex groups.

Second, the behavior of interest here was laughing at a humorous tape, whereas contagion research usually involves negative or antisocial behaviors. We can see no reason why contagion should be limited to one type of behavior. If members of a group are unlikely to engage in a behavior, and if many of them engage in it after one person performs it, that seems to us to constitute contagion. Admittedly, this will often involve negative behaviors, but surely it need not be restricted to them. For example, when one or two people in an audience stand up to show their appreciation for a performance and then gradually the rest of the audience rises, this is a perfect instance of contagion even though the behavior is positive. On the other hand, since the present study focused

on positive behavior, it is an open question whether the same effect would have occurred with a negative behavior. We predict that it would, but additional research is necessary to demonstrate this.

REFERENCES

Aiello, J. R., Epstein, Y. M., & Karlin, R. A. Effects of crowding on electrodermal activity. *Sociological Symposium*, 1975, **14**, 43–57.

Chapman, A. J. Funniness of jokes, canned laughter, and recall performance. *Sociometry*, 1973, **36**, 569–578. (a)

Chapman, A. J. Social facilitation of laughter in children. *Journal of Experimental Social Psychology*, 1973, **9**, 528–541. (b)

Cupchik, G. C., & Leventhal, H. Consistency between expressive behavior and the elevation of humorous stimuli: The role of sex and self-observations. *Journal of Personality and Social Psychology*, 1974, **30**, 429–442.

Diener, E. Effects of prior destructive behavior, anonymity, and group presence on deindividuation and aggression. *Journal of Personality and Social Psychology*, 1976, **33**, 497–507.

Festinger, L., Pepitone, A., & Newcomb, T. Some consequences of deindividuation in a group. *Journal of Abnormal and Social Psychology*, 1952, **47**, 383–389.

Freedman, J. L. *Crowding and behavior*. New York: Viking Press, 1975.

Freedman, J. L., Klevansky, S., & Ehrlich, P. The effect of crowding on human task performance. *Journal of Applied Social Psychology*, 1971, **1**, 7–25.

Freedman, J. L., Levy, A., Buchanan, R. W., & Price, J. Crowding and human aggressiveness. *Journal of Experimental Social Psychology*, 1972, **8**, 528–548.

LeBon, G. *The crowd*. London: F. Unwin, 1895.

Leventhal, H., & Cupchik, G. C. The informational and facilitative effects of an audience upon expression and the evaluation of humorous stimuli. *Journal of Experimental Social Psychology*, 1975, **11**, 363–380.

Leventhal, H., & Mace, W. The effect of laughter on evaluation of a slap-stick move. *Journal of Personality*, 1970, **38**, 16–30.

Marshall, J. E., & Heslin, R. Boys and girls together; Sexual composition and the effect of density and group size on cohesiveness. *Journal of Personality and Social Psychology*, 1975, **31**, 952–961.

Morrison, J. A note concerning investigations on the constancy of audience laughter. *Sociometry*, 1940, **3**, 179–185.

Nosanchuk, T. A., & Lightstone, J. Canned laughter and public and private conformity. *Journal of Personality and Social Psychology*, 1974, **29**, 153–156.

Paulus, P. B., Annis, A. B., Seta, J. J., Schkade, J. K., & Matthews, R. W. Density does affect task performance. *Journal of Personality and Social Psychology*, 1976, **34**, 248–253.

Prerost, F. J. A cross-sectional investigation of coping with crowding: Humor appreciation and preferences. *Dissertation Abstracts International*, 1975, **36**, 1974.

Redl. F. The phenomenon of contagion and "shock effect" in group therapy. In K. R. Eissler (Ed.) *Searchlights on delinquency*. New York: International Universities Press, 1949.

Schachter, S., & Wheeler, L. Epinephrine, chlorpromazine, and amusement. *Journal of Abnormal and Social Psychology*, 1962, **65**, 121–128.

Singer, J. E., Brush, C., & Lublin, S. C. Some aspects of deindividuation: Indentification and conformity. *Journal of Experimental Social Psychology*, 1965, **1**, 356–378.

Turner, R. H. Collective behavior. In R. E. L. Faris (Ed.) *Handbook of modern sociology*. Chicago: Rand McNally, 1964.

Wheeler, L. Toward a theory of behavioral contagion.*Psychological Review*, 1966, **73**, 179–192.

Young, R. D., & Frye, M. Some are laughing; some are not: Why? *Psychological Reports*, 1966, **18**, 747–754.

Zajonc, R. B. Social facilitation. *Science*, 1965, **149**, 269–274.

Zimbardo, P. The human choice: Individuation, reason and order vs. deindividuation, impulse, and chaos. In *Nebraska Symposium on Motivation* (Vol. 17). Lincoln, Nebraska: University of Nebraska Press, 1969.