Journal of Personality and Social Psychology
1973, Vol. 27, No. 1, 13–18

PROXEMIC EFFECTS ON COOPERATION, ATTITUDE, AND APPROACH–AVOIDANCE IN A PRISONER'S DILEMMA GAME [1]

HERSHEL GARDIN,[2] KALMAN J. KAPLAN, IRA J. FIRESTONE, AND GLORIA A. COWAN

Wayne State University

The present study investigated the effects of two proxemic factors—seating arrangement and availability of eye contact—on the cooperation, interpersonal attitude, and approach–avoidance tendencies shown by the two players in a Prisoner's Dilemma game. As expected, significant interactions emerged between these two proxemic factors on all three of the above outcomes. In data consistent with role-play findings, more positive cooperation and attitudinal outcomes tended to be associated with the more proximal side-by-side seating arrangement when interplayer eye contact was blocked. No trend emerged for the approach–avoidance data in this condition. When eye contact was available, however, the opposite pattern emerged, the more positive outcomes for all three dependent measures being associated with the less proximal across-table seating arrangement. The greater eye contact inherent in the across-table arrangement was stressed, as were the limitations of role-play data in the area of nonverbal communication.

The beginning of the continuing Paris peace talks on the Vietnamese War was occupied with a heated debate over the shape of the negotiation table and the seating arrangement of participants. Although viewed by some American political analysts as an ironic example of diplomatic preening more tragic than silly in view of the continuing loss of life, the various negotiators approached the question of the table with great seriousness. The ambassadors were evidently quite cognizant that several important issues—those of relative status, independence of bargaining voice, and de facto recognition of the legitimacy of some of the parties—were at stake.

In contrast to diplomats' awareness of these issues, psychologists have, until quite recently, placed their emphasis on man's phenomenal world, showing but a casual regard for the roles that physical settings might play in determining interpersonal behavior. Much interest in this latter topic has been stimulated by the anthropologist Edward Hall (1963, 1966), who has coined the term proxemics to refer to "the interrelated observations and theories of man's use of space as a specialized elaboration of culture. [1966, p. 1]" For Hall, man's behavior is influenced by the contents of territorial circles that surround him. He tolerates the distal presence of large numbers of other persons but becomes quite discriminating in space allocation at close distances. Uninvited entry here is likely to elicit fight or flight reactions. Thus, the occurrence of cooperation or competition and of social approach or avoidance tendencies may depend, in part, on physical and psychological distances, for example, "personal space" considerations (Sommer, 1969).

The present study uses a two-person Prisoner's Dilemma (PD) game to examine the effects of two proxemic factors: seating arrangement and availability–absence of visual contact on cooperation, attitude, and approach–avoidance tendencies. Our work draws on two observations of Sommer. Sommer (1968) reported that across five different cultures, "side-by-side" seating is consistently perceived as more intimate than the less spatially proximal "across the table" seating pattern. A second role-playing study (Sommer, 1969) built on this. Asking people to draw preferred seating arrangements for various activi-

[1] This article is an adaptation of the first author's master's thesis. A preliminary report of some of these findings was presented at the meeting of the Midwestern Psychological Association, Detroit, May 1971. The research was supported by Grant No. GS-2852 from the National Science Foundation to the second and third authors. The authors express appreciation to S. S. Komorita for sharing conceptual and technical expertise essential for the conduct of this study.

[2] Requests for reprints should be sent to Hershel Gardin, Department of Psychology, Wayne State University, Detroit, Michigan 48202.

ties on printed diagrams of rectangular tables, Sommer reported that a majority prefers side-by-side to across-table seating (51% versus 25%) for a hypothetical cooperative task, while a large plurality prefers across-table to side-by-side seating (41% versus 8%) for a hypothetical competitive task.

The association of the more proximal side-by-side seating with cooperation and the less proximal across-table seating with competition leads to the question of whether these two seating patterns induce these differences in cooperative–competitive behavior. The temptation to argue this is strong. However, we must be cautious. There are major differences in setting between role-playing projections and the actualities of a two-person game. For example, in supplementary data, Sommer's (1968) subjects connect side-by-side seating with cooperation because it facilitates "sharing things"—hardly a relevant factor in a PD situation where there are no objects to share. Across-table seating is described as "stimulating competition," being useful for such tasks because it "allows visual contact" that is presumably helpful for surveillance purposes. This latter observation, however, is directly contradicted by the findings of Wichman (1970) who reported that visual isolation yields greater competition and visual contact produces greater cooperation in a PD game, a relationship also suggested in the work of Exline (1963). Further evidence against a "visual contact induces competition" formulation can be drawn from an experimental demonstration of a positive relationship of visual contact with increased "liking" (Exline & Winters, 1965; Nachson & Wapner, 1967) and also with decreased aggression (Milgram, 1965).

There is, then, a discrepancy between phenomenological and experiential outcomes. It seems reasonable to suggest that in the context of an abstract role-play setting, subjects do not fully intuit the subtle yet powerful influences that nonverbal channels of communication exert on social behavior. Further, in social behavior, nonverbal factors seem capable of moderating the relationship between spatial proximity and perceived intimacy. Such at least is the implication of Kendon's (1967) research and is a point of view further affirmed in recent reviews (Argyle, 1969; Mehrabian, 1969).

The present study attempts to provide a resolution of this discrepancy through the experimental isolation of seating arrangement from eye contact. The effects of side-by-side and across-table seating patterns on cooperation are examined under conditions where normal visual contact is allowed and where it is blocked by a barrier. Eliminating visual contact (and virtually all nonverbal communication) should yield results analogous to those of Sommer. Put in terms of the authors' gradient model (Firestone & Kaplan, 1973; Firestone, Kaplan, & Russell, 1973; Kaplan, Firestone, Moore, & Degnore, 1971), we predict that, for the barrier conditions, cooperation increases with proximity of seating pattern (i.e., a positively inclined gradient of cooperation that slopes upward from across-table to side-by-side seating). In the no-barrier conditions, eye-contact effects dominate those of seating arrangement; this being especially so for the across-table pattern where there is full visibility and minimally so for the side-by-side pattern where eye contact is more restricted. Here we predict that cooperation decreases with proximity of seating pattern, or, equivalently, that it increases with degree of visibility (i.e., a negatively inclined gradient of cooperation that slopes downward from across-table to side-by-side seating). Parallel predictions are advanced for seating-proximity-based gradients derived from two additional measures: interpersonal attitude and sociometric approach–avoidance tendencies.

The final issue concerns behavioral approach–avoidance tendencies. Here we determine the relationship between the level of cooperation demonstrated by subject pairs, independent of assigned experimental condition, and the Sommer intimacy value of seating arrangements chosen by the subjects themselves for the final, questionnaire phase of the study. We predict a direct relationship between amount of cooperation and subsequent election of intimate, side-by-side seating.

METHOD

Subjects

Eighty male introductory psychology students, participating in research as part of their course requirement, were randomly assigned to a limit of 20 students (10 pairs) to one of the four conditions of the study.

Apparatus and Procedure

A standard pair of row and column PD panels presented an identical matrix of payoff values (5/5, 0/6, 6/0, 1/1) for all 50 trials of the gaming session. The placement of these panels for either side-by-side or across-table seating conditions and the interposition or absence of barriers for conditions preventing or allowing visual contact were both preset prior to the entry of each pair of participants.

Identical instructions were provided to the subjects in each of the four experimental conditions. All of the subjects were trained in the operation of their panel by a tape recording with an accompanying demonstration.[3] The significance of the red "operate" lights and the role of the two response buttons in the conjoint determination of the participants' individual point earnings were explained. Each subject was told to use a prepared tally sheet to record, during an intertrial interval, his own earnings for the preceding trial. A rest period was provided halfway through the session (after 25 trials), during which time the experimenter totaled each subject's score up to that point. No verbal communication was permitted during this or any other phase of the study.

Out interest in the effects of seating and visual contact prescribed our choice of a neutral strategy set so as not to bias outcomes to strongly toward either extreme cooperation or extreme competition. Subjects were told,

> The object of this experiment is for you to try to accumulate as many points as possible. . . . Please note that you are not necessarily out to beat each other. As one of you increases in points, the other does not necessarily have to decrease.

At the conclusion of the 50-trial sessions, the subjects were invited to a second room to fill out a questionnaire on their reactions to the study. After this, the earnings were distributed (10 points = $.01), and information about the purposes of the study was also provided.

Measurement

The measure of cooperative versus competitive behavior was the simple sum of the number of cooperative choices (toward the matrix cell value 5/5) made by each subject.

The postexperimental questionnaire included an item assessing the subjects' perception of instructional set. This was a 5-point scale to which the labels purely competitive, somewhat competitive, purely individualistic, somewhat cooperative, and purely cooperative were attached. A measure of interpersonal attitude was obtained by asking the subjects to give their "impression of the other individual" in terms of a series of 7-point unlabeled adjectival scales. The scores on the six adjective pairs used (pleasant–unpleasant, cooperative–uncooperative, sincere–insincere, friendly–unfriendly, trustworthy–untrustworthy, and good–bad) were averaged to provide an overall index of affect.

Sociometric approach–avoidance tendencies were assessed by averaging responses to two questions. The first asked subjects to indicate their willingness "to work together with the other individual in further psychology research," in terms of a 5-point scale, the labels for which ranged from strongly in favor, through don't know, to strongly opposed. The second probed into the subject's feelings "about introducing the other individual" into his "circle of friends." Again, a 5-point scale with labels ranging from definitely would not like to, through don't know, to definitely would like to was provided for response.

A measure of behavioral approach–avoidance response was obtained through the device of having the subject pairs choose the seats in which they were to fill out the postexperimental questionnaire. Many copies of the questionnaires were stacked at the corner of a 7½ × 3 foot rectangular table farthest from the access doorway to the room. Choice of seating in the eight chairs surrounding this table was unobtrusively recorded. The intimacy values (ranging from 1 = very intimate and close to 7 = very aloof, apart, and psychologically distant) of the resulting pattern, estimated from the normative data given in Sommer's (1969) monograph, provided an index of approach–avoidance behavior. Maximal approach was indicated by proximal side-by-side seating, and maximal avoidance was indicated by distal across-table seating.

RESULTS AND DISCUSSION

A two-way analysis of variance conducted on perceptions of the cooperative or competitive implications of the taped instructional set yielded no significant effects ($ps > .10$). Further, in no case did the mean value for any of the four conditions differ significantly from the 3.0 midpoint value that indicated a purely individualistic strategy. These results were consistent with our intent to establish neutral instructions.

A two-way analysis of variance was performed on the number of cooperative responses made by subjects over the 50-trial series. Interpretation of significant effects for both the seating variables ($F = 4.33$, $df = 1/76$, $p < .05$) and the visual contact variables ($F = 5.31$, $df = 1/76$, $p < .05$) was qualified by the significant interaction ($F = 14.57$, $df = 1/76$, $p < .001$) of their effects on cooperation as is shown in Figure 1. As can be seen in Figure 1, this interaction was consistent with our predictions. When visual contact was available (the no-barrier condition), a negatively sloping gradient obtained, with cooperation decreasing sharply as we move from lesser proximal (across-table) to more proximal (side-by-side) seating. When visual contact was eliminated, however, this trend tended to reverse. Here, in line with Sommer's role-play data, co-

[3] A transcript of these instructions and other materials is available upon request.

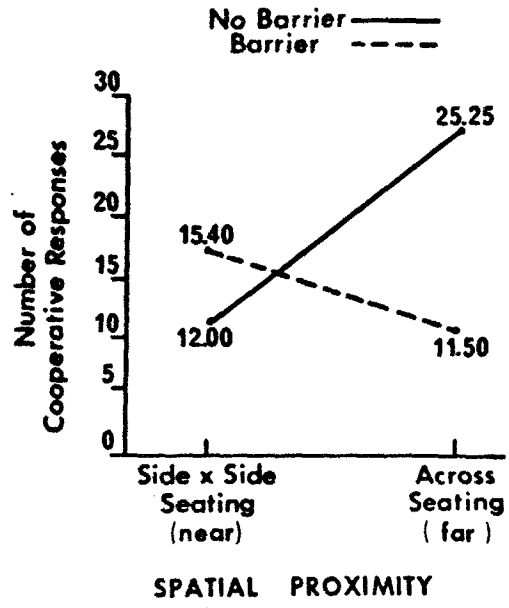

FIG. 1. Cooperation gradients as a function of eye-contact availability.

operation tended to increase as we move from lesser proximal (across-table) to more proximal (side-by-side) seating (i.e., a positively sloped gradient). Though these results confirmed our major prediction—the availability versus absence of eye contact producing contrastingly inclined gradient slopes—the reader should be cautioned of the following: Only under conditions of eye-contact availability was the slope in itself significantly different from zero ($F = 17.38$, $df = 1/38$, $p < .001$). Thus, seating arrangement served to differentiate cooperative tendencies solely under conditions when interplayer eye contact was available (i.e., the no-barrier condition).

Similar patterns emerged for the attitudinal and sociometric approach–avoidance data. Consider first the attitudinal data as presented in Figure 2. Here the two-way analysis was performed on the averaged favorability of the six interpersonal attitude items. Only visual contact produced a significant main effect ($F = 4.11$, $df = 1/76$, $p < .05$). As in the first set of data, however, its interpretation was qualified by its interaction ($F = 26.58$, $df = 1/76$, $p < .001$) with seating. The contrasting slopes shown in Figure 2 paralleled those emerging on the cooperation data (Figure 1). Again the seating-proximity-ordered gradient —in this case, an attitude gradient—tended to take on a positive slope in the no-visual-contact barrier condition and a negative slope for the no-barrier condition. Though neither of these slopes was in itself significantly nonzero, the one emerging under the condition where eye contact was available (i.e., the no-barrier condition), as in Figure 1, seemed clearly the stronger (Fs = 2.81, 1.21, respectively, $df = 1/38$, $p > .10$, in both cases).

Consider now the two-way analysis of variance conducted on the averaged sociometric approach–avoidance tendencies. As in the attitudinal data, Figure 3 indicates that the significant main effect for visual contact ($F = 4.99$, $df = 1.38$, $p < .05$) must have been qualified by its significant, though relatively weaker, interaction with seating arrangement ($F = 4.21$, $df = 1/76$, $p < .05$). Here the gradient slope seemed totally flat ($F < 1$) across seating proximity in the barrier condition, whereas under visual contact, the same negatively sloped gradient found for the cooperation and attitudinal data tended to obtain, though in this case it was not significantly different in itself from zero ($F = 2.10$, $df = 1/38$, $p < .10$).

As predicted, then, the absence or availability of visual contact significantly interacted with

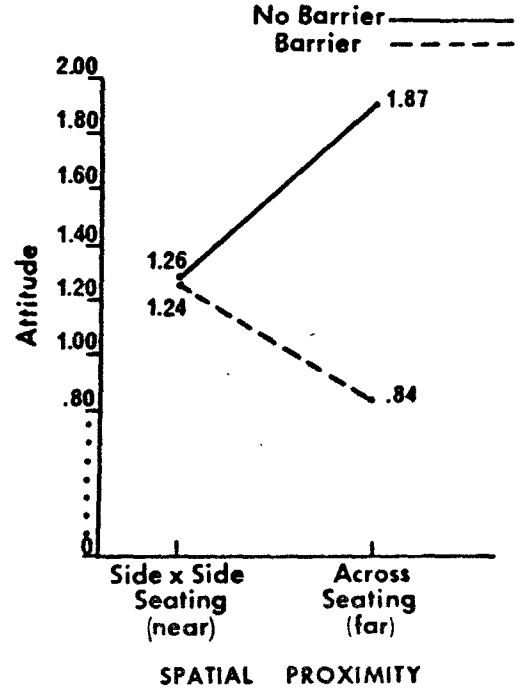

FIG. 2. Interpersonal attitude gradients as a function of eye-contact availability.

the proximity seating pattern to alter the slopes of observed cooperation, attitude, and sociometric approach–avoidance gradients. With visual communication (i.e., with no barrier), greater cooperation, more favorable attitude, and stronger sociometric approach tendencies were all associated with the less intimate but high eye-contact across-table seating arrangement (i.e., negative gradients), though this relationship was only significant for the cooperation outcomes. Without eye contact (i.e., with a barrier) this relation definitely did not hold, with a flat gradient emerging for approach outcomes and the opposing pattern (i.e., positive gradients) mildly suggested for the cooperation and attitudinal outcomes. This latter trend of greater cooperation and more positive attitude at the more proximal side-by-side seating arrangement mirrored the data emerging from the role-play studies discussed earlier (cf. Sommer, 1968) and suggested the following interpretation. When available, the effects of eye contact tended to dominate those of seating proximity per se. Thus, in our no-barrier condition, it was the less proximal across-table seating arrangement which maximized intimacy through direct eye contact and the positivity of interpersonal response. Without eye contact, as in our barrier condition and the role-play data, the effects of seating proximity per se seemed to reemerge, with positivity of interpersonal response associated with the more intimate side-by-side seating.

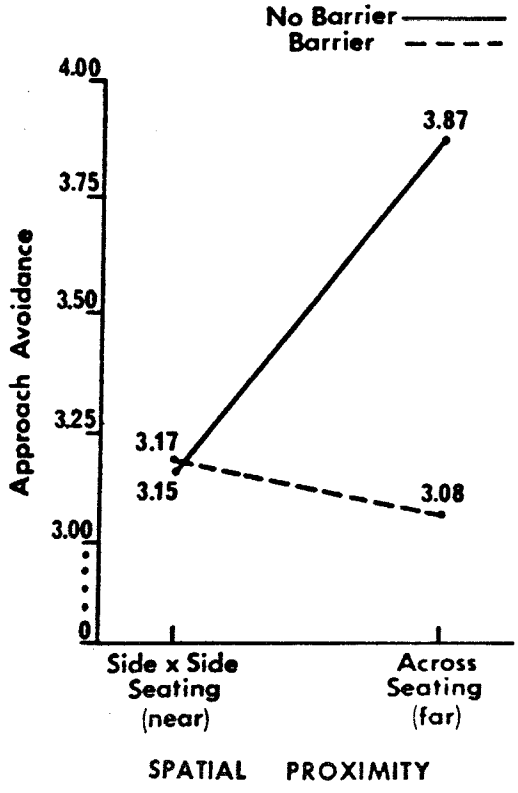

FIG. 3. Net sociometric approach–avoidance gradients as a function of eye-contact availability.

These results point to limits in the role-play approach to nonverbal communication and to a resolution of the results emerging therein with those deriving from experimental studies. Subjects do not seem, in the context of an abstract role-play setting, to correctly gauge the effects of nonverbal dimensions of communication operative in actual game play. Thus, role-play data seems to predict actual game-play behavior only when the latter paradigm specifically blocks off nonverbal channels.

Although each of our three dependent measures yielded essentially similar patterns of results (Figures 1, 2, 3), there were some differences. For example, by far our strongest effects emerged for the behavioral cooperation outcomes, the weakest for the sociometric approach tendencies. These differences were reflected in the pattern of intercorrelations between these variables, with the cooperation outcomes relatively independent of both attitude and sociometric approach ($rs < .20$, $df = 78$, $p > .05$, in both cases), the latter two measures themselves being strongly interrelated ($r = .54$, $df = .78$, $p < .001$).

These patterns become more interesting in the context of our second hypothesis. As the reader recalls, we predicted a direct relation between the number of cooperative responses shown by a pair of subjects, independent of experimental condition, and their subsequent behavioral approach toward one another. Our results were in line with this prediction ($r = .31$, $df = 38$, $p < .05$). This mild relationship between cooperation and subsequent physical closeness is consistent with the classic Heiderian "liking induces unit" formulation (Heider, 1946). Specifically, this interpretation rested on the assumption that cooperation induces interpersonal liking, which in turn induces desire for physical closeness. Mitigating this explanation, however, was the insignificant correlation previously reported between our behavioral measure of cooperation and inter-

personal attitude. Further caution in accepting this influence chain was indicated through the low level of correlations between the behavioral measure of approach and both attitude and sociometric approval measures ($rs < .20$, $df = 38$, $p > .05$, in both cases).

Perhaps the failure to obtain systematic relationships between pencil-and-paper (cognitive) measures of affect and the behavioral cooperation measures was a function of the irrelevance of the pencil-and-paper sociometric and attitude measures to the subject's appraisal of the situation. It was the situational context which was producing the forces at work in this experiment, and the behavioral measure of cooperation seemed largely a situational variable. The pencil-and-paper measures, on the other hand, were predominantly personal variables, asking the subject to affectively commit himself to a stranger who had done nothing "himself" to merit such commitment. Other factors may also have been at work in our results. For example, despite the relative independence of our behavioral measures from our questionnaire measures, both the two behavioral measures and the two questionnaire measures, though widely different in content were themselves intercorrelated. Whether this reflected only common method variance (cf. Campbell & Fiske, 1959) or a generalized case of attitude-behavior discrepancy (cf. Fishbein, 1967) must remain the question for future studies.

A final comment should be made in closing. The question is not so much whether across-table seating promotes more or less cooperation than side-by-side seating, but, rather, how visual contact, along with other nonverbal factors, influences the way in which we decode another human being who is otherwise unknown to us. What parameters involving the nature of the facial display, the visual behavior of the other player, and the personalities of the players can affect this decoding process? Investigating the complex interplay of social-environmental factors requires, obviously, more than one study. For the present, however, one conclusion seems clear. Because of its tightly controlled setting and its potentially rich and precise repertoire of relevant behavioral and questionnaire measures, the PD game affords an excellent vehicle for comparing the effects of verbal and nonverbal channels of communication.

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(Received September 22, 1971)