The influence of an advantaged third person on collaboration in a prisoner's dilemma game¹

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An experiment was performed to investigate the influence of the outcomes of an advantaged person on the behavior of two individuals playing a Prisoner's Dilemma game. It was hypothesized that more collaboration would occur when an advantaged person obtained higher outcomes whenever either one or both of the Prisoner's Dilemma game players made a noncollaborative choice than when there was no advantaged person present. The results supported the hypothesis.

The Prisoner's Dilemma (PD) game has caught the attention of many psychologists because it represents a situation in which individuals generally pursue a noncollaborative strategy rather than a collaborative strategy, despite the fact that joint collaboration is necessary in order to obtain the maximum gain in the long run. Of major interest to psychologists has been the determination of those factors which increase the use of the collaborative strategy. A number of such factors have been found and have been discussed in reviews by Becker & McClintock (1967) and Gallo & McClintock (1965).

The present investigation was concerned with the behavior of two individuals playing a PD game as influenced by outcomes of a third advantaged person who obtains higher outcomes than either of the PD game players whenever either one or both of them makes a noncollaborative choice. Some evidence from studies of coalition formations (see review by Gamson, 1964) is consistent with the hypothesis that "weakness is strength." This phrase refers to the observed tendency of two individuals who have the smaller resources to form a coalition with each other, rather than with a third, high resource, individual. Hence, the high resource person loses because he is left out of the coalitions which are formed. In addition, a study reported in Deutsch (1958) showed that two persons playing a PD game were more collaborative when a third, disliked person was rewarded whenever one or both players made a noncollaborative choice than when the third person was simply present, or when no third person was present. Therefore, it was predicted that two persons playing a PD game would form a kind of tacit coalition against an advantaged person by being more collaborative than when no advantaged person was present.

METHOD

Subjects

The Ss were 28 volunteer students from psychology courses at Hope College. Although Ss were sometimes acquainted, no close friends participated in the same session. When triads were used, the advantaged person was always a confederate of the E. The members of the dyads ($n = 6$ pairs) and triads ($n = 8$ pairs) were all of the same sex, and there were an equal number of male and female pairs in each group.

Procedure

Because there is some evidence that Ss from a small college may be more likely to collaborate than those from a large one (Oskamp & Perlman, 1965), data from the dyadic groups was obtained first. Since these Ss appeared to behave in the manner typically reported in the existing literature, data was then collected using the three-person groups.

In all groups, the Ss were led to the experimental room together, and were seated in separate booths, open at the front and rear, all facing the same matrix display. The Ss sat about

6 ft from the display, and the numbers were about 1½ in. high, easily visible to all Ss. The instructions were similar to those employed by other Es (e.g., Rapoport & Chammah, 1965). They described the mechanics of the situation, but encouraged neither collaboration nor noncollaboration. The instructions closed by urging the Ss to try to obtain as many points as they could.

Figure 1 shows the matrix of outcomes displayed to the three-person groups. In the two-person groups, which were shown only the center four cells from which the third number was deleted, Person A chose between the two rows and Person B between the two columns. The first entry in each cell was A's payoff and the second was B's payoff. In the three-person groups, Person A chose between the two rows, Person B between the first two or second two columns, and Person C, the advantaged person, between the outside two or center two columns.

The E sat adjacent to the matrix display, facing the Ss. The Ss indicated their choices to the E by holding up a card with either a 1 or a 2 on it. After recording the Ss' responses, the E illuminated the appropriate cell of the matrix for 4 sec. Each S recorded his own outcome and then made his next selection after the light illuminating the matrix cell went out. The payoffs within each cell were color coded to reduce confusion among the numbers. The choices made by the advantaged person were preprogrammed by the E, so that the advantaged person played 50% one and two choices in the first 10 trials, followed by 90% two choices on the remaining 40 trials. The payoffs were points without monetary or other value.

		PERSON B											
		1						2					
PERSON A	1	6	6	6	4	4	1	0	7	8	0	5	2
	2	5	0	2	7	0	8	1	1	8	1	1	2
		PERSON C											
		2						1					

Fig. 1. Matrix display for three-person groups.

RESULTS

Table 1 shows the mean proportion of collaborative choices made by the Ss in the two- and three-person groups for each of five trial blocks of 10 trials each. In an unweighted means analysis of variance on the number of collaborative choices, there was a significant effect of Trial Blocks ($F = 3.73$, $df = 4/104$, $p < .01$), Group Size ($F = 8.03$, $df = 1/24$, $p < .01$), and a significant Trial Blocks by Group Size interaction ($F = 3.70$, $df = 4/104$, $p < .01$). The Ss in the three-person condition made significantly more collaborative choices than those in the two-person condition. Inspection of Table 1 reveals that the difference between groups increased over trials, largely due to the decrement of collaborative choices made by the Ss in the two-person group.

Table 1
Mean Proportion of Collaborative Choices Made by Subjects in
Two- and Three-Person Groups Facing the PD Game
in Each of Five Trial Blocks

Group	Trial Block					Mean
	1	2	3	4	5	
Two-Person	.44	.29	.23	.28	.24	.30
Three-Person	.46	.39	.43	.37	.54	.44
Mean	.45	.35	.35	.33	.41	.38

DISCUSSION

The results clearly supported the hypothesis that the presence of a third, advantaged, person would produce more collaboration among two persons playing a PD game than when no third person was present. Moreover, the results with the two-person group are entirely consistent with those of other PD game studies, since, in games with 50 or fewer trials, it is a common finding that the proportion of noncollaborative choices increases over trials (Gallo & McClintock, 1965). Hence, it appears that the higher outcomes obtained by the advantaged person restrained the tendency of the two PD game players to make an increasing number of noncollaborative choices over trials.

It is interesting to note, though, that in the three-person situation the two individuals playing the PD game did not, on the whole, settle into a pattern of joint collaboration for more than just one or two trials, even though joint collaboration would permit the players to both maximize their long-run gains and remove the higher outcomes of the advantaged person. Since some people who participated in the three-person situation felt that the long-term consequence of

their choices were not clear to them, a simpler method of presenting the outcomes should be developed, if possible. As the outside four cells are not needed to establish the relationships under investigation, a display deleting them could be developed.

It should be possible to investigate many types of three-person interactions by employing the present technique. Not only could the type of interdependent relationship between two of the persons be varied independent of their relationship to the third person, but situations could be developed in which all three individuals were interdependent. This latter situation would then resemble a three-person coalition situation, but would allow for the elimination or control of communication among the group members.

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NOTE

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NOTES

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2. A player's manual for the game is available from American Documentation Institute, Auxiliary Publication Project, Photoduplication Service, Library of Congress, Washington, D. C., Document 8601.