Start effect and response bias in the prisoner's dilemma game

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In a Prisoner's Dilemma Game it was found that location of response switch did not bias the strategy selections of Ss. No DD outcome occurred for any pair of Ss on the first trial, but initial trial CC outcomes were followed by more cooperations than were initial trial CD outcomes. Females displayed more "trust" than did males.

In a Prisoner's Dilemma Game (PDG) each of two players has two possible alternative choices on each iteration of the game. Payoffs accrue to the Ss as a function of their joint choices. Because of the rules governing the relationships between the payoffs in the 2 by 2 matrix of outcomes (see Luce & Raiffa, 1951), each player can attempt to compete so as to get more points than the other or both players can choose to cooperate to get an equal number of points.

The two choices in research using the PDG have consisted of two colors (Ells & Sermat, 1966), two switches (Tedeschi et al, in press), and two colored switches (Oskamp & Perlman, 1965). None of these studies has attempted to determine if a response bias for color or handedness affects the dependent variables in the PDG although Komorita (1965) did counterbalance his procedure.

Subjects. Thirty-two Ss, 16 males and 16 females were randomly assigned to two experimental groups each playing against the same 50% cooperative planned but unpatterned strategy. The Ss participated as a requirement of the introductory psychology course at the University of Miami. In one group the cooperative choice was the left switch and in the other group it was the right switch.

Apparatus. Each S faced a cabinet-like unit which displayed the four-cell matrix on its face and two light switches on its horizontal base. The equipment is fully explained in Steele & Tedeschi (1967). Each S was in a separate room. The matrix is presented in Fig. 1.

Procedure. The Ss read instructions which explained the choices and how the payoffs related to their joint decisions. They were each instructed to obtain as many points as they could, though a competitive orientation was avoided. The full instructions are given by Tedeschi et al (1967). One hundred iterations of the PDG were then played by all Ss.

Results and Discussion. A sex by response bias (2 by 2) analysis of variance was performed on the data. There was no significant difference in the cooperative proportion (CP) either for switch location ($F = .41$, $df = 1/28$, $p > .10$) or for sex ($F = 1.94$, $df = 1/28$, $p > .10$) or for the Sex by Switch location interaction ($F = .56$, $df = 1/28$, $p > .10$).

Table 1 shows the results of MANOVA and the means for the proportions of defection, double cooperative responses (CC), double competitive responses (DD), and unilateral cooperations (ULP) for 2, 5, 10, 100, and the last 20 trials. It can be seen from the p values that no significant differences occurred on any of these dependent variables as a function of switch location.

1, 1	-10, 10
10, -10	-1, -1

Fig. 1. Matrix used in the experiment.

Following Rapoport's (1966) stochastic analysis for two-trial sequences, Table 2 summarizes the MANOVA for switch location and sex on the state condition propensities. No response bias was found, nor except in the case of "trust" were there any sex differences. However, females were more "trusting" than males ($F = 4.67$, $df = 1/28$, $p < .05$). Trust is displayed when the S cooperates after a trial on which both Ss competed. No Sex by Response interactions were statistically significant.

In an attempt to determine if the outcome on the first trial affected selections over the next 99 trials, the groups were divided post hoc into subgroups representing first-trial outcomes–CC and UL. There were no DD dyads. Thus, there were four groups: left and right switches as cooperative choices subdivided into CCL, CCR, ULL, and ULR.

The means for the dyadic outcomes are presented in Table 3. Newman-Keuls pairwise comparisons revealed that more CC outcomes occurred for the CCR dyads than for those in the ULR ($Q = .193$, $p < .05$) and the ULL ($Q = .173$, $p < .05$) dyads. Because the CCL group did not differ from any of the other groups, the influence of the first trial outcome is difficult to interpret.

No differences occurred between the subgroups on the frequency of DD outcomes, but the CCR groups did yield a smaller ULP than any of the other three groups ($p < .01$).

It is clear from the evidence that response bias does not affect the dependent variables in a PDG. However, the results did support the findings of Sermat & Gregovich (1966) in a simulated other "chicken" game that an initial joint cooperative outcome is followed by greater cooperation in later trials than is an initial unilateral outcome. Furthermore, no DD outcome occurred on the first trial for any dyad. The initial joint response sets the initial condition for mutual trust.

The findings that females displayed more "trust" than males is a reversal of the findings of Rapoport & Chammah (1965). Rapoport (1964) points out that females respond more coopera-

Table 1
Multivariate ANOVA Values and Proportion Means for TDP, Sum 1P, Sum 4P and ULP for the Switch Position Conditions over 2, 5, 10, 100 and the Last 20 Trials

	TRIALS																			
	First 2				First 5				First 10				Last 20				1-100			
Response	Means				Means				Means				Means				Means			
Variables	L	R	F	P	L	R	F	P	L	R	F	P	L	R	F	P	L	R	F	P
TDP	.28	.44	3.43	.09	.53	.58	.48	.50	.54	.59	.88	.36	.68	.66	.46	.51	.36	.34	.17	.31
Sum 1P	.44	.13	3.43	.09	.20	.10	1.3	.26	.20	.13	.84	.38	.06	.08	.54	.47	.10	.09	.06	.82
Sum 4P	–	–	–	–	.25	.25	0.0	1.0	.28	.31	.55	.47	.42	.40	.28	.60	.40	.43	.34	.57
ULP	.56	.88	3.43	.09	.55	.65	2.8	.12	.53	.56	.34	.57	.53	.51	.23	.64	.50	.49	.90	.36

tively in the early trials and tend to become more defensive in later trials. It is possible that the shorter game used here in which females are displaying more "trust" and attempting to break out of frequent DD outcomes would, if continued, become more like the Rapoport and Chammah study.

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Table 2
Mean Proportion and P Values for the Stochastic Variables of Trustworthiness, Forgiveness, Repentance and Trust for the Switch Position and Sex Conditions

	Response Bias			Sex		
	Means			Means		
Variable	L	R	p	M	S	p
TW	.363	.370	NS	.365	.368	NS
F	.402	.429	NS	.415	.416	NS
R	.244	.208	NS	.200	.246	NS
T	.392	.358	NS	.345	.405	$>.05$

Table 3
Proportion for CC, DD and ULP Responses over 99 Trials as Related to Initial Response and Switch Positions

	Groups			
Game Variables	CCL	ULL	ULR	CCR
CC	.13	.03	.06	.27
DD	.37	.47	.45	.30
ULP	.50	.50	.49	.42

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