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Partial-altruistic interactions as a function of reciprocity induction and written declarations

N. Rangel[a], L. Pulido[b], A. Ávila[b], S. Ordóñez[a] and E. Ribes-Iñesta[b]

[a]Centro de Estudios e Investigaciones en Comportamiento, Universidad de Guadalajara, Guadalajara, Jal., México; [b]Centro de Estudios e Investigaciones en Conocimiento y Aprendizaje Humano, Universidad Veracruzana, Xalapa, Ver., México

ABSTRACT

Two studies were conducted to systematically evaluate the effects of induced reciprocity by a confederate and written declarations about anticipated responding in the task on partial-altruistic interactions. The experimental situation consisted of solving puzzles on two synchronized computer screens. Sixteen college students were assigned to 16 dyads (one participant and one confederate), eight in each experiment. All dyads were exposed to successive experimental conditions in which the percentage of pieces placed in the participant's puzzle by the confederate varied from 0%, 25%, 50%, 75% to 100%. Half of the dyads were exposed to an increasing order of percentages and the other half to a decreasing order. In Experiment 1, the effects of time-restricted induction of reciprocal behavior by a confederate were analyzed, implementing a response alternation procedure, on partial-altruistic behavior of the participant in the dyad. In Experiment 2, the effects of the interaction between reciprocal responding and written declarations anticipating the participant's responses in the same partial-altruistic situation were compared. Participants showed partial-altruistic behavior as a function of the percentage of pieces placed by the confederates in remote puzzle. Results are discussed in terms of the kinds of reciprocity involved in all social exchange relations and the role of situational and verbal factors.

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Social behavior is based upon cooperation among individuals. Even competition, in social formations, is to be understood as following special rules of cooperation (Weiss, 1926). Along this line, May and Doob (1937) commented that "…these two Latin derivatives, the former meaning *to strive together* and the latter *to work together*, embrace a multitude of connotations bearing on the central problem of human relations" (p. 3; emphasis in original). These authors stress that

it would be a mistake, however, to call competition and cooperation polar concepts; for the opposite of "competitive" is not always "cooperative" but may be "uncompetitive"; and "uncooperative" may be the contrast to "cooperative". There seems to be a common element in the two terms: competition or cooperation is behavior directed toward the same social end by at least two individuals (pp. 5–6).

CONTACT: Nora Rangel norarangel2@hotmail.com

Competition is a special case of unequal social interaction under the same rules of working together. Playing chess, competition sports and especially commercial relations are clear examples of the fact that competition entails different sorts of cooperation.

Partial altruism is a special case of cooperative behavior under exchange contingencies. Earnings, resources or labor strength are always subject to some kind of reciprocity rule, not necessarily symmetrical, direct or immediate. In a choice task with two participants solving puzzles in separate computers, partial-altruistic behavior has been defined (Ribes et al., 2008) as consistent responding to the peer's puzzle which produces simultaneous earnings for the participant and for his/her peer (see Ribes et al., 2006, 2008, 2010 for more details about the definition and characterization of partial-altruistic interactions as a special kind of cooperative behavior). In contrast, individual behavior consists in responding to one's puzzle with earnings restricted only to the participant. The development of partial-altruistic behavior requires that both participants in the task respond to the peer's puzzle in such a way that both of them may obtain twice of earnings as compared to responding exclusively to his/her own puzzle. In previous studies using this experimental task (Ribes & Rangel, 2002; Ribes, Rangel, Carbajal, & Peña, 2003a; Ribes et al., 2003b; Ribes, Rangel, Magaña, López, & Zaragoza, 2005), it was found that participants in a partial-altruistic situation preferred to respond to the individual contingency (their own puzzle), in spite of the fact that they obtained fewer earnings. Exposure to concurrent contingencies involving differential earnings was not sufficient to promote the occurrence of partial-altruistic interactions. However, when spontaneous verbal agreements occurred among participants at the beginning of the experimental task, participants engaged in partial-altruistic behavior by placing pieces in the peer's puzzle (Ribes et al., 2006). The influence of verbal induction of partial altruism was confirmed in a subsequent study (Ribes et al., 2008). In this study, verbal anticipation of responses in the form of written declarations by the participants of the dyad induced enduring partial-altruistic interactions between them. Marwell and Schmitt (1975) observed a similar effect when verbal exchanges incremented cooperative or social responses. Recently, Pennisi (2005) stated that "… explicit linguistic interactions may be a necessary condition for the development of behavior under shared contingencies" (p. 93).

Additionally to verbal agreements and declarations of anticipated responding, the induction of reciprocal responding by a confederate has proved to be a relevant factor in the development of partial-altruistic performance. Partial-altruistic behavior may be seen as a case of positive reciprocity in which each participant in the interaction provides extra earnings to his/her peer. In a previous study (Ribes et al., 2008), a confederate initially prompted the experimental participant by placing 10 pieces in the participant's puzzle. In a reciprocity condition, after prompting, the confederate placed a piece in the peer's puzzle every time he/she had previously placed a piece in the confederate's puzzle. In an indifference condition, the confederate always placed pieces in his/her own puzzle, independently of the piece placements of the peer. As a result, reciprocal responding by the confederate induced partial-altruistic behavior in the experimental participant; meanwhile, indifferent responding induced that the participant chose to respond to his/her own puzzle. In a subsequent study (Ribes et al., 2010), the quantitative induction of reciprocity in the participant was examined as a function of relative responding by the confederate to the participant's puzzle. All dyads

(one participant and one confederate) were exposed to successive experimental conditions in which the percentage of pieces placed in the participant's puzzle by the confederate varied from 0%, 25%, 50%, 75% to 100%, with half of the dyads exposed to an increasing order and the other half to a decreasing order. Participants showed reciprocal responding and partial altruism as a function of the proportion of pieces placed by confederates in the participants' puzzles. This finding strengthened the assumption that individual and partial-altruistic responding may be located along a continuum of reciprocity, in this case, from reciprocal indifference to positive partial-altruistic behavior in varying degrees.

Two problems arise from previous studies just reviewed. The first one is related to the generality of relative reciprocal responding by participants. Does participant's reciprocal responding in a partial-altruistic situation also occur when placing pieces is restricted in time by an alternation procedure? Does the alternation procedure promote that reciprocal responding by participants match the percentage of pieces placed by the confederate or partial-altruistic behavior may override the percentage criteria established in the different conditions? A second problem has to do with the interaction between reciprocal responding and verbal declarations anticipating the participant's responses in the partial-altruistic situation. In a study previously quoted (Ribes et al., 2008), verbal anticipation by participants resulted in more enduring effects than reciprocal behavior induced by a confederate on the participant's partial-altruistic behavior.

In order to explore, in a systematic way, the problems mentioned earlier, two experiments were conducted in this research report. The development of Experiment 1 had to do with the first problem. Its purpose was to explore, through the introduction of an alternation procedure of responding, the generality of relative reciprocal responding by participants, effect that was found in Ribes et al. (2010). Related to the second problem, the aim of Experiment 2 was to evaluate, using Ribes et al. (2010) procedure, whether the effect of reciprocal responding is also obtained under conditions of verbal anticipation. This would provide further support to the data reported by Ribes et al. (2008).

Experiment 1

An experiment was designed to confirm the findings by Ribes et al. (2010) where reciprocity of responding by the participants of a dyad was observed in a partial-altruistic situation. A similar procedure than the one implemented in Ribes et al. (2010) was used. However, it was modified to prevent that any of the two members' responding could force the peer to respond to a given puzzle. This was done by reducing the options where they could place the pieces of the puzzle. Thus, the modification consisted in a response alternation procedure between participants in such a way that any member of the dyad could move a piece only after the other member had moved one piece in any of the two puzzles.

Method

Participants

Four female and four male students from the University of Veracruz, ages from 19 to 28, volunteered to participate in this experiment. They were randomly assigned to eight

dyads, one member of which was an experimenter-confederate. Confederates were one male and one female graduate student, specially trained for this experiment. Participants were not informed that his/her peer was an experimenter-confederate. At the beginning of the experiment, participants were shown a list of available music CDs as part of a reinforcement sampling procedure (Ayllon & Azrin, 1968). At the end of each experimental phase, depending on the earned points, participants could exchange their earnings for zero, one or two CDs of their choice.

Apparatus

Two Pentium Dual-Core 2.70 computers were used with a color monitor, keyboard and mouse (the latter served as an input response device). Instructions and experimental setup were displayed on the computer screen. Responses were automatically recorded. The experimental task was designed using a Java environment.

Experimental situation

Seventeen baseline and experimental sessions took place in five consecutive days for each dyad in two rooms that were isolated from noise and other distractions. Two interconnected computers were located one in each room. One participant with one confederate of each dyad solved the task in separate rooms. Two baseline sessions and three sessions corresponding to the first experimental condition were run on the first day. In the remaining four days, three sessions a day took place. Participants took a 10-minute break after each session.

Procedure

In this experiment, a within-subject design was used comprising two individual baseline sessions and five experimental phases. Each phase involved a specific confederate's behavioral pattern toward the peer in the dyad: the percentage of reciprocal placing of pieces into the peer's puzzle. Eight dyads were randomly assigned to two different groups: one exposed to an ascending order of percentage of reciprocity by the confederate and the other to a descending order. The experimental task consisted of solving a puzzle on two different computer screens. Each of the computers presented two displays of the same 50-piece visual puzzle on its monitor. One puzzle appeared in the left section of the screen, the other in the right section. The puzzle on the left section of the screen (labeled "local" or my puzzle) had to be completed by the participant working on the computer. The puzzle on the right section of the screen (labeled "remote" or peer's puzzle) was the same as the puzzle solved by the other member of the dyad working in the other computer. The computers were synchronized in such a way that the performance of one member of the dyad, displayed on the left side of his/her monitor, was also displayed on the right side of the other member's monitor. Each member could, therefore, track the performance of his/her peer. The computers also allowed for each member to place pieces into both puzzles. When a piece was put in its correct place (whether into one's puzzle or into the peer's puzzle), the piece automatically snapped into its position and a given amount of points was earned and displayed

on each monitor. The pieces only snapped in if they were placed in their correct position. By activating a window on the screen, each member of the dyad could audit how many points had been earned. Points were exchanged for CDs at the end of each set of daily sessions. Figure 1 shows the typical arrangement appearing on each screen at the start of the session. In each session, a different puzzle was presented for both members. Sessions had no time limit. Figure 2 shows examples of the 50-piece puzzles used in the experiment.

Baseline sessions A and B served as control conditions to assess participants' puzzle-solving performance under individual, non-shared contingencies. During baseline conditions, participants did not receive points for solving the puzzle. In baseline A, each participant separately solved his/her puzzle, without the display of the peer's puzzle. Baseline B was similar to baseline A, but each participant could observe the display of the peer's puzzle. In order to expose participants to the situation in which two subjects could solve both puzzles, but preventing the early interaction between them, in baseline B, the computer was programmed to simulate a peer solving the puzzle. The computer placed a piece in the remote puzzle, randomly selected, every five seconds.

Experimental phases involved a partial-altruism situation. In this situation, when a participant placed a piece into his/her own puzzle (local puzzle), points were awarded only to him/her. When a piece was correctly placed into the peer's puzzle, points were awarded to both participant and confederate. The task consisted of a choice situation in which, when placing pieces into the peer's puzzle (shared or partial-altruistic response),

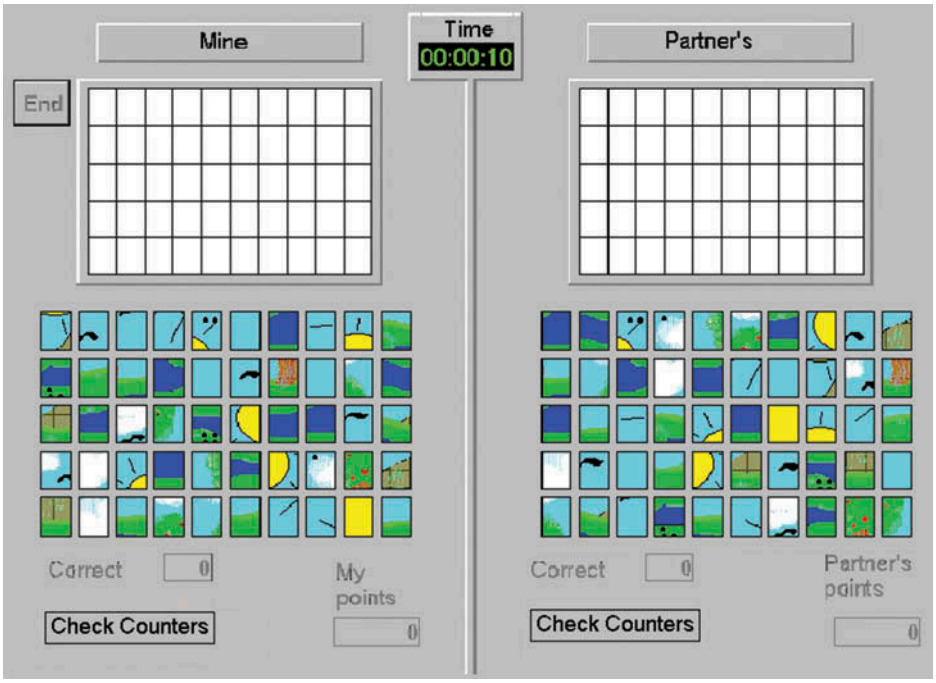

Figure 1. Typical arrangement of the computer screen at the start of a session. In baseline A, the screen did not display the peer's puzzle. In baselines conditions (A, B), participants did not earn points.

Figure 2. Visual puzzles used in different experimental sessions.

both members of the dyad could obtain twice as much earnings compared to placing pieces into his/her own puzzle (individual response). During experimental sessions, for each piece placed by a participant into his/her own puzzle, only he/she obtained 10 points. For each piece placed into the peer's puzzle, both participant and confederate obtained 10 points. Participants were informed about how many points they could earn by responding to their own puzzle (500 per session) or by responding to the peer's puzzle (1000 points per session). In order to obtain 1000 points per session, both members of the dyad (participant and confederate) should place all the pieces in the peer's puzzle. If they obtained less than 1580 points at the end of a daily session, no CD was earned. If they obtained from 1581 to 2400 points, one CD was earned by each member of the dyad. If they obtained more than 2401 points, two CDs were earned by each one. Before each experimental session, instructions and an exemplifying demo were presented on the screen. When a member of a dyad completed his/her puzzle, he/she could finish the session for both of them by pressing the 'End' key (see Figure 1). He/she could also wait for his/her peer to finish. If the 'End' key was not pressed, the session ended when both participant and confederate completed their puzzles. In this study, confederates were instructed to never end the sessions by pressing the 'End' key.

In each experimental phase, the confederate in each dyad placed a percentage of pieces into his/her peer's puzzle. In Group 1, confederates followed an ascending percentage of 0, 25 (13 pieces), 50 (25 pieces), 75 (38 pieces), and 100% (50 pieces) while, in Group 2, confederates followed a descending order from 100 to 0%. Placing pieces by the confederate and the participant followed an alternation pattern. That is, they could place a piece only after his/her peer had previously placed one. None of them could move two pieces in succession.

The percentage of reciprocity by confederates varied according to experimental phases. During the 100% of reciprocity phase, confederates placed as many pieces as possible in the participant's puzzle. During the 0% of reciprocity phase, confederates never placed a piece in the participant's puzzle, even when participants placed pieces in the confederates' puzzles. In the phases of 75%, 50%, or 25% of reciprocity, the confederate placed the programmed pieces (38, 25, or 13, respectively) in the peer's puzzle. Excepting in the 0% condition, confederates began each session placing a piece in the participants' puzzle and continued doing that until reaching the number of programmed pieces. After that, the confederates placed the remaining pieces in their own puzzle, according to the programmed proportion in the specific condition. Participants could place pieces in the confederates' puzzles as long as these were not completed. In each dyad, the confederate was the same through all the experiment. Reciprocity was evaluated through the proportional placement of pieces by participants in the confederates' puzzle following the placement (collocation) of pieces by confederates. Confederates and participants had no interaction outside of the laboratory situation. The confederates were provided with explicit training experience in order to implement the arranged contingencies.

Results and discussion

Figures 3 and 4 show the number of correct placements in both puzzles by the participants and confederates in each dyad of Groups 1 and 2. Baselines are not included since all participants placed correctly all the pieces in the local puzzle. Panels labeled "local" indicate the number of correct placements in one's own puzzle. Panels labeled "remote" indicate the number of correct placements made in the peer's puzzle.

Figure 3 shows that participants in four dyads of Group 1 increased the placement of pieces into the remote puzzle according to the increasing percentage of reciprocity by the confederate, in successive phases. The participant's preference for responding to the remote puzzle increased according to the percentage of placements in the peer's puzzle made by confederates. The number of placements in the remote puzzle by the participants was the same or slightly higher than reciprocal placements by confederates. In the 0% of reciprocity phase, participants in Dyads 2 and 3 did not place any piece in the remote puzzle. When the percentage of reciprocal placement was lower than 100%, participants in Dyads 3 and 4 usually placed more pieces than the confederates in the remote puzzle, usually during the second and third phases. Participants in this group did not end the task before the completion of both puzzles.

Figure 4 shows that participants in Group 2 decreased the placement of pieces into the remote puzzle according to the decreasing percentage of reciprocity by the confederate, in successive phases. Participants in Dyads 6, 7, and 8 sometimes placed more pieces into the remote puzzle than their confederates, but they never placed fewer pieces. On the contrary, the participant in Dyad 5 always placed fewer pieces in the remote puzzle than the confederate, with no pieces placed during the 0% of reciprocity phase. This performance affected the number of pieces that the confederate could place in the local puzzle during phases involving 25%, 50%, and 75% of reciprocity. This participant was the only one who ended the session after completing his/her puzzle in

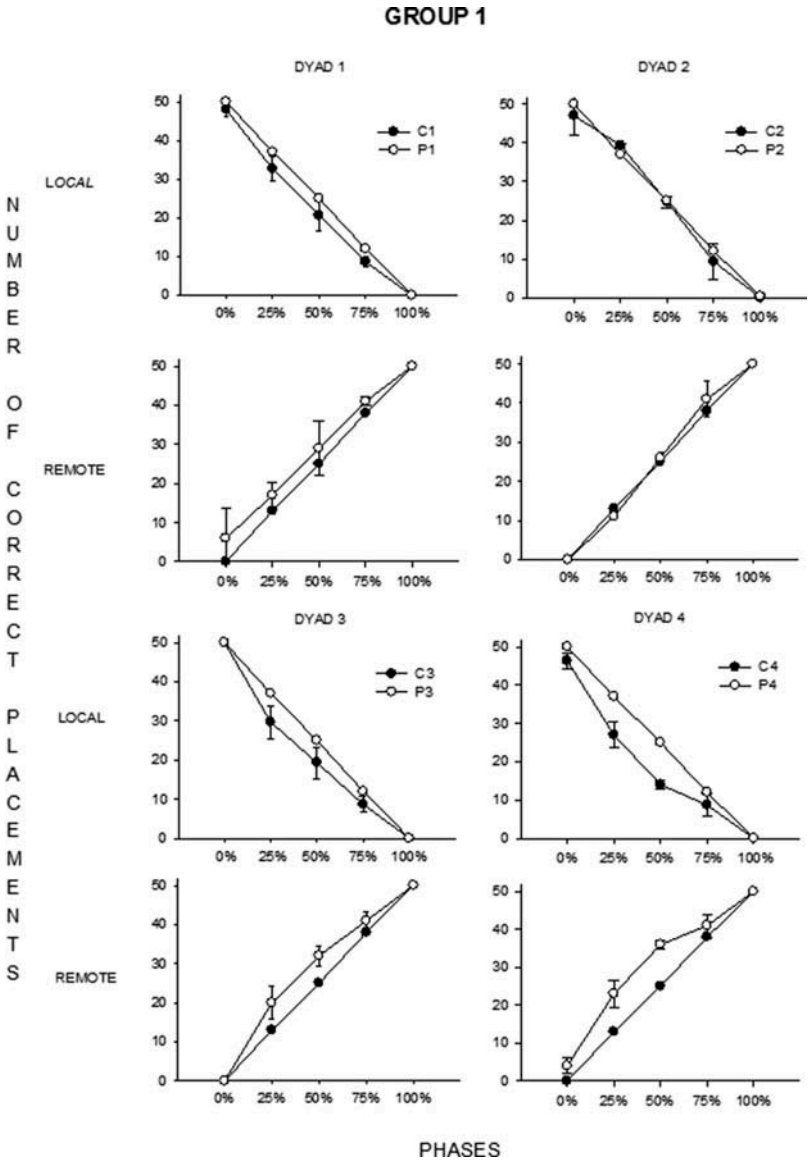

Figure 3. Number of correct placements into both puzzles by the participants and confederates in Group 1. Symbols and lines represent experimental conditions. Empty circles correspond to participants (P) and filled circles correspond to confederates (C). Error bars show standard deviations of the means.

sessions 2 and 3 of the first and second phases. The other participants did not show different performances than those observed in Group 1. Participants in this Group did not end the task before the completion of both puzzles.

Results of this experiment confirm that development of partial-altruistic behavior depends, in the first instance, on the induction of reciprocal responding by at least one of the members in the dyad (in this case, the confederate). Participants showed consistent placing of pieces in the remote puzzle according to the percentage of

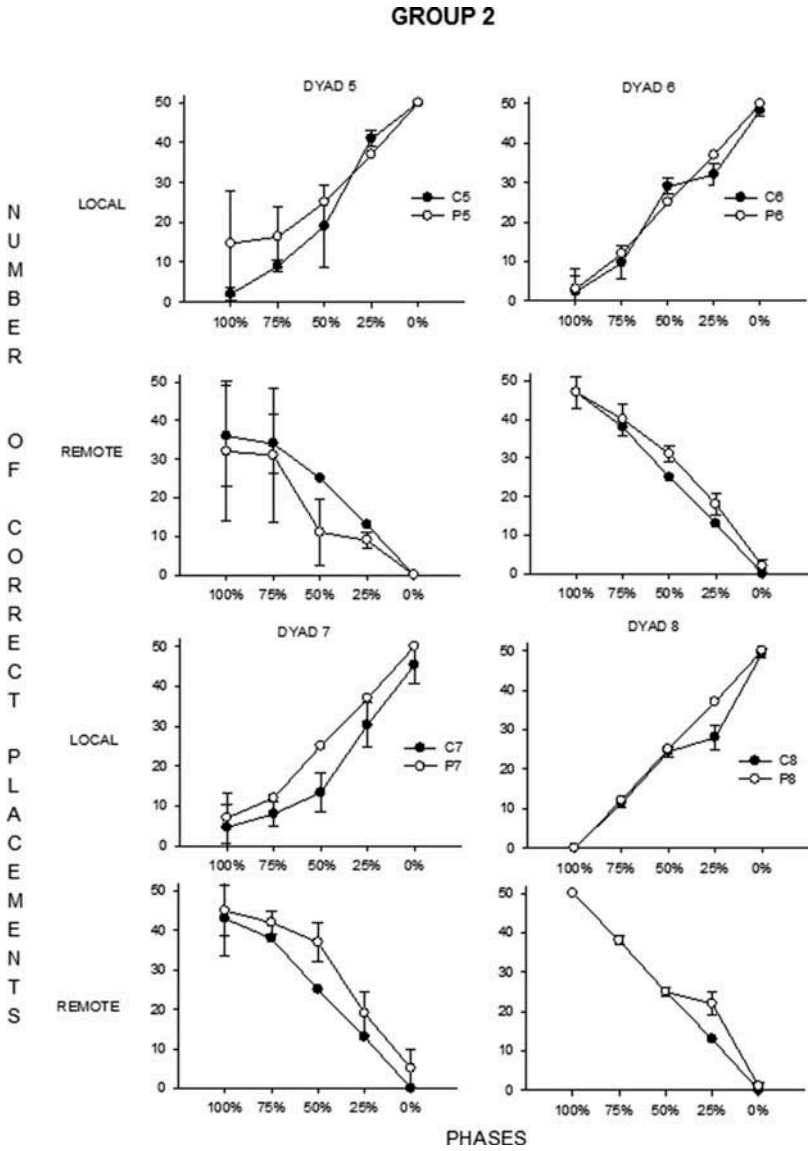

Figure 4. Number of correct placements into both puzzles by the participants and confederates in Group 2. Symbols and lines represent experimental conditions. Empty circles correspond to participants (P) and filled circles correspond to confederates (C). Error bars show standard deviations of the means.

reciprocal responding by the confederate. Reciprocal responding to percentages of placing in the remote puzzle by the confederate resulted from an alternated-response procedure instead of a free-responding procedure, confirming the reliability of the finding previously reported by Ribes et al. (2010). Participants never placed fewer pieces than the confederate in the remote puzzle (with exception of Participant 5) in any of the percentage of reciprocity conditions (obviously excluding the 0% condition). On the contrary, some extra responding to the remote puzzle by the participants was observed

especially during the 0%, 25%, and 50% of reciprocity conditions, showing a restricted induction of partial-altruistic behavior. Reciprocity of responding under partial-altruism contingencies seems to be a robust phenomenon independently of artifacts generated by the experimental procedure.

Experiment 2

The response alternation procedure used in Experiment 1 showed a consistent effect of the percentage of response reciprocity on the occurrence of partial-altruistic behavior. Experiment 2 was designed to evaluate the relative effects of participant's written declarations about anticipated responding on different percentages of induced reciprocity in a partial-altruistic situation.

Method

Participants

Six female and two male students at the University of Guadalajara, ages from 18 to 25, volunteered to participate in this experiment. Confederates were three male and one female graduate-student, specially trained for this experiment. As in Experiment 1, participants were not informed that their peer was as an experimenter-confederate. Points earned during the sessions were exchange for musical CDs at the end of every experimental phase.

Apparatus

Two Pentium IV computers were used with a color monitor, keyboard and mouse (the latter served as an input response device). Instructions and the experimental setup were displayed on the computer screen. Responses were automatically recorded. The experimental task was designed using Visual Basic 6.0 for Windows 95.

Experimental situation

The situation was the same that in Experiment 1.

Procedure

In order to evaluate the effects of written declarations on non-alternated responding, the experimental procedure was similar to that in Ribes et al. (2010) in which no response alternation procedure was used. Participants could place their pieces freely in time. Confederates always placed the programmed number of pieces in the participant's puzzle at the beginning of each session. Nevertheless, since the task was a free-choice situation, the speed with which participants placed their pieces could not match that of confederates. In some cases, participants could firstly respond to the puzzle in which it was experimentally planned the confederate's responses. Therefore, confederates could place fewer pieces in either puzzle than the scheduled percentage. To evaluate the effect of written declarations, a procedure similar to that in Ribes et al. (2008) was employed. Prior to the beginning of solving their puzzles, the participant and the confederate filled up a questionnaire declaring how they were going to respond to the task. Each member of the dyad could read about the intentions of his/her peer. The confederate always

declared that he/she was going to respond to the peer's puzzle and that he/she expected the participant to respond to the remote puzzle (confederate's puzzle). The questionnaire is included in the Appendix.

Results and discussion

Figures 5 and 6 show the number of correct placements in both puzzles by the participants and confederates in each dyad of Groups 1 and 2. Baselines are not included since all participants placed all the pieces correctly in the local puzzle.

Panels labeled "local" indicate the number of correct placements in one's own puzzle. Panels labeled "remote" indicate the number of correct placements made in the peer's puzzle.

Figure 5 shows that all participants increased the placement of pieces into the remote puzzle according to the increasing percentage of reciprocity by their confederates, in successive phases. Only the participant in Dyad 4 seemed to match confederate's number of correct placements in the remote puzzle. Participants in the other dyads placed more pieces than the confederate in the remote puzzle during sessions with 25%, 50%, and 75% of reciprocity.

Figure 6 shows that participants in Group 2 decreased the placement of pieces into the remote puzzle according to the decreasing reciprocity by the confederate in successive phases. However, only participants in Dyads 7 and 8 approximated the confederates' number of placements in the remote puzzle. Participants in Dyads 5 and 6 showed a higher number of placements (above 60%) in the remote puzzle, after the initial 100% of reciprocity phase.

Table 1 shows written declarations by participants of all dyads before every experimental session. Participants responded to two kinds of questions. The first one was related to the puzzle in which the participant was going to respond and the earnings for doing so. In the second question, it was asked where the participant thought his/her peer (the confederate) was going to respond and which it would be the peer's earnings. As previously mentioned, confederates always responded that they were going to respond to the peer's puzzle and that they expected their peers to respond to the remote puzzle. Participants in Group 1 were first exposed to the 0% of reciprocity in responding. The only option discarded by all participants was to place pieces in their own (local) puzzle. Participant 1 declared, on six of the sessions, he/she would place pieces in the peer's puzzle if he/she did the same. In the rest of the sessions, this participant declared, as the rest of the group participants, that he/she would place pieces in both puzzles; sometimes because the peer would do the same and other times irrespectively of the peer's placements. When asked where they expected their peers would place their pieces, most participants in this group responded that in the remote puzzle (theirs) or in both puzzles. In the first two phases, with 0% and 25% reciprocity, all participants (except #4) sometimes declared that they expected their peers would respond to the local puzzle (the confederate's own puzzle). In Group 2, three of the participants (6, 7, and 8) responded to the first question, in most of the sessions, by saying that they would place their pieces in the remote puzzle if their peers did the same. Participant 5 declared in most of the sessions, that he/she was going to respond to any puzzle independently of the peer's response. To the second question, participants in

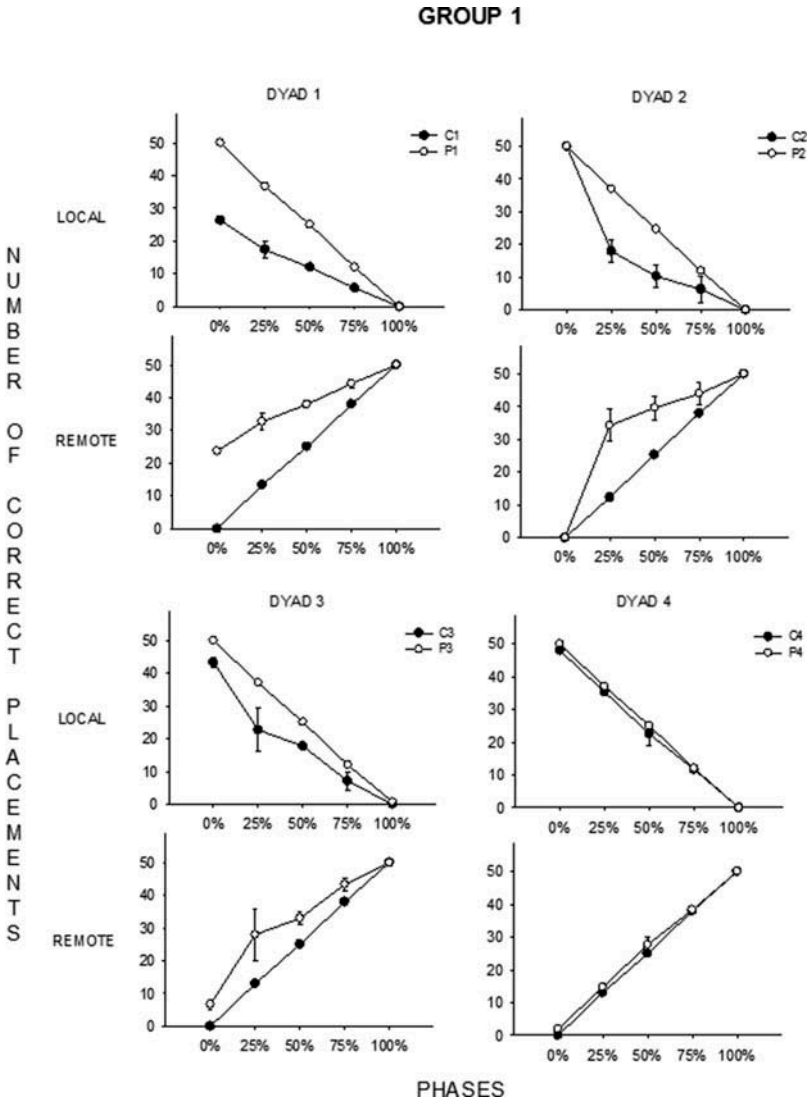

Figure 5. Number of correct placements into both puzzles by the participants and confederates in Group 1. Symbols and lines represent experimental conditions. Empty circles correspond to participants (P) and filled circles correspond to confederates (C). Error bars show standard deviations of the means.

Group 2 mostly responded that they expected that their peers (confederates) would place their pieces in the remote puzzle, in both puzzles or in any puzzle. In some sessions of phases 4 and 5 (corresponding to 25% and 0% of reciprocity), participants 5 and 7 responded that their peers were going to place their pieces in the local puzzle (the confederates' puzzles).

The results of this experiment confirm a strong effect of reciprocal responding on partial-altruistic performance. As in Experiment 1, participants adjusted their responding in the remote puzzle to the behavior of the confederate and, in some cases, they placed slightly more pieces in the peer's puzzle. This effect occurred independently of

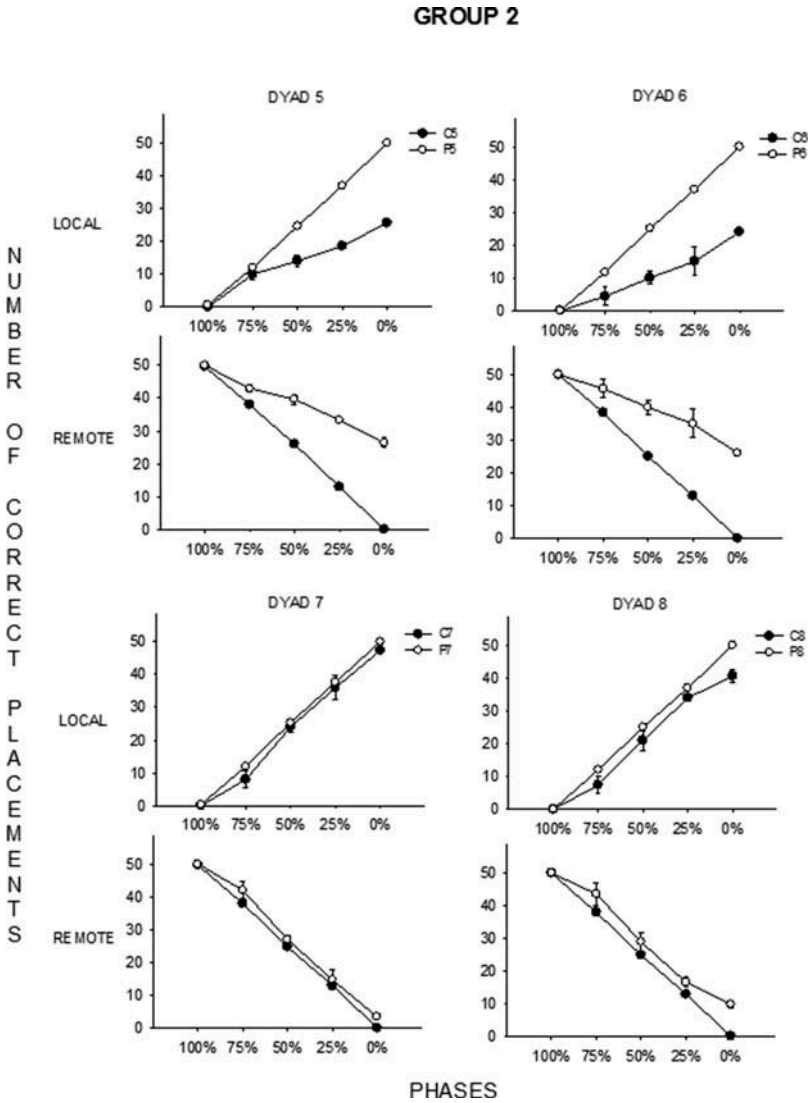

Figure 6. Number of correct placements into both puzzles by the participants and confederates in Group 2. Symbols and lines represent experimental conditions. Empty circles correspond to participants (P) and filled circles correspond to confederates (C). Error bars show standard deviations of the means.

the ascending or descending order of percentage of scheduled reciprocity for separate groups. Verbal declarations by participants were congruent with their behavior when placing pieces in both puzzles. However, verbal declarations do not seem to be the main factor to induce reciprocal responding by a participant. Rather, verbal declarations seemed to change according to the percentage of reciprocity operated by the confederate in the immediately preceding session. This effect is illustrated by changes in the verbal declarations of the participants in the session with lower percentages of reciprocity.

Table 1. Options chosen by participants in Groups 1 and 2 from Experiment 2 to the questions presented before every experimental session.

In which puzzle am I going to respond?															
	Group 1														
	Phase 1			Phase 2			Phase 3			Phase 4			Phase 5		
Participants	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3
P1	4	4	3	3	4	4	4	4	4	2	2	2	2	2	2
P2	2	4	4	4	2	2	4	4	4	4	4	4	4	4	2
P3	4	3	3	4	2	4	4	4	4	4	4	4	4	4	4
P4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3
	Group 2														
	Phase 1			Phase 2			Phase 3			Phase 4			Phase 5		
	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3
P5	4	*	*	4	4	2	4	4	4	2	4	4	4	4	4
P6	4	2	2	2	2	2	2	2	2	2	2	2	2	4	4
P7	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2
P8	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2
In which puzzle do you think that your peer is going to respond?															
	Group 1														
	Phase 1			Phase 2			Phase 3			Phase 4			Phase 5		
Participants	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3
P1	1	1	1	2	2	2	2	2	4	1	1	1	1	1	1
P2	2	2	2	2	3	3	3	3	3	3	3	3	3	1	1
P3	2	2	2	2	4	3	1	1	1	4	1	3	1	1	1
P4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Group 2														
	Phase 1			Phase 2			Phase 3			Phase 4			Phase 5		
	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3
P5	1	*	*	1	1	1	1	1	1	1	1	3	3	2	2
P6	4	1	1	1	1	1	1	1	3	3	3	3	3	3	4
P7	3	1	1	1	1	1	3	1	3	1	3	2	1	2	2
P8	1	1	1	1	4	1	1	1	1	1	1	1	1	1	1

*Missing values.

General discussion

Ribes et al. (2010) found that participants' reciprocal responding varied as a function of the proportion of individual or shared responses made by a confederate. In order to continue exploring this result, in Experiment 1, it was evaluated whether this effect could also be obtained under a response alternation procedure that prevented that any of the two members of the dyad would respond to any puzzle before the other had placed a piece. That is, in a freely time response procedure, participants could be forced to respond to a given puzzle since options where to place pieces would be decreased by the peer's responses. The results of Experiment 1 show that participants displayed partial-altruistic behavior as a function of the percentage of remote placements made by confederates.

Considering these results, in Experiment 2, it was evaluated whether using the original procedure proposed by Ribes et al. (2010) – without the alternation procedure – the effect of verbal anticipation found in Ribes et al. (2008) was also obtained. Results

of Experiment 2 also confirm the effect of anticipated verbal declarations about reciprocal responding on partial-altruistic performances.

In both experiments, the behavior displayed by the confederates was scheduled independently of participant's behavior. It consisted in placing a determined percentage of pieces at the beginning of each session in the participant's puzzle. Reciprocity was operationally defined when participants placed a similar percentage of pieces in the confederate's puzzle. Strictly speaking, the behavior of confederates induced reciprocity to the extent that participants placed a similar number of pieces in their remote puzzles to those placed by confederates in the participants' puzzles. Reciprocity, such induced, regulated the extent or amount of partial-altruistic interactions during experimental sessions, from 100% to 0%.

These data suggest that partial-altruistic interactions seem to depend on reciprocal behavior of peers rather on the amount of earnings that participants may obtain. This interpretation helps to understand why, in previous experiments (without verbal interactions), participants chose individual contingencies instead of shared contingencies which provided larger earnings (Ribes & Rangel, 2002; Ribes et al., 2003a, 2003b, 2003c). Social interactions, thus, seem to depend basically on the behavior of peers rather than on extrinsic outcomes as it is supported by economic assumptions (e.g., Rachlin, 2002).

Reciprocity seems to work as an overall effect, rather than as a local, one-to-one, phenomenon. Although in the experiments here reported, participant's behavior was sometimes immediately reciprocal to confederate's behavior; in other instances, reciprocal responding (especially during 25%, 50%, and 75% conditions) was not a one-to-one effect due to the personal speeds of participants placing their pieces, among other reasons. The conditions establishing extreme values, 100% and 0% of reciprocity, promoted consistent responding to the remote puzzles (partial-altruistic behavior) or to the local puzzles (reciprocal indifference), confirming previous observation (Ribes et al., 2010) considering that partial altruism and other social behaviors could be seen as phenomena located in a continuum of reciprocity, including negative, indifferent, and positive interactions. Preference for individual contingencies by both participants under social contingencies would illustrate a case of reciprocal indifference. Consistent responding by one of the peers to the remote puzzle (Ribes et al., 2010, 2008) or verbal instigation to do so (Ribes et al., 2008) seems to change reciprocal indifference into partial-altruistic behavior as a case of positive reciprocity.

The results of the second experiment in this study suggest that verbal behavior displays different functions in social interactions. Written declarations by participants about where they were going to place their pieces or where they expected their peers would respond seemed to adjust to the actual percentages of reciprocity occurring after each session. This result replicates the finding by Ribes et al. (2008) in which a confederate reciprocal responding to the participant's behavior affected participant's written occurring at the beginning of the next session. Reciprocity consisted in the confederate placing a piece on the participant's puzzle only after the participant had placed a piece in the confederate's puzzle. Although written declarations by the participants stating that they would place a piece in any puzzle could facilitate partial-altruistic behavior in that study, it is most likely that consistent reciprocal behavior by the confederate was responsible for its maintenance. In the same study, partial-altruistic behavior was found to occur between naïve participants when they anticipated, in their

written declaration responding to the remote puzzle or to any puzzle at the beginning of every session. In this case, the verbal agreement to respond to the remote puzzles by both participants seemed to be responsible for the occurrence of partially altruistic behavior, pointing to two different functions of written declarations. One was a declaration about which puzzle should be chosen according to the behavior of the peer (confederate) in the previous session. Another was a declaration of intention regarding the participant's behavior in the session to follow. The first type of written declarations was an outcome of previous interactions with the confederate in solving the puzzles and, henceforth, it was similar to an implicit description of past events. The second type of written declarations anticipated the behavior to be displayed during the session, setting up the contingencies to prevail during the task. In the second experiment here reported, written declarations by the participants corresponded to the first type of verbal function and they did not regulate their behavior. Written declarations differ in their effects from spontaneous verbal agreements emerging during the task (Ribes et al., 2005, 2006). In this case, verbal behavior seems to directly promote partial-altruistic behavior through reciprocal responding of both participants to the remote puzzle.

The findings of these and other studies (Henrich & Henrich, 2007; Marwell & Schmitt, 1975; Ostrom & Walker, 2003; Torche & Valenzuela, 2011) suggest that cooperation, conceived as the general form of social behavior, evolves from a complex network of reciprocity relations, giving rise to diverse exchange interactions among individuals across power, sanction, and economic relations. Although reciprocal relations are not restricted to direct an immediate episode involving symmetrical exchanges of responding and outcomes, as in the experiments here reported (Molm, 2010), reciprocity seems to initially grow out from the moment-to-moment exchanges among individuals. The particular history of this exchange may be identified with "trust" (Vuolevi & Van Lange, 2012), and trust would be a determinant setting factor for the development and stability of future interactions entailing non-immediate, asymmetrical, and indirect or delayed exchanges of behavior and outcomes. Trust, as the interpersonal history of reciprocal interactions, is not only restricted to the behaviors taking place in a given exchange episode, but also involves the development of social qualitative judgments such as confidence and reputation, related to verbal variables dealing with agreements, declarations, and expectations.

The research on reciprocity and social interactions must move to the experimental analysis of various parameters related to symmetrical-asymmetrical reciprocity in responding and outcomes under immediate and delayed conditions of exchange. At the same time, it is necessary to evaluate the functional role of different types of verbal interactions among participants and the conditions under which these verbal episodes emerge during reciprocal exchanges. In this context, the systematic manipulation of confederate's behavior seems to be a promising experimental tool. Verbal and instrumental behavior of confederates may allow for the induction, shaping, and maintenance of different patterns of reciprocal interactions between participants exploring the development and emergence of different social interactions under rigorously prescribed contingencies.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Appendix

Appendix. Questionnaire presented at the beginning of every experimental session in Experiment 2. The arrow symbol (►) indicates the options to which confederates responded in all experimental sessions.

Please respond to the following questions:

In which puzzle am I going to respond?

○ If my peer responds to his/her puzzle, I am going to respond to mine.
➢ If my peer responds to my puzzle, I am going to respond to his/ hers.
○ If my peer responds to both puzzles, I am going to respond to both puzzles.
○ I am going to respond to any puzzle independently of my peer's responses.

I respond in this way, I am going to earn

○ More points than he/she does.
○ Less points than he/she does.
○ Equal of points that he/she does.
➢ I can't know it before the task.

In which puzzle do you think that your peer is going to respond?

➢ To mine
○ To his/her puzzle
○ To both puzzles
○ To any puzzle

If he/she responds in that way, he/she is going to earn

○ More points than me.
○ Less points than me.
○ Equal points than me.
➢ I can't know before the task