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Cooperation in Social Dilemmas: Social Norms and Cognitive Processes

Cooperación en Dilemas Sociales: Normas Sociales y Procesos Cognitivos

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The purpose of this study was to analyze the role of social norms and cognitive processes in cooperative decisions in a non-probabilistic self-selected sample of Psychology freshmen attending the Universidad Nacional de Córdoba (Argentina). Two studies were conducted (Study 1: n = 124; Study 2: n = 104). In both of them a factorial design implemented in 2 phases was used: (a) cooperative environment and non-cooperative environment, using the Prisoner's Dilemma Game (PDG) and (b) time response conditions (Study 1) or cognitive load conditions (Study 2). In this stage participants played the Public Goods Game. The level of cooperation in the second stage was the main dependent variable. Student' t test, logistic and linear regression analyses, and univariate and multivariate analyses of variance were carried out. The manipulation for generating several social norm environments was not effective. Multiple effects on cooperation were observed depending on which indicators of cognitive processing were considered. The main finding of this study is an interaction effect between the social norm environment and the cognitive load condition in the first PDG round (Study 2).

Keywords: cooperation, social norms, cognitive processes, experimental games

El objetivo de esta investigación fue analizar el rol de las normas sociales y los procesos cognitivos en las decisiones cooperativas en muestras no-probabilísticas de auto-selección de ingresantes a Psicología de la Universidad Nacional de Córdoba (Argentina). Se llevaron a cabo 2 estudios experimentales (Estudio 1: n = 124; Estudio 2: n = 104). En ambos se utilizó un diseño factorial en 2 fases: (a) contexto cooperativo o no cooperativo, utilizando el Juego del Dilema del Prisionero (JDP), y (b) condición de tiempo de respuesta (Estudio 1) o de esfuerzo cognitivo (Estudio 2), utilizando el Juego de Bienes Públicos. El nivel de cooperación fue la principal variable dependiente en la fase 2. Se utilizó t de Student, análisis de regresión logística y lineal y análisis univariados y multivariados de la varianza. La manipulación para generar distintos contextos normativos fue inefectiva. Se observaron distintos efectos en la cooperación según el indicador de procesos cognitivos usado. El principal resultado corresponde a la interacción entre el contexto social normativo y la condición de carga cognitiva en la primera ronda del JDP (Estudio 2).

Palabras clave: cooperación, normas sociales, procesos cognitivos, juegos experimentales

The development of human societies relies on cooperation. Nowak (2012) proposed five mechanisms through which cooperation can evolve: kin selection, multilevel selection, spatial selection, direct reciprocity, and indirect reciprocity. With the aim of explaining why evolution has favored cooperation, researchers have carried out several experiments using experimental games that explore these mechanisms in the lab (Bolton, Katok, & Ockenfels, 2005; Rockenbach & Milinski, 2006). While such questions have dominated cooperation studies for years, some authors have started to explore what happens when the mechanisms of cooperation are absent, focusing their attention on cognitive processes (Rand & Nowak, 2013).

In relation to the study of cooperation, most articles about cognitive processes follow Kahneman's proposal that decisions result from the interaction between two systems, an intuitive one (System 1) and a deliberative one (System 2; e.g., Peysakhovich & Rand, 2016; Rand, Greene, & Nowak, 2012; Rand & Kraft-Todd, 2014). We built on this proposal in our study. Studies on this topic have not always yielded

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consistent results (Cappelen, Nielsen, Tungodden, Tyran, & Wengström, 2014; Cornelissen, Dewitte, & Warlop, 2011; Halali, Bereby-Meyer, & Ockenfels, 2013; Hauge, Brekke, Johansson, Johansson-Stenman, & Svedsäter, 2009; Hauge, Brekke, Johansson, Johansson-Stenman, & Svedsäter, 2014; Lotito, Migheli, & Ortona, 2013; Nielsen, Tyran, & Wengström, 2014; Piovesan & Wengström, 2009; Rand et al., 2012; Rubinstein, 2007; Schulz, Fischbacher, Thöni, & Utikal, 2014; Tinghög et al., 2013) and—to the best of our knowledge—only a few have been conducted in Latin American countries.

In order to shed light on the controversial question about the processes involved in cooperation and to encourage the study of cooperation in the local context, we propose to examine the effects of social norms and two indicators of cognitive processing—time responses (Study 1) and cognitive load (Study 2)—on the cooperative decisions of students in multiple experimental games. We present the results of two experimental studies, each of which comprised two stages. In stage 1 of both studies, the generation of social norms was not effective, while the results of stage 2 differed across studies depending on which indicator of cognitive processing was considered.

Our study can generate empirical evidence to contribute to cooperation literature. It is important for our future as a society to conduct this type of experimental research, since it reveals how people make cooperative decisions and which environments favor or undermine cooperation. The complexity of the study of cooperation requires the contribution of a wide range of disciplines, such as psychology or economics, or a mix of them (new approaches of behavioral economics). Furthermore, most research on cooperation has taken place predominantly in the United States (Yale University and Harvard University) and Germany (Max Planck Institute for Human Development). Some authors suggest that there is some cultural variability in the results of studies on cooperation, affecting elements such as reasoning and perception styles, among others (e.g., Henrich, Heine, & Norenzayan, 2010). Although there are studies of cooperation in our immediate context (Latin America; e.g., Cárdenas & Jaramillo, 2007), they are scarce in comparison to other regions. Thus, this article seeks to contribute to the local development of this topic, facilitating the establishment of new lines of research. Moreover, the fact that manipulating the generation of social norms was not effective in either studies of our research, makes it possible to initiate a discussion about the use of the framework of repeated games for this purpose and to think about new ways to manipulate social norms.

Regarding the experimental design we used, we also make a contribution. Although we followed the procedure employed by Peysakhovich and Rand (2016), our studies are not a direct replication of their study. Only Stage 1 in both studies is similar to that implemented by the authors, so it can be considered a *direct replication* according to Schmidt (2009). Nevertheless, we made several modifications in stage 2 of both studies, an approach that brings our work closer to a *conceptual replication* according to Schmidt (2009). Basically, a conceptual replication consists in testing hypotheses or results from a previous study but using a different experimental set-up. In stage 2, we included repeated rounds of two experimental games instead of one instance of different games. Taking into account differences in cooperation in games with different possibilities for future interaction (Dal Bó, 2005; Rand & Nowak, 2013), we intended to evaluate the effects of several experimental manipulations throughout multiple rounds. Another difference in stage 2 is related to the addition of cognitive processing indicators. Due to controversial results regarding cognitive processes and cooperation, we decided to work with two indicators: time pressure and cognitive load. Moreover, we added a validated version of the Rational Experiential Inventory. Peysakhovich and Rand (2016) used the Cognitive Reflection Test, but we did not have clear evidence of its usefulness in our context. Additionally, we included a measure to explore external validity, for which subjects had the possibility of choosing whether to donate or not the money earned in the experimental games. Below we explain in more detail all these similarities and differences with respect to the original article.

We structured the rest of the article as follows. First, we present a review of the literature together with the main objectives and hypotheses. Then, we lay out the method and results of Study 1 and Study 2. Finally, we discuss the results based on previous studies.

Literature Review, Objectives, and Hypotheses

Social Heuristics Hypothesis (SHH)

This recent approach (Peysakhovich & Rand, 2016; Rand et al., 2014) holds that individuals develop heuristics in their social interactions and that these are shaped in everyday experiences. Strategies which are commonly advantageous become automatic in other contexts, like default responses. Subsequently, it is assumed that automatic cooperative responses are formed outside the lab in various contexts via the mechanisms leading to the evolution of cooperation outlined above (Rand et al., 2014; Rand & Nowak, 2013).

In this regard, Peysakhovich and Rand (2016) offer evidence in favor of the SHH through a two-phase study. In stage 1, subjects were exposed to several environments of cooperative and non-cooperative social norms. In stage 2, subjects were exposed to only one round of multiple experimental games. Researchers demonstrated that participants exposed to a cooperative environment (CE; stage 1) were substantially more cooperative in the first rounds of the various experimental games (stage 2), with these effects being more noticeable in subjects who relied more on their intuitions or heuristics to make decisions. Similarly, in another study carried out by Rand and Kraft-Todd (2014), the results were also in favor of the SHH. Results showed that a decision made under time pressure increases contribution between subjects who trust each other in their daily interactions and who have no previous experience in these games. Another study also found that intuition promotes cooperation only in those subjects without previous experience with the virtual platform where experiments were conducted (Mturk; Rand et al., 2012). In this paper, we offer new evidence about the SHH using a sample of Argentinean university students.

Social Norms

Human beings must share social norms to live in CE. One of the methods used to generate social norms in the lab –which has strong empirical support– consists in the repetition of experimental games (Peysakhovich & Rand, 2016). In this study, we replicated the generation of social norms implemented by Peysakhovich and Rand (2016). Like these authors, we expected that subjects exposed to CE would internalize cooperative norms and that those exposed to non-cooperative environments (NCE) would internalize non-cooperative norms (Hypothesis 1, H1).

Cognitive Processes

The cognitive processes involved in the decision of cooperating or not cooperating have been studied in different ways (Kinnunen & Windmann, 2013; Rand et al., 2012; Rand et al., 2014). One of the methods used by researchers to distinguish between these processes consists in measuring the subject's response times. System 1 is associated with fast responses, while System 2 is associated with slow responses (Kahneman, 2012). Consequently, to manipulate the response time, two experimental conditions—time pressure and time delay—are generated. This procedure has been used by Rand et al. (2012), among other researchers, who pose the question of whether human beings are intuitively selfish or intuitively cooperative. These researchers observed that forcing subjects to decide quickly increases contributions in experimental games, while forcing them to decide more rationally decreases contributions.

Furthermore, similar results to those of Rand et al. (2012) have been found (Cappelen et al., 2014; Lotito et al., 2013; Nielsen et al., 2014; Rubinstein, 2007). Nevertheless, other studies provide evidence which stands in opposition to previous results (Piovesan & Wengström, 2009; Tinghög et al., 2013). Thus, in our first study we compared the level of cooperation between two response time conditions: time pressure and time delay. Like Rand et al. (2012), we expected that subjects in the time pressure condition would contribute more in the first round of the Prisoner's Dilemma Game (PDG) and the Public Goods Game (PGG) than subjects exposed to the time delay condition. Moreover, a decrease in cooperation is expected across PGG rounds (Guala, 2005), with the time pressure condition being associated with a smaller drop in cooperation than the opposite condition. We also evaluated the possible effects of interaction between the normative environment (stage 1) and the time response condition (stage 2) on cooperation in the PDG and in the PGG (Hypothesis 2, H2).

Besides response time, cognitive load is used as an indicator to differentiate systems 1 and 2. Researchers generally allocate subjects in two conditions: high cognitive load (HCL) and low cognitive load (LCL). In the HCL condition, system 1 has a stronger influence than system 2, because the subject is busy with a more complex task and is similar to the time pressure condition (Kahneman, 2003).

One of the tasks which are most commonly used to manipulate the cognitive load consists in memorizing a series of numbers or letters (e.g., Duffy & Smith, 2014; Hauge et al., 2009; Hauge et al., 2014). Like those on response time, studies on cognitive load have yielded contradictory results. Similar to Schulz et al. (2014), Kessler and Meier (2014) observed that subjects cooperate more in the HCL condition. However, in a subsequent replication, they found the opposite result (in line with Halali et al., 2013): on average, subjects in the LCL condition donated more than those in the HCL condition. Other authors found no differences in cooperation between cognitive load conditions (Cornelissen et al., 2011; Hauge et al., 2009; Hauge et al., 2014).

In our second study, we followed the same objectives as in stage 2 of Study 1, but using another indicator of cognitive processing. In this case, following Schulz et al. (2014), we expected that subjects

exposed to a HCL condition would cooperate much more than subjects exposed to a LCL condition in the first PDG round and also in the first PGG round (Hypothesis 3, H3).

Cognitive Processing Style

In addition to the above indicators used to assess dual processes, researchers have developed measures aimed at estimating the willingness of an individual to decide in a rational or in an experiential manner. One of them, the Rational-Experiential Inventory (REI; Epstein, Pacini, Denes-Raj, & Heier, 1996; Pacini & Epstein, 1999), was administered in this study. This inventory has been proven to have adequate psychometric properties in several countries, such as the United States of America, Sweden, and Argentina (Björklund & Bäckström, 2008; Reyna & Ortiz, 2016; Witteman, van den Bercken, Claes, & Godoy, 2009).

Therefore, in line with Kinnunen and Windmann (2013), we expected that higher scores in the experiential dimension would be related to cooperative behavior in games (Hypothesis 4, H4).

External Validity

Some authors have studied whether individuals act in the same way in laboratory experiments as in real-life situations, especially when cooperation is involved (Levitt & List, 2009; List, 2008). For instance, Levitt and List (2007) suggest that cooperative behavior could be very different because participants in the lab know that their behavior is controlled and maybe they cooperate only because they want to please the experimenter. Hence, we think it is important to evaluate the relationship between cooperative lab decisions and real-life decisions. In this study, participants had the possibility of donating or not donating the money earned in the experimental games to a citizen or non-governmental organization of their choice. Like Benz and Meier (2008) and Peysakhovich, Nowak, and Rand (2014), we expected that the decisions of cooperation in the experimental games would be directly related to the decision to donate the money earned (Hypothesis 5, H5).

Study 1

Method

Participants. We used a non-probabilistic self-selected sample (Romero & Bologna, 2011; Sterba & Foster, 2008), composed of 124 Psychology freshmen enrolled in the Universidad Nacional de Córdoba, Argentina. We determined the sample size on the basis of previous studies with similar experimental conditions (e.g., Peysakhovich & Rand, 2016). A total of 100 students (57 female, M = 19.63, SD = 2.69) fulfilled the inclusion criteria (Psychology freshman enrolled at the Universidad Nacional de Córdoba, Argentina). Due to the fact that a participant did not fulfill the inclusion criteria, we discarded the first session, which included a total of 24 students.

Design and experimental tasks. We implemented a 2 x 2 factorial design in two phases (Figure 1). In stage 1, we defined the first independent variable, allocating subjects to one of the social norm environments: cooperative and non-cooperative. In stage 2, we exposed subjects to two different response time conditions: time pressure and time delay. The main dependent variable was the level of cooperation in stage 2, in which subjects played six repeated rounds of the PDG and the PGG.

Variable	Stage 1	Stage 2
Independent variables	Cooperative environment	Time pressure
		Time delay
	Non-cooperative environment	Time pressure
		Time delay
Dependent variables	PDG	PDG & PGG

Figure 1. Experimental design (Study 1). PDG = Prisoner's Dilemma Game; PGG = Public Goods Game.

In stage 1, to create social norm environments, each subject played a random number of PDG rounds. At the beginning of each game, we matched subjects in pairs. Each game consisted of a random number of rounds. Both subjects had to decide simultaneously whether to cooperate or not with their partner, using the same payoff as Peysakhovich and Rand (2016).

At the end of each round, we informed subjects of their partner's decision and of each player's earnings for each round. Then, they played another round with the same partner, or the game finished (with specified probability) and we re-matched subjects with a new partner. We used the same probabilities employed by Peysakhovich and Rand (2016).

The initial amount of money received in this game consisted in 40 experimental monetary units (MUs) in the CE and 150 MUs in the NCE. We established this difference in order to guarantee that subjects would finish stage 1 with similar earnings in both conditions (Peysakhovich & Rand, 2016).

In stage 2, subjects made decisions in the PDG (six rounds) and the PGG (six rounds) under one of the following time response conditions: (a) time pressure: subjects had to respond as quickly as possible in a 10-second interval; (b) time delay: subjects had to decide carefully, wait, and think for at least 10 seconds before answering. In the PDG, we randomly paired subjects, who had to decide simultaneously whether to cooperate with their partner. We used the same payoff matrix as Rand et al. (2014).

In the PGG, subjects played six rounds in groups of four with the same partners, i.e., the groups did not vary. Subjects received an initial endowment of 20 MUs. The total amounts contributed to the common pool were multiplied by 1.6 and then partitioned equally among all four group members, regardless of how much each had contributed.

Instruments.

Rational-Experiential Inventory (Pacini & Epstein, 1999). We used a version of the Rational-Experiential Inventory studied by Reyna & Ortiz (2016). The inventory measures different ways of processing information and consists of two major dimensions: Experiential and Rational. The Experiential dimension includes 15 items ("Using my gut feelings usually works well for me in figuring out problems in my life"), while the Rational dimension comprises 13 items ("I enjoy solving problems that require hard thinking"). The items are scored on a 5-point Likert scale (1 = *totally false*, 5 = *totally true*). High scores in the items of one dimension, for example, the Rational dimension indicated a greater inclination to use that modality of thinking. The instrument has shown adequate psychometric properties in our context. Specifically, Reyna and Ortiz (2016) provided evidence of internal validity through exploratory and confirmatory analysis, replicating the bifactorial structure observed in previous studies (see Pacini & Epstein, 1999; Witteman et al., 2009). In addition, they obtained evidence of adequate properties of internal consistency, with Cronbach's alpha coefficients of 0.84 for the Experiential dimension and 0.80 for the Rational dimension. In the present study, we found good internal consistency indices (Cronbach's alpha) for both dimensions (Experiential: 0.88; Rational: 0.83).

Sociodemographic questionnaire. Participants reported their gender, age, place of birth, place of residence, the initials of their full name, and the last three digits of their DNI (national identity document).

Procedure. We carried out five experimental sessions with 12 subjects and five sessions with 8 subjects. The procedure comprised the following steps (Figure 2). We randomly assigned subjects to a computer (see Appendix 1). They signed an informed consent form and we read the instructions out loud (the subjects had the instructions on paper, as shown in the Appendix 2, 3 and 4).

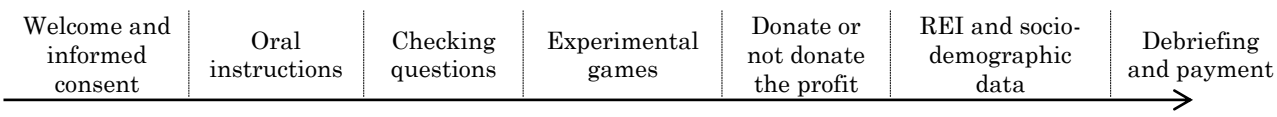

Figure 2. Experiment timeline (Study 1 and Study 2). REI = Rational and Experiential Inventory.

We used the z-Tree software package (Fischbacher, 2007) to carry out the experiments. Subjects answered five control questions to check their understanding of the instructions and we informed them about their earnings at the end of the experimental games (min = 15 Argentine pesos, max = 35 Argentine pesos).

After that, subjects were given the opportunity to donate their earnings to a nongovernmental organization of their preference. Then, they completed the inventory described and the sociodemographic questionnaire.

At the end of the study, only those who chose not to donate the money earned in the games received the experimental monetary units converted to cash (1 MU = 30 Argentine pesos).

Data Analysis. Using STATA 12, we analyzed the data in two formats, arranged in two ways: (a) the decisions made in each round in a different column (wide) and (b) the decisions made in every round in a single column (long). We used a significance level of 0.05 for all the analyses.

To assess cooperation at stage 1, we considered the total amount of cooperation and cooperation across rounds. To compare the mean cooperation between CE and NCE settings we calculated Student' *t* test. We applied logistic regression analysis to assess if rounds affected cooperation in both normative environments. To calculate standard errors, we considered the session as grouping level.

In stage 2 we compared cooperation according to time response conditions in PDG and PGG, evaluating Student' *t* test. We then conducted logistic regression analyses to assess whether the predictor variables help explaining the first cooperation decision and repetitive PDG decisions (dependent categorical variable). On this occasion, we computed standard errors considering subjects who had interacted over six rounds with the same partner. We used the pair as a cluster. Also, we conducted linear regression analyses to evaluate the effects of treatment on cooperative decisions (contribution, continuous variable). We calculated standard errors (bootstrapping) considering the group in which subjects had interacted during the game. Considering the measurement variable level, we complementarily analyzed the data using analysis of variance (ANOVA). The unit of analysis considered was the group (four subjects each; 25 groups). The dependent variable was the sum of subject contributions of each group in each round, while the independent variables were their treatment in stage 1, in stage 2, and their interaction. We also conducted a multivariate variance analysis (MANOVA) to consider contributions across all rounds (repetitive rounds). Then, we evaluated decisions in each round through univariate analyses, using the Tukey test for post hoc analysis.

Finally, we conducted a logistic regression analysis to evaluate whether cooperative decisions made in experimental games predict the subject's willingness to donate.

Results

Stage 1: Cooperative and non-cooperative social norms environments (H1). Subjects in the CE cooperated 18.08 (37%) times on average (min = 0, max = 36), while subjects in the NCE cooperated 10.04 (20%) times on average (min = 0, max = 36). There was a difference in mean cooperation between both settings, $t(92) = -3.58$, $p < 0.001$, $d = -0.71$, 95% CI [-0.22, -0.06] (Figure 3).

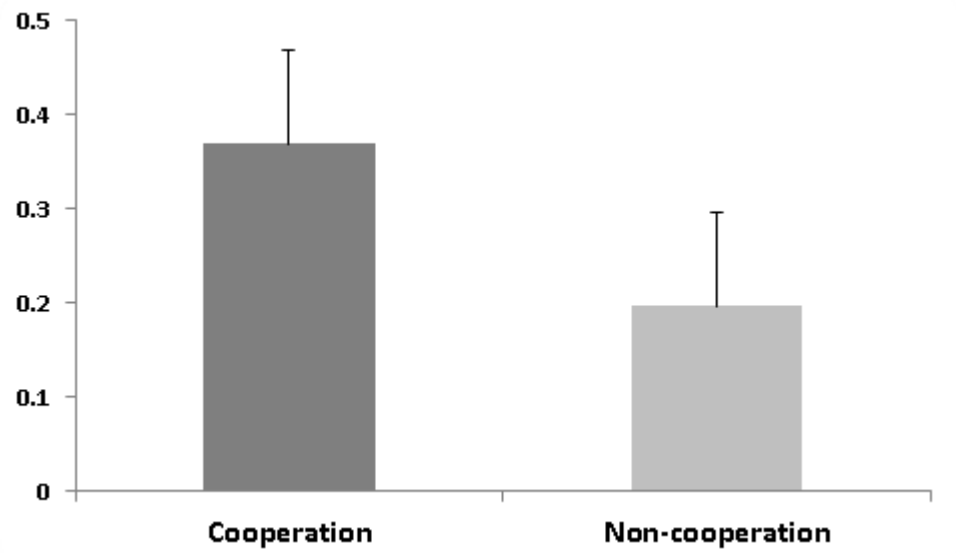

Figure 3. Total cooperation according to social norms environments in stage 1 (Study 1).

As shown in Figure 4, the subjects' cooperation across rounds was different in both environments, specifically from round number 28 onward.

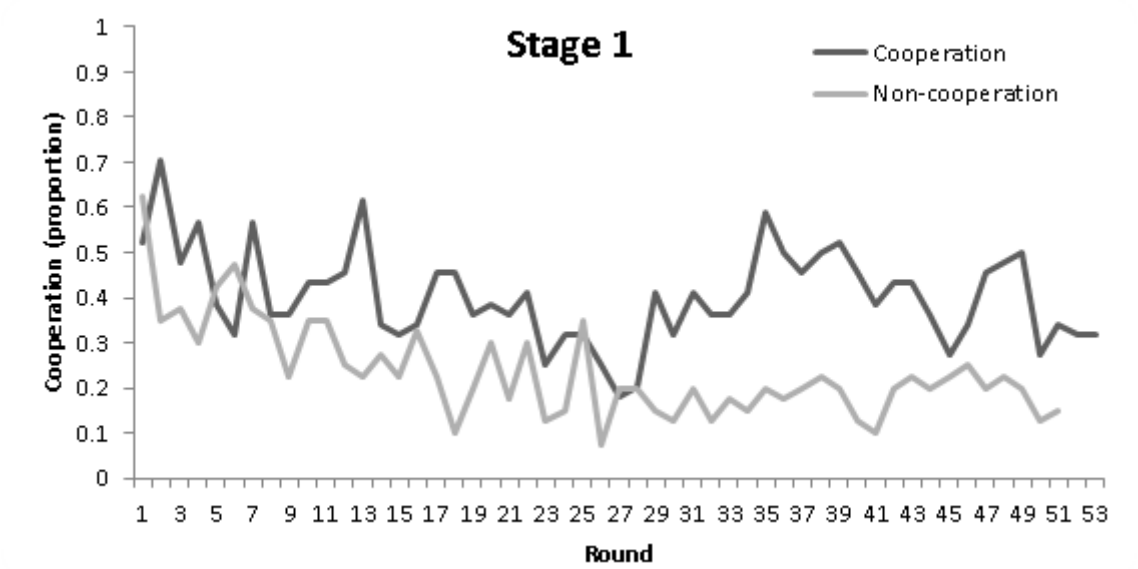

Figure 4. Cooperation according to social norms environments across rounds in stage 1 (Study 1).

In a first logistic regression model (Table 1), we included the social norm setting as the only predictor variable. The global fit of this model was significant, $p < 0.001$, although the *Pseudo* R^2 (0.02) was low. However, the results confirmed the differences in cooperation between social norm environments, $p = 0.001$. The value of the odds ratio (OR) in Table 1 indicates that the CE doubles the probability of cooperation, in comparison to the NCE.

In a second regression model (Table 1), we included rounds as a predictor variable. The global fit of this model was slightly higher than that of the previous model, *Pseudo* $R^2 = 0.03$, $p < 0.001$. In this case, we found no effect of the social norm setting, $p = 0.196$, but we did find a significant contribution of rounds, $p < 0.001$. The value of the OR in Table 1 indicates that the probability of cooperating in a given round is 0.98 times lower than in the previous round, i.e., the probability of cooperating decreases as the rounds proceed. In addition, there is an interaction effect of social norms and cooperation, $p = 0.012$. In the CE, cooperation increases across rounds. In contrast, we observed a decrease in cooperation as rounds progress in a NCE.

Table 1
Effects of Social Norm Environment and Rounds on Cooperative Decisions of Stage 1 (Study 1)

Predictor	Model 1					Model 2				
	b	*SE*	*p*	OR	95% CI for OR	*b*	*SE*	*p*	OR	95% CI for OR
Stage 1 – CE = 1	0.75	0.22	0.001	2.11	1.35, 3.27	0.31	0.24	0.196	1.37	0.85, 2.20
Rounds						-0.02	0.01	< 0.001	0.98	0.96, 0.99
Stage 1 x rounds						0.02	0.01	0.012	1.02	1.00, 1.03
Constant	-1.41	0.15	< 0.001	0.25	0.18, 0.33	-0.81	0.21	< 0.001	0.44	0.29, 0.68
Pseudo R^2	0.023					0.031				
N	5204					5204				

Note. CE = cooperative environment; *b* = observed regression coefficient; *SE* = standard error; OR = odds ratio; CI = confidence interval. Standard errors grouped at the session level (bootstrapping).

Stage 2: Response time treatments, time pressure and time delay (H2, H4). In the PDG, subjects cooperated an average of 1.69 times (min = 0, max = 6) under the time delay condition and 2.06 times (min = 0, max = 6) under the time pressure condition, with no difference between them, $t(98) = -0.95$, $p = 0.347$.

With reference to the first cooperative decision, the global fit of the logistic regression model was not significant, *Pseudo* R^2 = 0.05, p = 0.558. Results indicate that cooperation was not affected by being exposed to different social norm environments and to a different time response condition. In addition, we examined the possible interaction effect between response time conditions and different CEs on the first cooperative decision, which produced no statistically significant results, b = 0.05, p = 0.970. We obtained similar results when the dependent variable comprised cooperation decisions over six PDGs, b = 0.77, p = 0.395.

In the PGG, subjects under the time delay condition contributed an average of 10.59 MUs (min = 0, max = 20), while those under the time pressure condition contributed 11.79 MUs on average (min = 0, max = 20). There was no difference between conditions, $t(98)$ = -1.13, p = 0.260.

With regard to the linear regresion analyses, we first assessed a model considering the initial cooperative decision as the dependent variable, R^2 = 0.05, p = 0.195. None of the variables predicted cooperation, neither the rational nor the experiential styles (Table 2).

Subsequently, we tested another model, $R^2 = 0.05$, $p < 0.001$, including the contributions across rounds as the dependent variable, social norm environments and response time conditions as predictor variables, and decision styles as covariables. Results (Table 2) showed that only rounds predict cooperation, with a lower level of cooperation being observed as the rounds progress; however, there is no effect when considering the interaction between rounds and treatments.

Table 2
Effects of Social Norm Environments and Response Time in the First Round and Across Rounds on Decisions in the Public Goods Game (Stage 2, Study 1)

Predictor	Cooperation 1				Cooperation			
	b	*SE*	*p*	95% CI for *b*	*b*	*SE*	*p*	95% CI for *b*
1 = CE	1.02	1.96	0.604	-2.83, 4.86	2.88	1.94	0.138	-0.93, 6.69
2 = TP	0.77	2.36	0.744	-3.85, 5.40	1.32	2.50	0.598	-3.57, 6.21
Stage 1 x stage 2	1.19	2.97	0.689	-4.63, 7.00	-2.87	3.20	0.369	-9.13, 3.40
Rounds					-0.62	0.27	0.020	-1.15, -0.10
Stage 1 x rounds					0.27	0.38	0.479	-0.48, 1.02
Stage 2 x rounds					0.52	0.41	0.203	-0.28, 1.32
Stage 1 x stage 2 x rounds					-0.26	0.61	0.667	-1.46, 0.93
Rational	0.90	1.08	0.405	-1.22, 3.02	0.40	0.69	0.567	-0.96, 1.75
Experiential	1.85	0.97	0.057	-0.06, 3.76	-0.20	0.72	0.776	-1.61, 1.20
Constant	1.79	5.01	0.721	-8.03, 11.61	10.02	4.19	0.015	1.96, 18.37
R^2	0.047				0.045			
N	100				600			

Note. CE = cooperative environment; TP = time pressure condition; b = observed regression coefficient; *SE* = standard error; CI = confidence interval; Cooperation 1 = cooperation in the first round; Cooperation = cooperation in all rounds. Standard errors grouped at the group level (bootstrapping).

Considering the effects observed as the rounds progressed, we decided to evaluate regression models including cooperation in each PGG round (two to six, respectively: R^2 = 0.15, p = 0.003; R^2 = 0.07, p = 0.249; R^2 = 0.04, p = 0.520; R^2 = 0.06, p = 0.259; R^2 = 0.09, $p < 0.001$; Table 3). The treatments applied in stage 1 and stage 2, their interaction, and the participants' decision styles were included as covariables. In these cases, we also calculated standard errors, clustering at the group level (bootstrapping).

In the second PGG round, exposure to a different social norm environment in stage 1, p = 0.013, and to a different response time condition in stage 2, p = 0.024, together with the interaction between these stimuli, p = 0.005, made contribution in this round significantly predictable. This indicates that subjects exposed to a CE contributed more than those exposed to a NCE and also that subjects who made decisions under time pressure contributed more than those who made decisions without time pressure.

Table 3
Effects of Social Norm Environment and Time Response Condition on Decisions in Each Round (2, 3, 4, 5, 6) of the Public Goods Game (Stage 2, Study 1)

Predictor	Cooperation 2				Cooperation 3				Cooperation 4			
	b	*SE*	*p*	95% CI for *b*	*b*	*SE*	*p*	95% CI for *b*	*b*	*SE*	*p*	95% CI for *b*
1 = CE	5.04	2.03	0.013	1.06, 9.01	5.10	2.13	0.017	0.93, 9.26	3.42	2.03	0.092	-0.56,7.40
2 = TP	4.56	2.02	0.024	0.60, 8.53	2.69	2.04	0.186	-1.30, 6.68	3.02	2.02	0.135	-0.94, 6.99
Stage 1 x stage 2	-8.00	2.88	0.005	-13.64, -2.36	-4.32	2.94	0.142	-10.09, 1.45	-4.47	2.66	0.093	-9.70, 0.75
Constant	5.84	6.77	0.388	-7.43, 19.11	13.58	6.09	0.026	1.64, 25.52	5.19	6.67	0.436	-7.88, 18.26
R^2	0.116				0.065				0.039			

Predictor	Cooperation 5				Cooperation 6			
	b	*SE*	*p*	95% CI for *b*	*B*	*SE*	*p*	95% CI for *b*
1 = CE	3.89	2.05	0.058	-0.13, 7.91	4.51	2.15	0.036	0.29, 8.72
2 = TP	1.74	1.95	0.373	-2.09, 5.57	6.05	2.89	0.001	2.33, 9.77
Stage 1 x stage 2	-1.34	2.52	0.595	-6.27, 3.60	-5.80	2.89	0.045	-11.47, -0.14
Constant	8.58	6.23	0.169	-3.63, 20.79	12.92	5.45	0.018	2.24, 23.60
R^2	0.058				0.095			

Note. CE = Cooperative environment; TP = time pressure condition; *b* = observed regression coefficient; *SE* = standard error; CI = confidence interval; Cooperation X = cooperation in each round. Standard errors grouped as group level (bootstrapping).

Then, to understand the interaction effect, we conducted a comparison pair analysis. This analysis proved that subjects exposed to a NCE in stage 1 and to a time delay condition in stage 2 cooperated less than subjects within a NCE in stage 1 and under a time pressure condition in stage 2, $p = 0.024$, and those exposed to cooperation in stage 1 and time delay in stage 2, $p < 0.001$. It should be mentioned that, when comparisons between pairs were performed correcting the amount of comparisons (Bonferroni's method), the differences mentioned were not significant, $p = 0.145$ and $p = 0.078$, respectively.

In the third round, the treatment in stage 1 predicted the level of contributions, $p = 0.017$. Subjects exposed to a CE in stage 1 showed an increased contribution level in this round, compared to those exposed to a NCE. Treatment in stage 2 and its interaction with treatment in stage 1 were not predictors of cooperation.

In the fourth and fifth round, none of the predictors helped explain contribution levels.

In the last PGG round, results confirmed that exposure to different social norm environments, $p = 0.036$, and to different time response conditions, $p = 0.001$, as well as the interaction between these factors, $p = 0.045$, made contribution in that round significantly predictable. Similarly to round 2, this indicates that subjects who were exposed to a CE contributed more than those exposed to a NCE and that subjects who made decisions under time pressure contributed more than those who made decisions without time pressure. Next, we applied a pair comparison analysis to study interaction effects (Bonferroni's method). This analysis showed that subjects exposed to a NCE in stage 1 and to a time pressure condition in stage 2 cooperated more than those in a NCE in stage 1 and under a time delay condition in stage 2. Furthermore, subjects in the CE in stage 1 and under time pressure in stage 2 cooperated more than those in the NCE in stage 1 and under time delay in stage 2 of the last PGG round.

When considering contributions across all rounds (repetitive rounds), the MANOVA indicated that none of the effects were significant, i.e., the median contribution vectors did not differ according to experimental treatments, $\lambda(3, N = 25) = 0.274$, $F = 1.48$, $p = 0.143$.

When we evaluated decisions in each round through univariate analyses, in round 2 there was an interaction between treatments in stage 1 and 2, $\eta^2_p = 0.214$; however, post hoc analysis did not show any differences, $p = 0.415$, $p = 0.193$, $p = 0.993$, $p = 0.936$, $p = 0.578$, $p = 0.298$ (Table 4).

Table 4
Effects of Social Norm Environment and Time Response on Decisions in Each Round of the Public Goods Game (Stage 2, Study 1)

Predictor	Coop.1		Coop. 2		Coop. 3		Coop. 4		Coop. 5		Coop. 6	
	$F(1,21)$	p	$F(1,21)$	p	$F(1,21)$	p	$F(1,21)$	p	$F(1,21)$	p	$F(1,21)$	p
Stage 1	1.46	0.240	0.36	0.555	3.94	0.061	0.76	0.394	6.81	0.016	1.38	0.253
Stage 2	0.66	0.427	0.04	0.836	0.19	0.664	0.22	0.645	0.74	0.399	6.18	0.021
Stage 1 x stage 2	0.00	0.964	5.72	0.026	1.48	0.237	3.09	0.093	0.34	0.564	3.62	0.071

Note. Coop. = Cooperation in each round.

In round 5, we observed an effect of treatment in stage 1, $\eta^2_p = 0.245$: subjects within a CE in stage 1 cooperated more ($M = 53.23$, $SD = 10.81$, 95% CI [47.46, 59.00] than subjects exposed to a NCE ($M = 40.25$, $SD = 13.36$, 95% CI [32.42, 46.91]). In round 6, there was an effect of treatment in stage 2, $\eta^2_p = 0.227$: subjects who made decisions under time pressure cooperated more ($M = 45.69$, $SD = 12.04$, 95% CI [39.54, 52,77]) than subjects who made decisions without time pressure ($M = 32.25$, $SD = 16.70$, 95% CI [23.84, 41.92]). In the subsequent rounds, we observed no effects.

External validity (H5). The logistic regression results indicate that cooperation in the PDG is not a predictor of willingness to donate, $b = -0.07$, $p = 0.908$, nor does it predict cooperation in the PGG, $b = 0.08$, $p = 0.108$. In sum, cooperative behavior in both experimental games was not related to the participants' willingness to donate the money gained in games.

Summary

In stage 1, we found differences between the cooperative and non-cooperative social norm environments. However, our results do not support H1. When rounds were considered in further regression analyses, the normative environment no longer helped explain cooperative behavior. In stage

2, contrary to H2, we found no differences between the response time conditions in terms of their effect on cooperation in the first round of any experimental games. In rounds 2, 3, and 6 of the PGG, cooperation was higher in the CE than in the NCE; also, cooperation was higher in the time pressure condition than in the time delay condition in rounds 2 and 6 (H2). Neither the rational nor the experiential dimensions were found to be related to the level of cooperation nor did we detect any links between cooperation in the experimental games and willingness to donate the money earned playing. The latter two results do not support either H4 or H5.

Study 2

Method

Participants. We used a new non-probabilistic self-selected sample (Romero & Bologna, 2011; Sterba & Foster, 2008) composed of 104 Psychology freshmen of the National University of Cordoba, Argentina. Due to incomplete data, we considered a total of 96 students (70 female, $M = 19.47$, $SD = 2.59$) for further analyses.

Design and experimental tasks. The experimental design included two between-subjects factors implemented in two phases (Figure 5). We carried out stage 1 treatment in the same manner as in Study 1. In stage 2, we exposed subjects to different cognitive load conditions while they were playing six PDG rounds and six PGG rounds (see description in Study 1). The experimental conditions in stage 2 were the following: (a) low cognitive load (LCL): subjects were instructed to remember two digits; (b) high cognitive load (HCL): subjects were told to remember seven digits. Cooperation in stage 2 was the main dependent variable.

Variable	Stage 1	Stage 2
Independent variables	Cooperative environment	High cognitive load
		Low cognitive load
	Non-cooperative environment	High cognitive load
		Low cognitive load
Dependent variables	PDG	PDG & PGG

Figure 5. Experimental design (Study 2). PDG = Prisoner's Dilemma Game; PGG = Public Goods Game.

Instruments and Procedure. We used the same materials and procedure as in Study 1 (see Figure 2). In Study 2, we carried out six experimental sessions with eight subjects and four sessions with 12 subjects. Internal consistency indices (Cronbach's alpha) for REI dimensions were 0.85 for the experiential style and 0.83 for the rational style.

Data Analysis. Using STATA 12, we analyzed the data in two formats, arranged in two ways: (a) with the decisions made in each round in a different column (wide) and (b) with the decisions made in every round in a single column (long). We used a significance level of 0.05 for all the analyses.

To assess cooperation at stage 1 and to evaluate external validity we did the same analyses as in Study 1.

In stage 2 we compared cooperation according to time response conditions in LCL and HCL, evaluating Student' t test. We then conducted logistic regression analyses considering as dependent variable the subjects' first decision while playing the PDG and also their decisions across all rounds. As predictor variables, we included the CE (stage 1), the cognitive load condition (stage 2), and the interaction of both variables. We also included experiential and rational decision styles as covariables. When the dependent variable was cooperation across rounds, we also included rounds as predictors. Also, we conducted linear regression analyses, including the contributions in the first PGG round as dependent variable in a first model, and the contributions across rounds as dependent variables. The predictors were the social norm environment, the cognitive load condition, and the interaction between treatments. When the dependent variable considered was the cooperation across rounds, the rounds were also included as predictors. We conducted an ANOVA considering the contribuction of each group ($n = 24$).

Results

Stage 1: Cooperative and non-cooperative social norm environments (H1). Subjects in the CE cooperated 12.75 (24%) times in total, whereas subjects in the NCE cooperated 11.81 (23%) times in total. We found no differences between conditions, $t(94) = -0.18$, $p = 0.858$.

As shown in Figure 6, we observed no differences in cooperation across rounds connected to the social norm environments to which subjects were exposed.

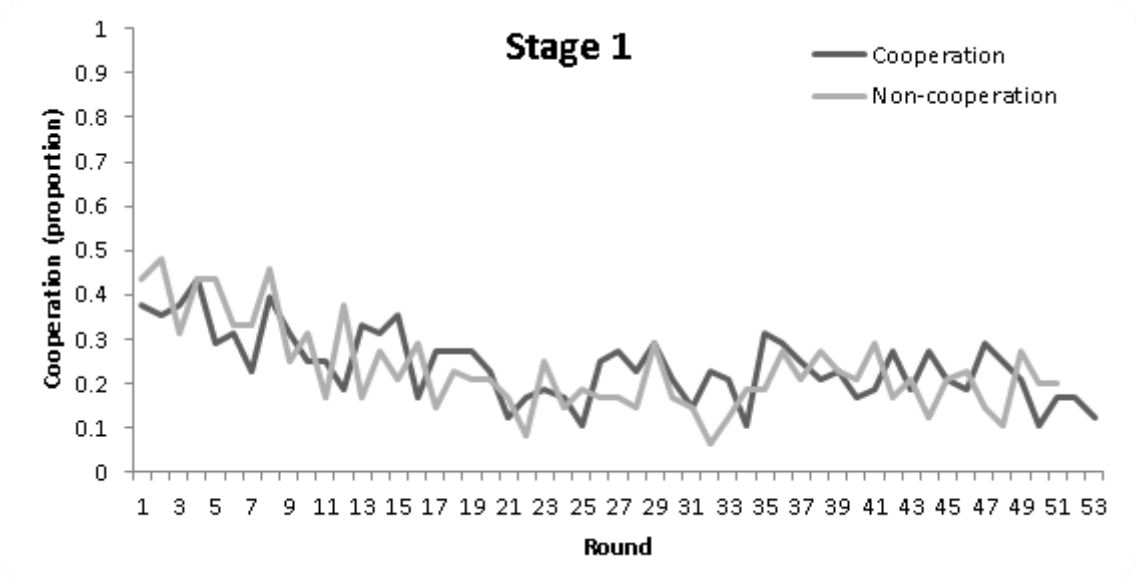

Figure 6. Cooperation according to social norm environment across rounds in stage 1 (Study 2).

In a first logistic regression model (Table 5) we included the social norm environment as a predictor variable. The global fit of the model was low, *Pseudo* $R^2 = 0.00$, $p = 0.860$. Social norm environments were not found to be predictors, i.e., the probability of cooperation in a CE was the same as in a NCE.

Table 5
Effects of Social Norm Environment and Rounds in Cooperative Decisions of Stage 1 (Study 2)

Predictor	Model 1					Model 2				
	b	*SE*	*p*	OR	95% CI for OR	*B*	*SE*	*p*	OR	95% CI for OR
Stage 1 – CE = 1	0.04	0.23	0.860	1.04	0.66, 1.65	-0.08	0.25	0.753	0.92	0.56, 1.52
Rounds						-0.02	0.01	0.013	0.98	0.86, 1.00
Stage 1 x rounds						0.01	0.01	0.626	1.01	0.98, 1.03
Constant	-1.19	0.13	< 0.001	0.30	0.24, 0.39	-0.66	0.07	< 0.001	0.52	0.46, 0.59
Pseudo R^2	0.000					0.013				
N	4976					4976				

Note. CE = cooperative environment; *b*. = observed regression coefficient; *SE* = standard error; OR = odds ratio; CI = confidence interval. Standard errors grouped at the session level (bootstrapping).

In a second model (Table 5) we included the rounds as a predictor in addition to the social norm environment, *Pseudo* $R^2 = 0.01$, $p = 0.011$. In this case, only the rounds explained cooperation ($p = 0.013$). The probability of cooperation in a given round is 0.98 times lower than in the previous round. Although the contribution of the rounds was significant, the interaction between the social norm environment and the rounds was not.

Stage 2: Cognitive load conditions, high and low (H3, H4). In the six PDG rounds, subjects under the LCL condition cooperated 0.24 times on average (min = 0, max = 6), whereas subjects in the HCL condition cooperated 0.15 times on average (min = 0, max = 6), with no difference between them, $t(94) = 1.99$, $p = 0.049$.

In relation to the first cooperative decision, *Pseudo* $R^2 = 0.09$, $p = 0.005$ (Table 6), results of the logistic regression analyses indicate that the social norm environment, $p = 0.002$, and the cognitive load condition, $p < 0.001$, predicted the first PDG decision. In this case, exposure to a CE during stage 1 increased 12.17 times the probability of cooperating in the first PDG round, compared to a NCE. Moreover, exposure to a HCL condition increased 9.62 times the probability of cooperating, compared to a LCL condition. We found an interaction effect, $p = 0.007$.

When decisions across rounds were considered (Table 6), the *Pseudo* R^2 value was 0.029. The treatments (stages 1 and 2), the treatment interaction, and the rounds were not predictors of cooperation. We only found an interaction between cognitive load and rounds, $p = 0.007$.

Table 6
Effects of Social Norm Environments and Cognitive Load in the First Round and Across Rounds of the Prisoner's Dilemma Game (Stage 2, Study 2)

Predictor	Decision 1					Decision				
	b	*SE*	*p*	OR	95% CI for OR	*B*	*SE*	*p*	OR	95% CI for OR
1 = CE	2.50	0.81	0.002	12.17	2.50, 59.32	0.88	0.72	0.216	2.42	0.60, 9.84
2 = HCL	2.26	0.61	0.000	9.62	2.89, 32.06	0.63	0.57	0.268	1.87	0.62, 5.70
Stage 1 x stage 2	-3.28	1.21	0.007	0.04	0.00, 0.40	-1.21	0.97	0.213	0.30	0.04, 2.00
Rounds						0.09	0.08	0.238	1.10	0.94, 1.98
Stage 1 x rounds						-0.17	0.15	0.246	0.84	0.63, 1.13
Stage 2 x rounds						-0.25	0.12	0.029	0.78	0.62, 0.97
Rational	0.28	0.46	0.550	1.32	0.53, 3.28	0.11	0.22	0.411	1.12	0.74, 2.10
Experiential	-0.01	0.45	0.979	0.99	0.41, 2.37	0.22	0.27	0.785	1.24	0.64, 1.79
Constant	-4.02	2.02	0.046	0.02	0.00, 0.93	0.07	1.00	0.010	1.07	0.11, 0.53
Pseudo R^2	0.094					0.030				
N	96					576				

Note. CE = cooperative environment; HCL= high cognitive load condition; Coef. = observed coefficient; CI = confidence interval; Decision 1 = cooperation in the first round; Decision = cooperation in all rounds. Standard errors grouped at the group level (bootstrapping).

In the PGG, subjects exposed to a LCL condition contributed 10.21 MUs on average (min = 0, max = 20), while subjects exposed to a HCL condition contributed 9.53 MUs (min = 0, max = 20). There was no difference between them, $t(94) = 0.57$, $p = 0.571$.

In the model that considered the first-round decision, the fit was significant but the R^2 value was low, 0.05, $p = 0.260$. None of the variables predicted cooperation, neither the rational nor the experiential styles.

We obtained similar results when the contributions in all rounds were considered as dependent variables, $R^2 = 0.05$, $p = 0.003$. No variable proved to be a predictor of cooperation across PGG rounds.

To assess decisions in each round, we used univariate analysis (Table 7). There was an effect in round number six due to the treatment in stage 1, $\eta^2_p = 0.203$: subjects who were exposed to a CE cooperated much more in this round ($M = 44.33$, $SD = 19.24$) than those exposed to a NCE ($M = 29.75$, $SD = 11.55$). We observed no other effect.

Table 7
Effects of Social Norm Environment and Cognitive Load on Decisions in Each Round of the Public Goods Game (Stage 2, Study 2)

Predictor	Coop.1		Coop. 2		Coop. 3		Coop. 4		Coop. 5		Coop. 6	
	$F(1,21)$	p	$F(1,21)$	p	$F(1,21)$	p	$F(1,21)$	p	$F(1,21)$	p	$F(1,21)$	p
Stage 1	3.62	0.072	2.07	0.166	0.44	0.514	0.00	0.989	0.73	0.404	5.08	0.036
Stage 2	0.16	0.689	0.04	0.844	1.04	0.319	2.91	0.104	0.29	0.598	0.03	0.869
Stage 1 x stage 2	0.47	0.501	0.77	0.391	2.76	0.112	0.65	0.431	1.31	0.266	2.05	0.168

Note. Coop. = Cooperation in each round.

External validity (H5). Cooperation in both experimental games (PDG and PGG) did not predict the subjects' willingness to donate, PDG: $b = 0.06$, $p = 0.956$; PGG: $b = 0.06$, $p = 0.095$.

Summary

In stage 1, we did not observe any differences in cooperation between social norm environments. This result does not support H1. In contrast, and in line with H3, the main finding of this study is the interaction effect between the social norm environment and the cognitive load condition on the first PDG round. However, we found no differences between cognitive load conditions in terms of their impact on cooperation in any of the PGG rounds. Results of H4 and H5 were consistent with those of Study 1.

General Discussion

This study aimed to provide new tools to discuss the role of social norms and cognitive processes in cooperation. In this section of the article, we discuss the results in relation to the main hypothesis. The discussion focuses on the social norm environments (stage 1) in both studies and on the basis of the multiple indicators of cognitive processing (stage 2) that we examined in both studies.

Data analysis of stage 1 (Study 1) showed differences between the CE and the NCE. However, when rounds were considered in further regression analyses, the social norm environment no longer explained cooperative behavior. This suggests that cooperation was more closely associated with the rounds than with the social norm environment to which subjects were exposed, although in the visual inspection of both environments (cooperative and non-cooperative) revealed some particular curves. The experimental generation of social norms in the lab differed from the results of Peysakhovich and Rand (2016), who found remarkable differences in cooperation in United States students exposed to CE and NCE.

The problems encountered when generating social norms in the lab were also confirmed in Study 2. We found no differences in cooperation between social norm environments. We consider that differences between our study results and those published by Peysakhovich and Rand (2016) could be related to cultural particularities of the payoff matrix valuation in the PDG. Some cross-cultural studies reveal different patterns of behavior in experimental games in different cultures (Henrich, 2000; Oosterbeek, Sloof, & van de Kuilen, 2004). Hence, it is possible for payoff matrices to be valued in a different manner by subjects in our local context (Cordoba, Argentina) and in the original study by Peysakhovich and Rand (2016, Boston, United States of America). In addition, we used repetition in the PDG to create social norm environments; however, as our results show, this was not an effective choice. We have identified other ways to generate social norm environments (e.g., reputation, punishment, competition between groups, and frame effect), a point that we will be mentioning later.

Regarding stage 2, we expected that subjects who were under time pressure in Study 1 would contribute more than subjects exposed to a time delay condition in the first PDG and PGG round (Rand et al., 2012). This hypothesis was not supported by the results. Similarly, Tinghög et al. (2013) did not find any differences between the response time conditions in terms of the cooperation observed in the first round of both experimental games. However, we must remark that they carried out six experiments with particular response time conditions: only in the first study did the subjects play the PDG under similar time response conditions as in Rand et al. (2012) and our own study.

We also observed particularities in the PGG and subsequent data analyses. In the study by Rand et al. (2012), like in our study, the subjects in the PGG had to use a PC screen to express how much of their initial amount they wanted to contribute to the common pool. In the study by Tinghög et al. (2013), the subjects had to decide between two options: keeping a certain amount or contributing a certain amount.

Therefore, unlike Rand et al. (2012) and us, the authors conducted a logistic regression analysis in the PGG instead of a linear regression analysis.

In rounds 2, 3, and 6 of the PGG, cooperation was higher in the CE than in the NCE; also, cooperation was also higher in the time pressure condition than in the time delay condition in rounds 2 and 6. Although in the last round (number 6) response time had an effect, automatic response (i.e., under time pressure) could be biased by the accumulated experience in the game. As the rounds proceed, the subjects respond more quickly when they know the particularities of the game and, at this point, response conditions are not likely to produce the same effect as in the first round.

In stage 2 of Study 2, we sought to compare cooperation under cognitive load conditions in the PDG and the PGG. Social norm environments, cognitive load conditions, and the interaction between them predicted cooperation in the first PDG round. Subjects who contributed more in the first round were those who were exposed to a social norm environment in stage 1 and to the high cognitive load condition in stage 2. The latter indicates that cooperative subjects make their decisions in an automatic, intuitive way. This result is consistent with Schulz et al.'s (2014) findings. However, Schulz et al. used a *n*-back task. Contrary to findings based on the first PDG round, we observed no differences in cooperation between the low and high cognitive load conditions in the other PDG rounds.

Furthermore, we did not observe any differences between cognitive load conditions in terms of their impact on cooperation in any of the PGG rounds. These findings are consistent with most studies which use cognitive load as an indicator to assess cognitive processing (Cornelissen et al., 2011; Hauge et al., 2009; Hauge et al., 2014; Kessler & Meier, 2014).

Moreover, we assessed whether the different modes of information processing using the Rational-Experiential Inventory (Pacini & Epstein, 1999) were involved in experimental game decisions. Studies 1 and 2 show that the rational and experiential dimensions are not related to the level of cooperation observed. Conversely, Kinnunen and Windmann (2013) found that subjects who scored higher in the experiential dimension kept less money in the Dictator Game and accepted less money in the Ultimatum Game. Peysakhovich and Rand (2016), using the Cognitive Reflection Test (Frederick, 2005), found that subjects who rely more on their intuition or heuristics to make decisions, and were exposed to a cooperative social norm environment, cooperated more in the first round of a variety of experimental games.

We also evaluated whether decisions in the experimental games (stage 2) of both studies were related to the participants' willingness to donate the money earned playing the games to a non-governmental organization. However, we were unable to identify an association.

Limitations and Future Directions

One of the limitations of this study concerns the procedure used to create social norm environments. During the experiment, some subjects reported experiencing tiredness, since they had to play 53 rounds in the CE and 51 rounds in the NCE, which amounts to approximately 40 minutes doing the same task. Therefore, in future studies, researchers could evaluate the experience of participating in the experiment, e.g., feelings of tiredness, entertainment, or boredom.

Additionally, instead of using repeated PDG rounds, we suggest manipulating the instruction frames. For example, in a description, the salience of a norm could be manipulated, thus enabling us to condition the subject's subsequent decisions. According to Belaus, Reyna, and Freidin (2016), the variation of the frame focused the participants' attention on a specific social norm in economics games, which influenced their subsequent responses. In this regard, it would be interesting to carry out an experiment in which the cooperative social norm condition is created by participating in an experimental game where the descriptive and the prescriptive norms are manipulated.

Another limitation has to do with the manipulation of cognitive processes through time response indicators. Our study and previous works (Cappelen et al., 2014; Nielsen et al., 2014; Tinghög et al., 2013; Rand et al., 2012; Rubinstein, 2007) have focused on a linear relation between cooperation and time response. However, recent studies suggest that response time generally follows an inverted-U pattern, where extreme responses occur faster than intermediate ones. Accordingly, Evans, Dillon, and Rand (2015) have observed that extreme cooperative and selfish decisions occur faster than intermediate decisions. These findings affect the way in which time responses are interpreted and may help explain the variety of results found when response time is used as a cognitive process indicator in relation with cooperative decisions.

As we have previously stated, there is no agreement in the academic literature about the impact of reflective and intuitive processes on cooperation when response time (Study 1) and cognitive load (Study 2) are used. The variety of results published can be classified into three groups: (a) those that show that intuition promotes cooperation, (b) those that provide evidence that reflexive processing increases cooperation, and (c) those that do not show an interaction between cooperation and indicators that assess cognitive processes.

According to Hauge et al. (2014), the differences found regarding the link between cognitive processes and cooperative decisions might be due to the use of different experimental games, which could affect the subject's decisions. The games that are most frequently used in these designs are the Dictator Game, the Ultimatum Game, the Trust Game, the PDG, and the PGG. Although all these games involve paying a personal cost to give a personal benefit to another player, each has its own variations and particular specifications. However, this possible explanation is called into question in a recent study by Peysakhovich et al. (2014), who report that decisions made in a game are related to decisions made in other games. These researchers observed a relation between all cooperative PGG, DG, and TG decisions ($p < 0.001$).

Another possible explanation of these results concerns the various indicators of cognitive processing, response time, and cognitive load, which have particular forms of operationalization. Some studies define and compare decisions in different response time conditions (e.g., answering before 7/10 seconds versus answering after that time), while other studies regard the time response of each subject as a continuous measure. On the other hand, multiple tasks were employed to measure cognitive load (e.g., memorization, Stroop test, *n*-back task). Given how variable the results reported are, it would be interesting to carry out meta-analysis studies to clarify the role of cognitive processes in cooperation.

In addition, we suggest using other scales besides the Rational-Experiential Inventory (Pacini & Epstein, 1999) to assess cognitive processes in future studies, such as the Cognitive Reflection Test (Frederick, 2005).

It would also be useful for future studies to consider other ways to evaluate external validity. For instance, one could follow the procedure described by Peysakhovich et al. (2014): at the end of the experiment, the researchers allowed the subjects to enrich the study by providing feedback about their understanding of the instructions, given that the formal writing used in them often creates confusion in a variety of situations. Interestingly, researchers observed a link between the subjects' cooperation in the experimental games and this collaboration task.

Concluding Remarks

In this article, we presented the results of two experimental studies. In Study 1, the generation of social norm environments in stage 1 was not effective, in contrast with Peysakhovich and Rand's (2016) findings. In stage 2, in line with Tinghög et al. (2013), we found no effects between time response conditions and cooperation.

In Study 2, the generation of social norm environments was also ineffective. However, in stage 2 cooperation was higher when subjects were exposed to a CE and to a high cognitive load condition (first PDG round), in contrast to other conditions in the PDG.

Finally, this study aimed to provide new tools to discuss the role of social norms and cognitive processes in cooperation. We expect that this study will promote empirical research on the topic of cooperation in our immediate context (Latin America). Improving our understanding of how cooperative decisions are made and which situations encourage subjects to cooperate are of great importance for future interventions seeking to foster cooperative interactions.

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Appendix 1
Experimental Stations

Appendix 2
General Instructions (Spoken)

General Instructions

Welcome!
Good morning/good afternoon. I would like to thank you for being here and participating in this study.
First, please turn off your mobile phones.
Today, you are going to play some experimental and computer games and you will also have to complete some questionnaires. The experiment will last about one hour.
In this study, we aim to examine the individual decisions of people; here are no right or wrong answers. All information is anonymous and confidential.
Throughout this experiment, you can earn experimental monetary units (MUs). At the end of the experiment, each of you will receive the amount of MUs that you earned in the games, converted to Argentine pesos with the following equation: 30 MUs = 1 Argentine peso.
In addition to the money you earn playing the games, you will receive an additional 15 pesos.
Before you begin, please read and sign the informed consent form.
...
Then I will read the instructions for the first task. The written instructions are next to your computer.
If you do not understand something, please read the instructions again. If you still have questions or have a problem during the game, raise your hand and a team member will assist you.
From now on you are not allowed to communicate with the rest of the participants.

Debriefing

In this session, we sought to study the factors that explain cooperation. The main issues affecting this research project were the small number of studies in our local context, the variety of explanations of the results obtained by other researchers, and the limited contributions of psychology to the study of cooperation.
To perform the study, we used two classical experimental games.
In stage 1, you make decisions in different environments of cooperation. In stage 2, you make decisions in any of the following conditions:
- Respond as quickly as possible and take your time to answer; or
- Memorize a long or short number while making decisions.
These tasks employ two different indicators (response time and cognitive effort) of cognitive processes in decision making.
To summarize, this study is aimed at obtaining information about how cooperative decisions are made, which environments encourage individuals to cooperate, and to what extent these contexts have effects on decision making.

Thanks

Now the study is over.
I ask you, please, NOT to discuss the experiment with you partners.
Now, please remain seated. We will tell you when you can leave…
Thank you for your collaboration!

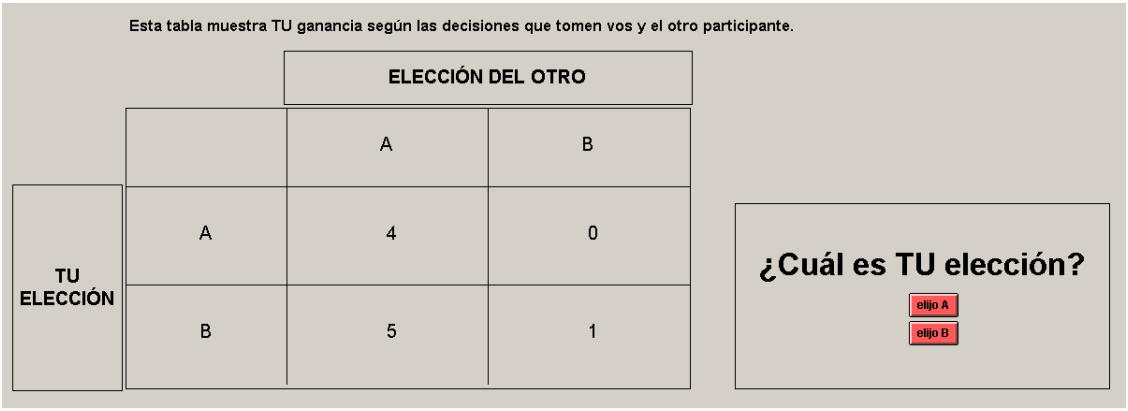
Appendix 3
Example of Experiment Instructions of Stage 1 (Written on Paper)

EXPERIMENTO

El experimento consiste en dos fases: 1 y 2. Las decisiones que tomen en la Fase 1 no afectarán lo que suceda en la Fase 2. Podrán ganar Unidades de Dinero Experimental (UDE) en ambas fases. Las instrucciones de la Fase 2 se van a mostrar directamente en la computadora después que termine la Fase 1.

Fase 1

La Fase 1 consiste en una serie de interacciones con otras personas.
En cada interacción, al comienzo cada uno será emparejado con otro participante de la sala y jugarán una cantidad aleatoria de rondas con ese participante.
En cada ronda, cada participante tendrá que elegir entre dos opciones: A o B.
La siguiente tabla muestra cuál será TU ganancia en cada ronda, la cual dependerá de tu elección y la del otro participante.



Si **TU elección es A** y la **elección del otro participante es A**, ambos ganarán 4 UDE

Si **TU elección es A** y la **elección del otro participante es B**, vos ganarás 0 y el otro ganará 5 UDE

Si **TU elección es B** y la **elección del otro participante es A**, vos ganarás 5 UDE y el otro ganará 0 UDE

Si **TU elección es B** y la **elección del otro participante es B**, ambos ganarán 1 UDE

Deberás realizar tu elección dentro de los 30 segundos, si no lo hacés, la computadora hará una elección aleatoria por vos en esa ronda.
Tu ganancia de cada ronda aparecerá en la pantalla de la computadora. Esa ganancia se sumará a tu cantidad actual de UDE.

Recordá que la cantidad de UDE que tengas al final de todo el experimento determinará cuánto dinero vas a ganar.
Después de cada ronda, la probabilidad de que juegues **otra ronda con la misma persona** es de **7/8** (7 de 8) y la probabilidad de que la **interacción con esa persona termine** es de **1/8** (1 de 8).
Esa probabilidad no depende de cuántas rondas ya hayas jugado. Luego de cada ronda se te informará si seguís jugando con la misma persona o si la interacción terminó.
Una vez que la interacción con una persona termine, serás emparejado nuevamente con otro participante de la sala para una nueva interacción.
Las elecciones que hagas no influirán en el número de interacciones que tengas ni el número de rondas en cada interacción.

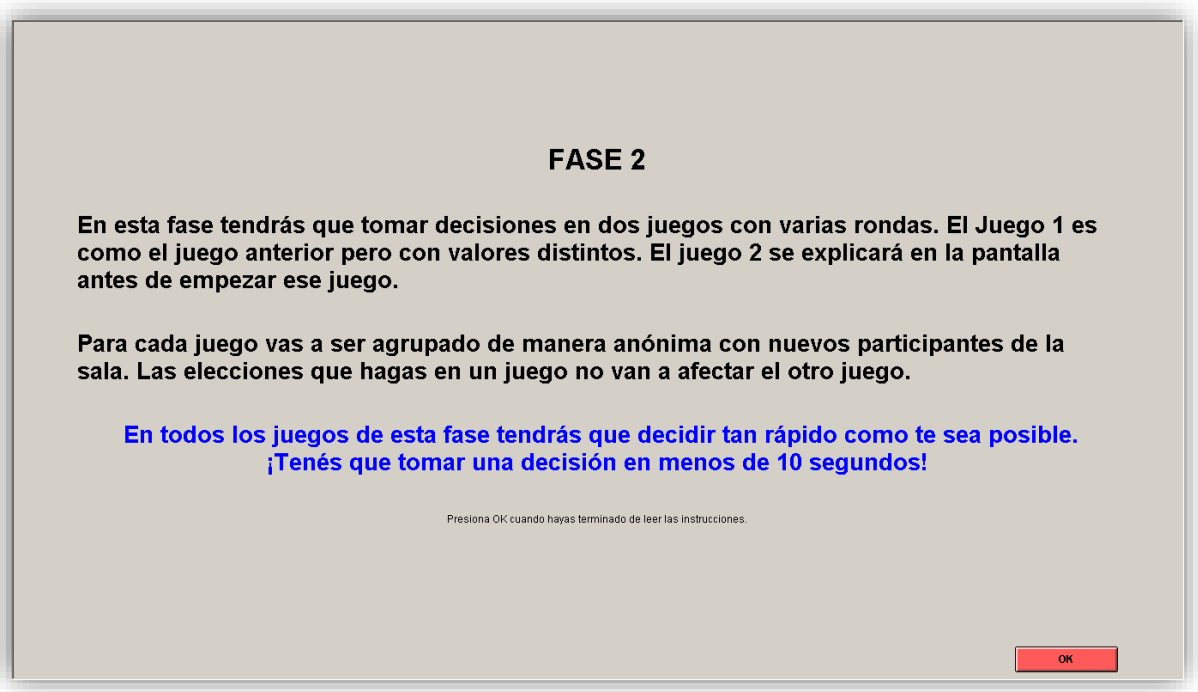
Resumen de la Parte A

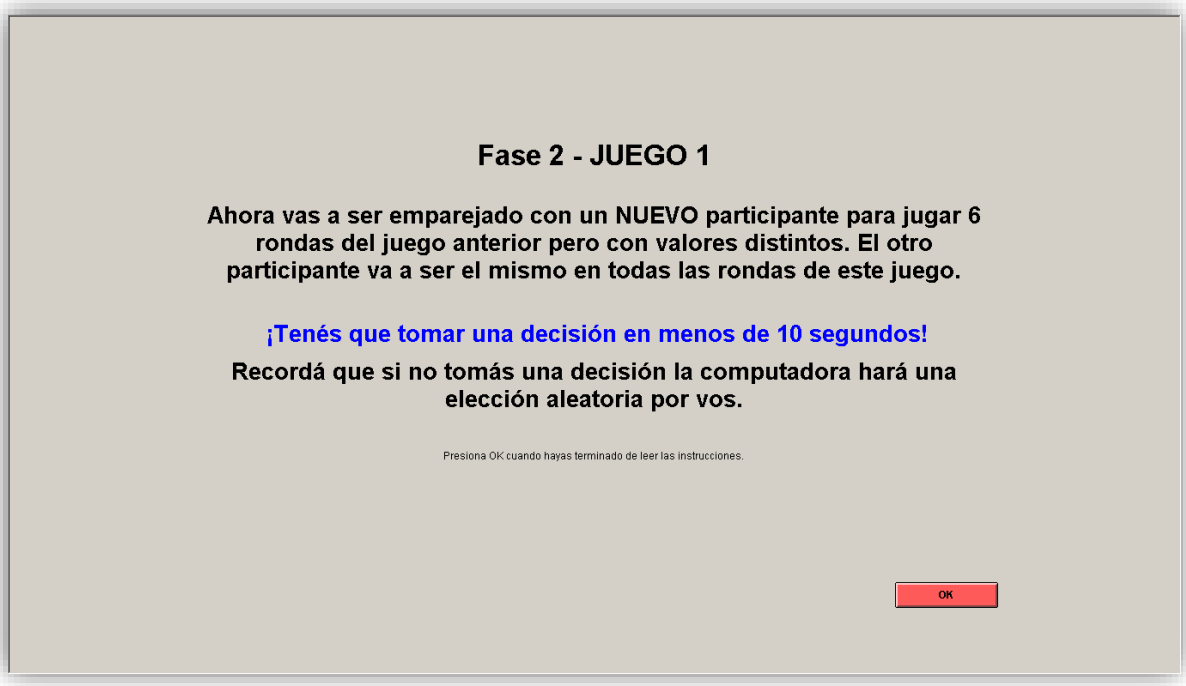
Cada interacción que tengas con otra persona en el experimento implica una cantidad aleatoria de rondas.
En cada ronda, vos y el otro participante (con el cual serás emparejado), tomarán una decisión y esa decisión determinará tus ganancias para esa ronda.
En cada interacción, después de cada ronda existe una probabilidad de 7/8 de jugar otra ronda con la misma persona. Tu comportamiento NO tendrá efecto sobre el número de rondas o el número de interacciones.
Al principio del experimento, comenzarás con 40 UDE en tu cuenta. Vas a ganar UDE en cada ronda de cada interacción. **Al final de todo el experimento, recibirás $1 por cada 30 UDE que haya en tu cuenta**.
……
Ahora, por favor, responde las preguntas que figuran en la computadora para asegurarnos que comprendiste la tarea.
La Fase 1 comenzará con una ronda de práctica. Esa ronda no se tendrá en cuenta para tu ganancia final.
Si tenés alguna pregunta, por favor hacela ahora.

Recordá que no se permite la comunicación entre participantes.
Si surgen dudas durante el experimento, primero consultá las instrucciones nuevamente. Si todavía tenés dudas o surge algún inconveniente durante el juego, levantá la mano y un miembro del equipo se acercará a tu lugar.

Appendix 4
Example of the Instructions of Stage 2: Time Pressure Condition (in Computer)

FASE 2 – CON PRESIÓN DE TIEMPO – RÁPIDO





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