Journal of Behavior, Health & Social Issues vol 1 num 2 Nov 2009 Pp. 7-19

Equity and reciprocity: Basic mechanisms of the organization of social behaviour

Equidad y Reciprocidad: mecanismos básicos de la organización del comportamiento social

Carlos Santoyo Velasco[1]

Facultad de Psicología, Universidad Nacional Autónoma de México

1. Dirigir correspondencia a: Facultad de Psicología, Ciudad Universitaria, Av. Universidad 3004, Edif. De Posgrado, P1, Cubículo 20, Del. Coyoacán, México, 04510, D.F.
Email: carsan@servidor.unam.mx

Received: August 10, 2009
Accepted: October 20, 2009

Abstract

This paper studies two analogous mechanisms: equity and reciprocity, from a bridge, or translational, research perspective. The characteristics of this perspective are described, as well as the overall strategies of laboratory and field research for studying these mechanisms and their links to the process of conditional cooperation and coercive reciprocity in representative situations of everyday life. The data gathered are discussed from this perspective on the basis of the selfish rationality model.
Key words: Translational research, equity, reciprocity, social behavior, development.

Resumen

Se aborda el estudio de dos mecanismos análogos: equidad y reciprocidad desde una perspectiva de investigación puente. Se describen las características de esta perspectiva, las estrategias generales de investigación de laboratorio y de campo para el estudio de dichos mecanismos y sus conexiones con el proceso de la cooperación condicional y la reciprocidad coercitiva en situaciones representativas de la vida cotidiana. Se discuten datos obtenidos desde dicha perspectiva con base en el modelo de la racionalidad egoísta.
Descriptores: Investigación puente, equidad, reciprocidad, comportamiento social, desarrollo.

In this paper we assume the use of the term *bridge research* as analogous to *translational research*, *translational* implying the transfer or translation of a basic principle to a different disciplinary field or a socially relevant situation that must be modified for the common good.

This paper looks at two analogous and complementary mechanisms as part of the study of the organization of social behavior: equity and reciprocity. In general, the quantitative study of equitable exchanges has been conducted under experimental conditions, while research on reciprocity has been undertaken both experimentally and through field work (Anderson, 1976; Cairns, 1979; Colman, 2003; Santoyo, 1994). The way the research on both mechanisms is connected and complemented can be strategically situated in what has come to be known as *bridge research* (Fisher & Mazur, 1998) or *translational research* (Gunner & Cicchetti, 2009).

One of the purposes of social behavior organization studies is to assess and extend the principles derived from basic research (*BaR),* to everyday settings. This extension is crucial for increasing the external validity of these principles and to optimize those points in which Behavioral sciences (*BS)* converge (Gintis, 2007). In this paper we present empirical examples of basic research on the equity mechanism and how it is feasible to extend its findings through bridge research (*BrR)* or "translational[1]" research.

One premise of the *BS* has been the "canonical selfishness model" that underlies organisms' decisions; a number of studies, however, have found consistent deviations that demonstrate, on the basis of different experimental games, that participants choose pro-social courses of action more frequently than predicted, and even sacrificed personal profit in order the modify the distribution of payoffs within the group (Henrich et al., 2005). This basic premise, a keystone of the *BS*, regulates how social exchange researchers over the last few decades have been looking at the way organisms interact to produce efficient or inefficient results, both for the individual and for the social unit under consideration.

BrR tries to extend the findings of *BaR* to applied settings (Fisher & Mazur, 1997). The contemporary perspective called *translational research* aims at deploying basic knowledge in the search for social welfare (Gunner & Cicchetti, 2009), contributing new assessment strategies, and designs for intervention or prevention programs.

BrR that replicates the findings of *BaR* can uncover new and potentially useful applications of the basic principles, but even research that does not replicate them can help to generate new *BaR* questions, which contribute to the understanding of the limitations of certain explanations, and the analysis of the contexts in which these explanations are applicable and those in which they might not be (McGuire, 1997).

Below, a description is given of two lines of research into functionally equivalent mechanisms: equity and reciprocity. These lines of research make use of experimental settings complemented by field work. For this, the study of these mechanisms is based on analogous quantitative models. Thus, the objective of the paper is to present a *BrR*-based strategy to account for the generality of the equity process and its quantitatively analogous mechanisms: conditional cooperation and reciprocity under different study conditions: ranging from laboratory with $n = 2$ and laboratory with $n > 2$, to situations in which the research conditions call for non-intrusive observational methods that are characteristic of field work.

Justification of the *Bridge research* strategy.

The problem of explaining social mechanisms by appealing to behavior principles and their operation in particular circumstances is central to various social sciences (Elster, 1989; Henrich et al., 2005; Homans, 1974).

The study of coetaneous links that the overall development of the *BS* has promoted in recent decades, in fields such as Sociology and Behavioral Psychology (Wilson & Herrnstein, 1985), Microeconomics (Ainslie, 1992; Rachlin, Battalio, Kagel, & Green, 1981), Experimental Economics and Game Theory (Camerer, 2003), Political Science (Elster, 1989), Sociobiology and Development Science (Cairns, Elder, & Costello, 1996; Gunner & Cicchetti, 2009), has permitted the evolution of the *BS* and related *BrR* as a key tool. In other words, there is no reason to limit the links resulting from the perspective of this paper exclusively to extending laboratory principles to everyday life; it is also feasible to find interdisciplinary links, as evidenced by the progress made in the *BS*.

---

1. In this paper we assume the use of the term *bridge research* as analogous to *translational research*, *translational* implying the transfer or translation of a basic principle to a different disciplinary field or a socially relevant situation that must be modified for the common good.

This paper, for the sake of parsimony and coverage, focuses on the mechanisms of equity and reciprocity. The advantage to selecting these mechanisms is that they are recognized as basic, universal and related to other social processes (Adams, 1965; Mellers, 1982; Wilson & Herrnstein, 1985), and they constitute the basis of higher-order strategic processes for studying social exchange (Caporael, Dawes, Orwell, & van de Kragt, 1989; Henrich, et al., 2005). Thus, the decision to study these mechanisms allows them to be indentified in social exchanges of different kinds and ubiquity in different settings. As will be shown in this paper, the proposed models incorporate, as an explicit object of study, components of the contribution that different people make to the relationship, as well as of the consequences or results derived from it. This constitutes the comparative and complementary basis of the proposed models, as will be demonstrated in the following sections.

Basic Research of $n = 2$ Social Exchanges: The Case of Equity

The study of social exchanges implies the analysis of the contribution that each person makes in a relationship and the "rewards" that she obtains for it (Adams, 1976; Berkowitz & Walster, 1976). In Equity Theory, the relationships that are studied have been expressed as linear equations (Anderson, 1976), where the proportion of a person's payoffs or rewards in relation to the other's is equal to the corresponding proportion of her effort, merits or relative contributions, as expressed in equation 1.

$$Oi / Oi + Oj = Ii / Ii + Ij \qquad \text{(Eq. 1)}$$

Oi and *Oj* are the results or payoffs of persons *i* and *j*; *Ii* and *Ij* are the corresponding values of their contributions to the relationship.

In general, this strategy, for both dyadic studies and those that work with $n > 2$, starts with *BaR* for the emission of judgments using instruments derived from functional psychophysics (Anderson, 1996), as an exploratory basis for future real-time social-exchange experiments. For the equity-judgment emission study, the participants respond to different situations requiring a decision. For example, Santoyo and Bouzas (1992) demonstrated how the model (Eq. 1) adequately describes equity judgments in multiple situations, in which variables such as levels of merit among participants, resources to be allocated or situational contexts are programmed factorially. The participants decided the amount of money to distribute between pairs of hypothetical professors according to their level of merit and preparation, in contexts of differential resources or different levels of inflation, among others. In short, the participants allocated the resources as a relative function of the merits of the others involved in the comparison situation, which is consistent with Information Integration Theory (*IIT*) applied to equity (Anderson, 1996).

For the study of equitable exchanges, experimental settings were developed to identify the relative contributions and payoffs that two people emit and obtain respectively in a real-time relationship (Hake & Vukelich, 1972). The procedures imply repetitive exchange situations with another person present during the session whose behavior produces interdependent tangible consequences; this strategy allows for the identification and assessment of mechanisms for the microregulation of the exchanges.

As an example of *BaR* with the goal of identifying social exchange strategies under conditions of play on a computer, pairs of 8- and 10-year-old schoolchildren decided the *effort allocation* for their partner (pressing a button associated with a requirement of a variable-ratio reinforcement program (*VR):* 20, 40 or 80). In addition, under conditions of *effort and payoffs allocation*, they chose points for their partner (e.g., as part of the task they allocated one of four payoff magnitudes: 1, 2, 4 or 8 points per turn); the points were exchanged at the end of each session for candy, toys or video-game access time.

According to this class of strategies, patterns of cooperative behavior organization can be studied, as well as "sub-optimal" relationship patterns (e.g., alternating reciprocal allocation of RV80 with one payoff point), which is equivalent to a "social trap" analogy; these were very frequent in the sessions. Although it was not surprising to find patterns in which reciprocal allocations represented "optimal" benefits, such as the allocation of the task that implied the least effort and the greatest payoffs possible (e.g., VR 20 and 8 points), both data are consistent with the canonical selfishness model. The former produced inefficient results, while the reciprocal allocations produced beneficial results for both participants. The difference lies in the perspective of the focal subject: personal vs. collective.

The study implies a sequential combination of probable results, given the options chosen alternately by each member of the pair, which can be expressed in a payment matrix similar to those used in the game theory field (Colman, 1982) (see Table 1, to represent the social exchange in question). The different game allocation options that participant *i* makes are represented in the rows, while the allocation made by *j* is represented in the columns. Each cell represents the joint allocated effort ratio in an alternate turn. The values 2 and 4 imply that the effort allocated by *j* is double or quadruple that allocated by *i*, respectively. An equivalent representation can also be made for the points that the participants allocate to themselves in the exchange, with values of 1, 2, 4 or 8 points.

Table 1

Effort allocated by *i* \ Effort allocated by *j*	VR 20	VR 40	VR 80
VR 20	1	2	4
VR 40		1	2
VR 80			1

Effort allocation matrix. Ratio of effort allocated to partner by children *i, j* in their successive role as focal-elector child or partner-receiver, depending on the turn. The ratios are derived from the combination of the requirements of the variable-ratio program (VR) that they alternately allocate to their partner (Adapted from Santoyo, 1992). The ones in the diagonal represent maximum reciprocity in the different conditions.

In general, the results obtained have been described by the equity formulation (Eq. 1), describing the executions of both of the children with optimal strategies and those with "non-optimal" strategies and replicated under conditions of low, medium and high-resource contexts for the focal-elector child (VR 80, VR 40, VR 20, respectively). In general, the phases of the experiment implied that the children in the role of elector, when it was their turn to decide the game that their partner would play, had games associated with these contexts predetermined for them by the experimenter during the session. Thus, each child could, in her turn as partner, win points depending on the game that the focal child allocated her; although when it was her turn to be the elector, she simultaneously received points according to the predetermined context, through which all the children passed.

The data from Table 2 show that in the different contexts in which the equity formulation was assessed, the R^2 values were higher than .9, which is evidence that equation 1 describes the equity relationships between peers, regardless of the context

Table 2

Condition	R^2	Det. Coef.	Std. E.	D.F.	F
VR 20	.993	1.01	.03	1, 19	1373 ***
VR 40	.994	.96	.02	1,13	2266 ***
VR 80	.992	.97	.02	1,18	2413 ***

*** p =.000.

Linear regression analysis, for each experimental condition. R^2 data, Determination coefficient, Standard error, degrees of freedom and F value. The analysis is derived from the equity model (see equation 1) for all the dyads under each experimental condition or context (adapted from Santoyo, 1992).

of abundant resources (VR20) or scarce resources (VR80), and even independently of their interaction strategy (e.g., cooperative or competitive).

To detect the exchange strategies it was necessary to adapt sequential analysis techniques, which uncovered the existence of a growing correspondence and correlation of the allocation of effort and points to the partner as a function of their experience in the game. This correspondence usually centers on the reciprocal and successive allocation of the game associated with the highest reinforcement rate (VR20), which suggests a strategy of optimal allocation between peers (Santoyo, 2002; Santoyo & Colmenares, 2003a).

In another study (in progress), Santoyo and Colmenares replicated and extended these findings, especially when the participants (university students, participating for academic credit) had information about their partners' choices and payoffs ($r^2 = .77$), as opposed to situations in which they were not given this information ($r^2 = .4$). Thus, the information about what the partner does and obtains is critical, which might imply that, in order for equity to occur, social comparison is important. In general, it has been demonstrated that the participants compare their ef-

fort and results between themselves, which has been assumed to be signaling factors taken into consideration for action in the exchange (González, 2009).

This is an example of *BaR* on social exchanges between dyads. The next section presents some related findings when the experimental unit is $n > 2$, which makes it possible to extend the $n = 2$ laboratory findings to situations where that level of analysis is extended to one of $n > 2$, especially in those in which the contents of social exchange are situated in more realistic conditions of everyday life.

The experimental $n > 2$ study: social dilemmas

The study of social dilemmas implies the analysis of strategies in contexts of scarce and highly valued resources in collective situations. In general, the social dilemmas represent a "deficient equilibrium"; *equilibrium* in that nobody has, for the time being, an incentive to change their consumer behavior; *deficient* in the sense that there is at least one alternative result that would be in the participants' interest to obtain and that would leave many better off (Kollock, 1998).

A public goods dilemma (*PGD*) involves more than two people, where each one faces the problem of whether or not to contribute to the common good. The contribution implies an immediate cost for the contributor, but it generates a shared benefit for all. Each person has the incentive to avoid the cost and enjoy the benefit (e.g., evading taxes), but when many do this, resources are exhausted or services deteriorate in the medium and long term, leading to an atrocious result: hence the term "social trap" (Platt, 1973). Thus, a public good (*PG)* is a resource that benefits everyone, regardless of whether they contributed to its availability or not.

A resource dilemma (*RD*), on the other hand, is defined by the non-exclusivity of consumption (anyone can make use if it) and is characterized by the "withdrawal" of benefits from the common good (the water we waste cannot be used by anyone). Therefore, the maintenance of the *PG* will depend on the amount of available resources, on the resource's exhaustion or consumption rate, on the relationship between availability and the number of users of the resource, as well as on the resource's renewal rate.

To summarize, social traps are characterized by a structure that implies that people respond with excessive consumption or refusal to cooperate, looking for payoffs or the evasion of immediate costs; in the long term, these traps result in individual and communal losses, with the corresponding devaluation of the resources. Thus, it is feasible that individuals identify information in their surroundings before deciding whether to cooperate or not. The mechanism of conditional cooperation, like equity, incorporates comparison between relative contributions and payoffs among players. In this case, the extension lies in offering a task that is more realistic and with $n > 2$ than the one assumed in the equity study.

In this section, we present some data about *PGD* and *RD*. At a first *IIT*-based level (Anderson, 1996), we present data from two recent studies about what participants are willing to contribute to a common fund in a housing complex that would cover unexpected emergency maintenance expenses. The situation represents a dilemma, in the sense that there is the option of making a minimum contribution (e.g., $30 instead of $300), with the expectation that others will make the generous contribution; the social trap occurs when the majority assumes this position, resulting in an insufficient overall contribution, and few or no services.

A series of studies on *PGD* in residential complex settings (Santoyo & Colmenares, 2003b; Santoyo & López, 2003), assessed the information that participants consider before making their contributions to the common good. This information is based on factors such as: the percentage of residents willing to contribute to the *PG* (e.g., 10, 30, 50, 70 or 90%), the average amount that they contribute (e.g., $30, 150 or 330), or the moment when the contribution must be made (e.g., today, in 6 or 12 months). The situation involves a factorial design where each person faces each combination of values. According to *IIT*, it is feasible to make the graphic representation of the integration rules used; these rules can be expressed algebraically.

Figure 1a presents data on the amount that the participants are willing to contribute to a community fund of a residential complex, as a function of the percentage of residents who are expected to make a contribution and the amount of money they would contribute (the instructions pointed out that the information had been obtained by surveying the condominium owners).

In general, the participants were willing to contribute a greater amount of money as the overall amount of residential contributions increased and

the percentage of residents willing to contribute grew (see Figure 1a). While the percentage of residents willing to contribute has no effect when the residential contribution is mid-level ($150), systematic effects take place when the residential contribution is low or high ($30 or $330), with the contribution decreasing or increasing, respectively, as a function of the percentage of residents who contribute, an effect that involves an algebraic multiplication rule (Anderson, 1996).

Subsequently, more refined analyses showed that the participants tend to contribute slightly lower amounts than those contributed by others (except in the case of minimum contributions, $30). When everyone behaves this way, the overall amount obtained is less than ideal, with the self-evident consequence of a decreased chance of obtaining the minimum amount of resources needed to meet the communal needs. These data are evidence of a phenomenon that we can describe as *conditional cooperation* (González & Santoyo, 2007), which represents an extension of the operation of the dyadic equity mechanism as a function that is proportional to the contribution that the other members of the group are seen to be giving as a unit.

Contributions made in *PGD's* take place in a time perspective of due dates, where decisions are situated in a context of when the "cost" of contribution will have to be assumed. Will more resources be collected if the contribution must be made today than if it is due in six months or a year? Even though the specific amounts of money might be "objectively" similar, does the fact of imposing a due date affect the contribution to the common good?

In general, given the assumption that preferences are consistent over time (Coombs, Dawes & Tversky, 1981; Dawes, 1988), it would be expected that each individual would be consistent in choosing the preferred amount of money to contribute, regardless of when it was due (Frederick, Lowenstein & O'Donoghue, 2003). Nevertheless, the literature in the field of intertemporal choice (e.g., Ainslie, 1992; Rachlin, 1994), shows that people are inconsistent in different contexts, which represents an anomaly

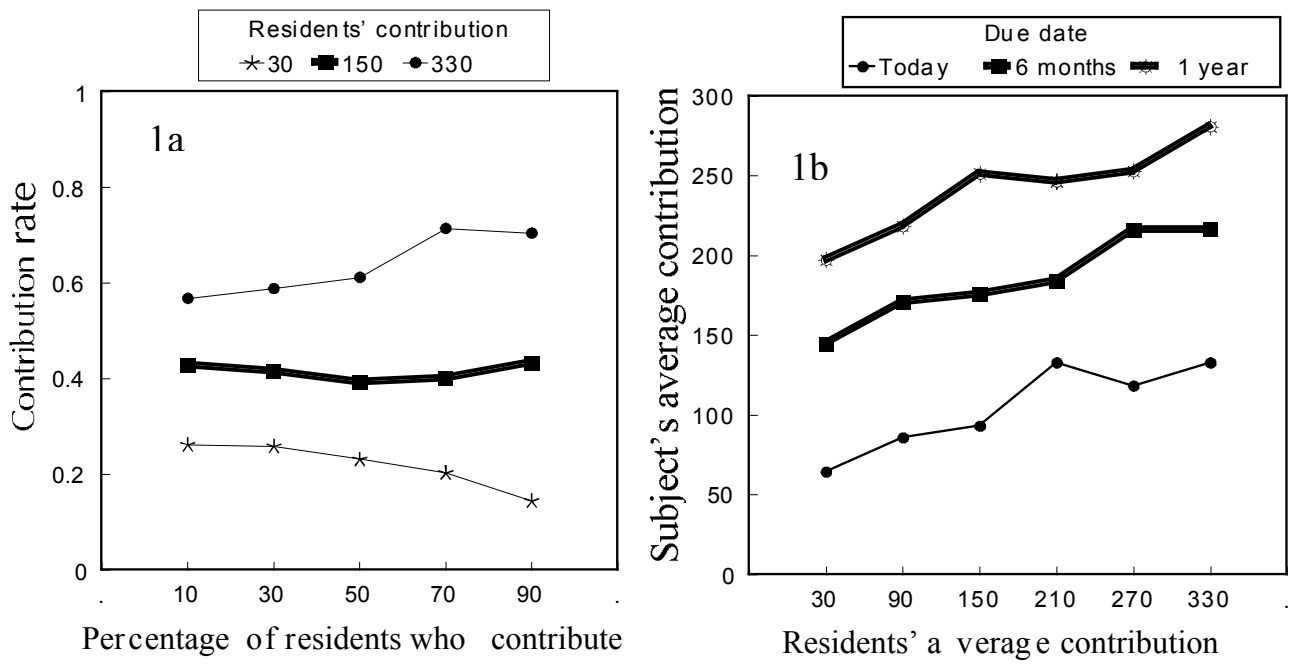

Figure 1. Integration of Information in Public Goods Dilemma. Monetary contribution rate to public good as function of the percentage of residents willing to contribute and of their average contribution (graph 1a, modified by Santoyo & López, 2003). Monetary contribution to the public good as a function of residents' average contribution and the due date for making the contribution (Graph 1b, modified by Santoyo & Colmenares, 2003b).

of the self-interest model. The work of Santoyo and Colmenares (2003b) is situated in this perspective, extending the findings of the field of intertemporal choice to a perspective of analysis of the process of "temporal discount" implied in a *PGD*.

The way people integrate temporal information for an eventual contribution is presented in Figure 1b. In general, the tendency is to "offer" a greater amount of money the farther away in time the due date is. The contributions, furthermore, tend to increase as a function of the residents' overall contributions. The implied algebraic rule corresponds, in this case, to an additive-type rule with parallel lines between the due dates. These findings are added to the list of anomalies in the field of intertemporal choice. But the study of *temporally distributed contributions* extends the mechanisms discovered under $n = 2$ laboratory conditions to settings that are ecologically and conceptually more relevant. Thus, the conditional contribution as a wider reciprocity phenomenon must be considered in a context of the factors involved in the decision-making situation, a result that is consistent with the *BrR* proposal.

For the study of resource dilemmas, González and Santoyo (2002) developed an experimental setting to analyze social exchanges, with simulations of virtual high-consumption (or "competitive") and moderate consumption (or "cooperative") partners. One study evaluated the hypothesis that self-control in the individual situation and cooperation in a situation of dyadic play are greater when choice attempts are grouped than when they are made one at a time (Brown & Rachlin, 1999). For this reason, we decided to evaluate and extend this hypothesis to $n > 2$ situations. The participants were exposed to situations where they decided the amount of consumption in each attempt, or the amount that they would take from an urn every two or four turns, depending on the situation. In general, the participants were sensitive to their partners' simulated consumption. The exposure to blocks of attempts had an effect related to the peers' consumption, which grew as more attempts were integrated into the decision block (Figure 2).

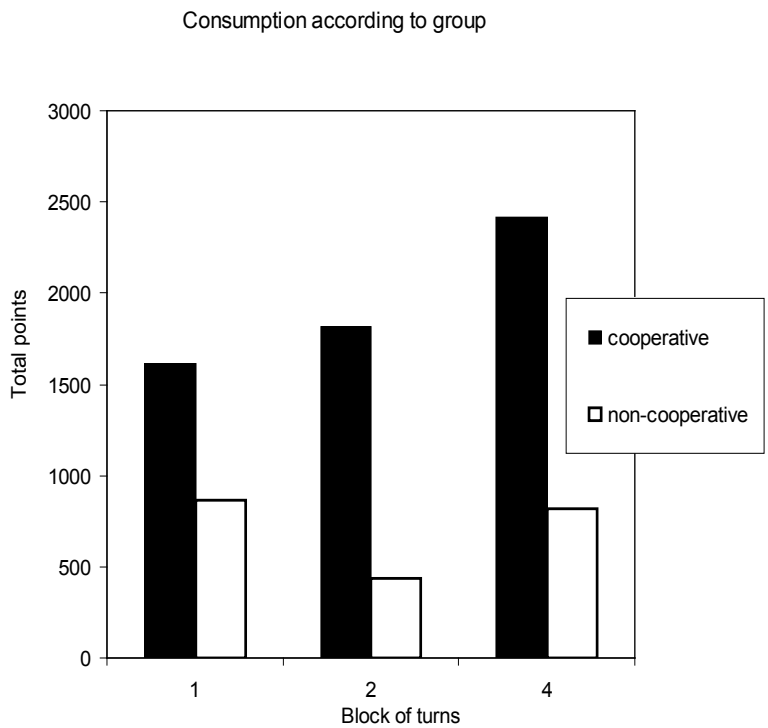

Figure 2. Consumption in a resource dilemma as a function of the group partners and the grouping of turns. Total points obtained in simple turns, or blocks of two and four turns. The dark bars represent the participants with virtual partners that simulated moderate consumption, and the white bars represent participants with virtual partners who simulated excessive, non-cooperative consumption (modified from González & Santoyo, 2002)..

Those who thought they were interacting with partners who exhibited moderate patterns of consumption obtained more points at the end of the session and as a function of the grouping of turns. Those who thought they were interacting with greedy, high-consumption partners, obtained a lower amount of payoffs, which produced deterioration in the function of resource renewal, leading obviously to its exhaustion. It was observed that participants with "non-cooperative" partners did not benefit from the demand to integrate group decisions into blocks, meaning that the grouping process proposed with $n = 2$ by Brown and Rachlin (1999) is not confirmed when the participants are exposed to these conditions, an effect that calls for further analysis in future studies. To sum up, the participants' sensitivity to the simulated consumption of virtual partners represents a perspective that is different from the mechanism of "conditional cooperation" as a function of reciprocity perceived in the decision situation.

A more recent study by González and Santoyo (2007) extended these findings to a situation in which group size was manipulated in a *PGD* in a simulation of high contribution by virtual partners while the point of supply was kept steady. González (2009) also extended the conditional cooperation hypothesis to a variety of experimental and signaling conditions (e.g., *PGD, RD,* and a condition of successive exposure to both), showing a variety of possibilities to be incorporated into the literature on equity mechanisms.

Up to this point, some of the strategies used in *BaR* have been described. In general, this research is complemented with field work in the following section. The *in situ* study of social interactions makes it possible to analyze the configuration of behavior patterns, their stability and change, and the individual differences in natural, relatively controlled situations such as a school setting. The following setting describes the approach centered on the analysis of everyday interactions observed *in situ* which has been called the "Coyoacán Longitudinal Study" (*CLS)*, for which the reciprocity mechanism is assumed, employed more often in this setting, but whose structure is similar to the structure presented for the equity model, comparing relative contributions and results that the participants make in the relationship.

Field work: bridge for extending basic mechanisms

In this paper, data on the reciprocity mechanism are selected, by way of example, from the Coyoacán Longitudinal Study (*CLS*) (Santoyo, 2007; Santoyo & Espinosa, 2006) to explain the social adjustment of elementary-school children in different situations over time. Like the equity model, the reciprocity model incorporates information from the contributions that different social agents make to the relationship, as well as their possible results; the difference lies in that fact that the data are obtained with observational sampling in field work, with no outright manipulation of the events and consequences to which the participants are exposed. In this sense, this research strategy coherently complements, as required by bridge research, the findings derived from laboratory situations and makes it possible to extend the generality of these situations.

The *in situ* study of social behavior organization is fundamental for explaining the operation of regulation mechanisms and for analyzing their potential consequences. It is important to understand the proximal factors in the regulation of social interactions because their study makes it possible to explain the configuration and trajectory of behavior patterns (Cairns, 1979; Cairns et al., 1996).

In general, the children spend many hours of their life in the school setting, making this an ideal, relatively ordered and permanent setting for analyzing how interpersonal relationships and the relative effects of the regulatory and institutional aspects are structured, as a part of the context and social ecology in which they are immersed. In addition, social adjustment in school is closely related to current academic performance and potential social adaptation to other settings.

The core methodological strategy of the *CLS* is based on the design and use of the Behavior Observation System for Social Interactions (*BOS-SI*) (Santoyo, Espinosa, & Bachá, 1994), which allows for the identification of the direction, quality, content, context beginning, configuration and participating social agents in each episode of the codified behavioral flow (for the validity, reliability and optimization of *BOS-SI*, see Espinosa, Blanco, & Santoyo, 2006).

The sequential analysis of the behavioral flow makes it possible to discover organized patterns of behavior that are susceptible to rigorous evaluation; their formal identification requires a contingency

analysis using conditional probabilities whose adjusted remainders exceed the level of statistical significance, > 1.96, for excitatory sequences, which implies a demonstration of the non-randomness of the patterns (Haberman, 1978; Siegel & Castellan, 1970). Some of the applications have been conducted with infants and nursery-school children (Espinosa, Anguera & Santoyo, 2004) and pre-school and elementary-school children (Santoyo, 2007; Santoyo & Espinosa, 2006).

The generic strategy for analyzing behavioral flow lies in: procedures for sampling focal children (90 or 50 minutes of observation per child in daily sessions of 15 and 10 minutes, in the classroom and at recess, respectively); analyzing the direction of the interaction (to identify who initiates the episode); identifying the quality of the act (coercive or pro-social); analyzing the relative duration of the episodes, etc. From this information, data are collected on the frequency of the episodes and whether they were answered by other children, which yields information that is analogous to the information generated with the equity model, except that in these cases, the data are collected with no outright manipulation by the researchers. Equation 2 expresses the positive reciprocity model (Santoyo, 1996).

$$Ep\ /Ep + Rp = Spep\ /\ Spep + Sprp \quad \text{(Eq. 2)}$$

Where *Ep* and *Rp* represent positive emission or reception events (e.g., *Ep*: the focal child addresses another child; *Rp*: a classmate addresses the focal child). *Spep* and *Sprp* represent the consequence of these events (e.g., *Ep* or *Rp* are positively answered by the classmate or focal child, respectively). Thus, these events correspond to the social process of choosing available partners in the setting and its consequences. The analysis may also be done for the study of coercion (Patterson, 1982), and for episodes of aggression among school children, which is represented in Equation 3.

$$En\ /En + Rn = Snen\ /\ Snen + Snrn \quad (3)$$

Where *En* and *Rn* represent negative emission and reception or provocations initiated by the focal child or by her classmates, respectively. *Snen* and *Snrn* represent whether the provocations were answered by the classmate or focal child, respectively.

In this way, it is feasible to study the organization of coercive behavior among peers by analyzing the reciprocity of coercive actions by children identified as aggressive (risk) with respect to those that are not identified as such (control). Coercive reciprocity is a differential characteristic between risk and control children; the former display reciprocity and symmetry in coercive acts, which serves to explain the phenomenon of escalation within and between episodes (Cairns, Santoyo, & Holly, 1994); the latter do not display negative reciprocity, do not escalate the episode; on the contrary, they tend to answer in a way that is incompatible with the provocations (Cairns et al., 1994; Santoyo, Colmenares, Figueroa, Cruz, & López, 2008). It is important to reiterate that the structure of the reciprocity model is similar to that of the equity model, both algebraically and in the contrasting components. Thus, in the negative reciprocity model, for example, the focal child's relative provocations of his peers are compared to the relative consequences received by both parts; the equity model likewise compares contributions and results of dyadic and group units, as the case may be. In addition, these data are consistent with the premises of the human nature model for understanding violent behavior, which was derived from the matching law but extended to account for crime (Wilson & Herrnstein, 1985), which is consistent with the premises of *BrR*. Even though this paper has not explicitly assumed the matching law as a mechanism to exemplify, we can point out that in the *CLS*, the children that display the most coercive behavior receive more attention from the teacher and from classmates on account of this behavior than for academic or pro-social behavior, which extends the conclusions of Wilson and Herrnstein's model (1985) to the school settings.

The study of reciprocity *in situ* also makes it possible to broaden the perspective of development by considering children's social network. In this way, while some children identified as aggressive are central to the network, others are rejected (González, 1998). Nevertheless, their relationship with other aggressive children constitutes a risk factor, given the high probability of negative reciprocity that they maintain and that allows these interactions to consolidate. Thus, field study of reciprocity, both coercive and positive, has proven to be a useful tool for our *BrR* goals.

Recent studies (López, 2005; López & Santoyo, 2005) have found that negative and positive reciprocity patterns describe the behavior organization of spouses with a history of violence, as opposed to "non-violent" spouses, who display more positive reciprocity than the former. Similar findings have been found in conflictive pairs of teenagers and their parents, unlike those displayed by non-conflictive pairs of teenagers and their parents (Pérez, 2009), in abused children, aggressive children, and a comparison group of non-aggressive children (Santoyo et al., 2008) and in research in progress using data from the *CLS* files, in cases of bullying (Santoyo & Mendoza, in progress). These data represent the relevance of the reciprocity mechanism given the lack of quantitative data on the asymmetry of this class of relationships (Olweus, 2003).

The study of social relationships is another of the possibilities for linkage with reciprocity, permitting the identification of aspects of the behavior flow that constitutes control mechanisms. In this way, it has been possible to assess the function of effectiveness, correspondence and social reciprocity as functional indices that account for the positioning of children with special educational needs within the social network (Rubio, 2004; Rubio & Santoyo, 2004) and for the stability of the social relationships of schoolchildren of different ages and social skills (Espinosa, in progress; Flores & Santoyo, 2009). In general, reduced positive reciprocity results in having few friends or not being accepted in the group, which leads to adverse consequences such as: Low achievement level, learning difficulties, dropping out of school, delinquent behavior, among others (Cairns & Cairns, 1994; Putallaz & Gottman, 1981). Furthermore, the lack of social skills could be a factor that predisposes a person to the development of psychopathology (Arkowitz, 1981).

Discussion

This paper has presented findings derived from the study of the analogous mechanisms of equity, conditional cooperation and reciprocity, from a perspective that allows for the systematic extension of the findings derived from basic $n = 2$ research with experimental tasks involving the allocation of effort and payoffs to the partner, to laboratory $n > 2$ studies in which social dilemmas are simulated with decision-making tasks in hypothetical situations of everyday life or social exchange with tangible, real-time consequences depending on the consumption of resources or the contribution to public goods, where conditional cooperation is the key mechanism. In both cases, the process involves comparing relative contributions and payoffs among participants as the key mechanism that explains these social exchanges. Thus, the extension of restricted $n = 2$ situations to analogous $n > 2$ situations from everyday life represents a first step in the bridge research strategy, where the aim is to extend the implications of equity mechanisms.

For the experimental study of social exchanges, the assumption of selfish rationality has regulated a large part of the international research in different areas, although it has not been immune to controversy (Gintis, 2007; Henrich et al., 2005). The laboratory research data presented here, both $n = 2$ and $n > 2$, are consistent with this assumption. Nonetheless, these data suggest that social exchanges are regulated by environmental factors such as the cooperation of others. In other words, cooperation is not a question of "all or nothing"; the data presented indicate that participants decide on their contribution as a function of how much others contribute, of the level of effort or payoffs the partners allocate to us, or their level of consumption, as related to associated temporal factors (i.e., contribution restrictions). These factors have been called signaling factors as information that can be obtained from the social environment and whose key reference is the conditional cooperation mechanism (González, 2009).

One challenge for the bridge research perspective is the development of experimental settings for simulating social traps in an ecologically valid way. In a scenario where research has been developed with arbitrary tasks, unrealistic incentives and unrepresentative subjects, it is up to us to design more creative experiments that account for the mechanisms that configure the structure of different social traps. The development of bridge research represents a step in the right direction toward a greater generality of the principles that underlie the explanatory framework of social exchanges.

A different level of extension is represented by field studies in which the reciprocity mechanism, analogous to the equity mechanism, is put to the test within naturalist research based on observational

methodology. In general, the reciprocity model has been particularly useful for detecting risk or protection factors when studies are done of coercive behavior patterns, social preferences and social competence. The structure of this mechanism is similar to that of the equity model, with the substantive difference that the reciprocity mechanism has been used more in field studies, especially those in which social interaction is the object of study.

Finally, more communication opportunities must be sought among researchers from different disciplines who are interested in similar phenomena (e.g., social traps, cooperation, selfishness, coercion, negotiation, etc.); who seek to extend basic principles to everyday life situations for the purpose of diagnosis, assessment, prevention or intervention; who develop experimental settings simulating socially relevant phenomena; who offer basic researchers evidence of the validity of certain principles or mechanisms; who are committed to the formation of professionals and who see bridge research as a strategic curricular axis.

References

Adams, J.S. (1965). Inequity in social change. In L. Berkowitz (Ed.). *Advances in Experimental Social Psychology* (Vol. 2, pp. 267-299). New York: Pergamon.

Ainslie, G. (1992). *Picoeconomics: The strategic interaction of successive motivational states within the person*. Cambridge University Press.

Anderson, N. H. (1976). Equity judgments as information integration. *Journal of Personality and Social Psychology, 33*, 291-299.

Anderson, N. H. (1996). *A functional theory of cognition*. Maheah, N.J.: Lawrence Erlbaum.

Arkowitz, H. (1981). Assessment of social skills. In M. Hersen & A.S. Bellack (Eds.), *Behavioral assessment: A practical Handbook* (pp. 296-237). New York: Pergamon Press.

Bakeman, R., & Gottman J. (1998). *Observación de la interacción: Introducción al análisis secuencial*. Madrid: Morata.

Barker, R. (1968). *Ecological Psychology*. Stanford: Stanford University Press.

Berkowitz, L., & Walster, E. (1976). *Advances in Experimental Social Psychology: Vol. 9*. New York: Academic Press.

Bierhoff, H. W., Cohen, R. L., & Greenberg, J. (1986). *Justice in social relations*. New York: Plenum Press.

Brown, J., & Rachlin, H. (1999). Self-control and social cooperation. *Behavioral Processes, 47,* 65-72.

Cairns, R. B. (1979). *Social development: The origins and plasticity of interchanges*. San Francisco: Freeman.

Cairns, R. B., Bergman, L. R., & Kagan, J. (1998). *Methods and models for studying the individual*. London: Sage Publications.

Cairns, R. B., & Cairns, D. B. (1994). *Lifelines and risks: Pathways of youth in our time*. Cambridge: Cambridge University Press.

Cairns, R. B., Elder, G. H., & Costello, E.J. (1996). *Developmental science*. Cambridge: Cambridge University Press.

Cairns, R. B., Santoyo, V. C., & Holly, K. (1994). Aggressive escalation: Toward a developmental analysis. In M. Potegal & J. Knutson (Eds.), *The dynamics of aggression: Biological and social Processes in dyads and Groups* (pp. 227-254). Hillsdale, N.J.: Lawrence Erlbaum Associates.

Camerer, C. F. (2003). *Behavioral game theory: Experiments in strategic interaction*. Princeton: University Press.

Caporael, L. R., Dawes, R. M., Orwell, J. M., & Van de Kragt, A. (1989). Selfishness examined: Cooperation in the absence of egoistic incentives. *Behavioral and Brain Sciences, 12,* 683-739.

Colman, A. (1982). *Game theory and experimental games: The study of strategic interaction*. Oxford: Pergamon Press.

Colman, A. M. (2003). Cooperation, psychological game theory, and limitations of rationality in social interaction. *Behavioral and Brain Sciences, 26*, 139-198.

Coombs, C. H., Dawes, R. M., & Tversky, A. (1981). *Introducción a la psicología matemática*. Madrid: Alianza Editorial.

Dawes, R.M. (1988). *Rational choice in an uncertain world*. Harcourt: Brace Jovanovich.

Eisenberger, N. E., Reykowski, J., & Staub, E. (1989). *Social and moral values: Individual and social perspectives*. Hillsdale, N.J.: Lawrence Erlbaum A.

Elster, J. (1989). *The cement of society*. Cambridge: Cambridge University Press.

Espinosa, A. C., Anguera, A. T., & Santoyo, V. C. (2004). Análisis jerárquico y secuencial de

patrones sociales "rudimentarios" establecidos por niños pequeños. *Metodología de las Ciencias del Comportamiento,* 193-200.

Espinosa, A. M. C., Blanco-Villaseñor, A., & Santoyo, V. C. (2006). El estudio del comportamiento en escenarios naturales: observación de las interacciones sociales.

In C. Santoyo & M.C. Espinosa (Eds.) *Desarrollo e Interacción Social: Teoría y métodos de investigación en contexto* (pp. 45-78). México, D.F.: CONACYT/UNAM.

Fisher, W. W., & Mazur, J. E. (1997). Basic and applied research on choice responding. *Journal of Applied Behavior Analysis, 30*, 387-410.

Flores, M. N., & Santoyo, V. C. (2009). Estabilidad y cambio de las relaciones sociales entre niños: análisis de mecanismos funcionales. *Revista Mexicana de Análisis de la Conducta, 35*, 61-76.

Frederick, S., Loewenstein, G., & O'Donoghue, T. (2003). Time discounting and time preference: A critical review. In G. Loewenstein, D. Read & R.F. Baumeister (Eds.) *Time and Decision* (pp. 13-86). New York: The Russell Sage Foundation.

Gintis, H. (2007). Unifying the behavioral sciences. *Behavioral and Brain Sciences*, *30*, 1-16.

González, B. L. F. (2009). Análisis experimental de las trampas sociales: factores de señalización. Unpublished doctoral dissertation. UNAM.

González, B. L. F., & Santoyo, V. C. (2007). Cooperación en dilemas de bienes públicos: el tamaño del grupo como señal de aportación. *Revista Mexicana de Análisis de la Conducta, 33*, 205-224.

González, N. M. F. (1998). Estudio de los patrones conductuales de niños agresivos: un enfoque contextual. Unpublished BA thesis. UNAM.

González, N. M., & Santoyo, V .C. (2002). Efectos de la conducta de otros sobre la cooperación en un dilema de recursos. *La Psicología Social en México, 9*, 810-816.

Gunner, M. R., & Cicchetti, D. (2009). Meeting the challenge of translational research in child development: Opportunities and roadblocks. In D. Cicchetti & M.R. Gunnar (Eds.), *Minnesota symposia on child psychology: Meeting the challenge of translational research in child psychology* (Vol. 35, pp. 1-27). New York: John Wiley & Sons.

Haberman, S. J. (1978). *Analysis of qualitative data: Vol. 1 Introductory topics*. New York: Academic Press.

Hake, D. F., & Vukelich, R. (1972). A classification and review of cooperation procedures. Journal of the Experimental Analysis of Behavior, 18, 3-16.

Henrich, J., Boyd, R., Bowles, S., Camerer, C., Fehr, E., Gintis, H., McElreath, R., Alvard, M., Barr, A., Ensminger, J., Henrich, N., Hill, K., Gil-White, F., Gurven, M., Marlowe, F., Patton, J.Q., & Tracer, D., (2005). "Economic man" in crosscultural perspective: Behavioral experiments in 15 small-scale societies. Behavioral and Brain Sciences, 28, 795-855.

Homans, G.C. (1974). Social Behavior: Its elementary forms. New York: Harcourt Brace Jovanovich.

Kollock, P. (1998). Social dilemmas: The anatomy of cooperation. Annual Review of Sociology, 24, 183-214.

López, C. E. (2005) Interacción conyugal conflictiva: Un punto de vista integrativo. Unpublished doctoral dissertation, UNAM.

López, C. E., & Santoyo, V. C. (2005). Asimetría de la interacción conflictiva de cónyuges violentos: la prueba de un modelo. Revista Mexicana de Análisis de la Conducta, 30, 115-138.

McGuire, W. J. (1997). Creative hypothesis generating in psychology: Some useful heuristics. *Annual Review of Psychology, 48*, 1-30.

Mellers, B. (1982). Equity judgment: A revision of Aristotelian views. *Journal of Experimental Psychology General, 111*, 242-270.

Olweus, D. (2003). *Bullying at school*. Oxford, UK: Blackwell Publishing.

Patterson, G. (1982). *Coercive family process: Vol. 3. A social learning approach*. Eugene Oregon: Castalia Publishing Co.

Pérez, R. M. (2009). El conflicto entre padres y adolescentes: Un estudio multimétodo. Unpublished doctoral dissertation, UNAM.

Platt, J. (1973). Social traps. *American Psychologist, 28*, 641-651.

Putallaz, M., & Gottman, J. (1981). Social skills and group acceptance. In S.R. Asher & J.M. Gottman (Eds.). *The development of children's friendships* (pp. 116-149). Cambridge: Cambridge University Press.

Rachlin H. (1994). The context of pigeon and human choice. In S. Hayes, L, Hayes, M., Sato, & K. Ono (Eds.). *Behavior analysis of language and*

cognition (pp. 301-319). Reno NV: Context Press.

Rachlin, H., Battalio, R., Kagel, J., & Green, L. (1978). Maximization theory in behavioral psychology. *The Behavioral and Brain Sciences, 4*, 371-417.

Rubio, M. P. (2004). Redes sociales establecidas en aulas integradoras: la perspectiva de los docentes y los alumnos. Unpublished doctoral dissertation, UNAM.

Rubio, M. P., & Santoyo, V. C. (2004). Interacciones sociales de niños con necesidades educativas especiales: Un enfoque funcional. *Revista Mexicana de Análisis de la Conducta*, 30, 1-20.

Santoyo, V. C. (1992). El análisis contextual de la equidad: Un proceso de elección interdependiente. Unpublished doctoral dissertation, UNAM.

Santoyo, V. C. (1994). *Contexto e Interacción social: Bases conceptuales y metodológicas*. Barcelona: P. P. U.

Santoyo, V. C. (1996). Behavioral assessment of social interactions in natural settings. *European Journal of Psychological Assessment, 12*, 124-131.

Santoyo, V. C. (2007). Estabilidad y cambio de patrones de comportamiento en escenarios escolares: Un estudio longitudinal en Coyoacán. México: UNAM/ CONACYT.

Santoyo, V. C. (1998). El análisis experimental de la conducta e interacción social: Un modelo contextual. In V. Alcaraz & A. Bouzas (Eds.), *Las contribuciones Mexicanas a la Psicología: una perspectiva de la Investigación* (pp.103-124). México: CONACYT/UNAM.

Santoyo, V. C. (2002). Analyzing behavioral interaction strategies in an "effort" and "profit" allocation task. Presented at the 29th annual ABA Convention, San Francisco, Calif. May 24.

Santoyo, V. C., & Bouzas, R. A. (1992). Juicios psicofísicos de equidad: Algunas implicaciones para la asignación de incrementos salariales. *Revista Mexicana de Psicología, 9*, 85-90

Santoyo, V. C., Colmenares, V. L., Figueroa, B. N. E., Cruz, C. A., & López, C. E. (2008). Organización del comportamiento coercitivo de niños de primaria: Un enfoque de síntesis. *Revista Mexicana de Psicología, 25*, 1, 71-87.

Santoyo, V.C., & Colmenares, V.L. (2003a). Intercambio social bajo situaciones de asignación de esfuerzo y ganancias. XVI Mexican Congress of Behavior Analysis. Puerto Vallarta, Jal. October 2-4.

Santoyo, V. C., & Colmenares, V. L. (2003b). Integración de la información en un dilema de bienes públicos. VI National and V International Convention of Thought and Language. March 23-26. Hermosillo, Sonora.

Santoyo, V. C., & Espinosa, A. M. C. (2006). *Desarrollo e interacción social: Teoría y Métodos de investigación en contexto*. México: CONACYT/ UNAM.

Santoyo, V. C. Espinosa, A. C. & Bachá, M. G. (1994). Extensión del sistema de observación conductual de las interacciones sociales: Calidad, dirección, contenido contexto y resolución. *Revista Mexicana de Psicología, 11*, 55-68.

Santoyo, V. C., Espinosa, A. C., & Maciel, A. O. (1996). Reciprocidad y patrones coercitivos de niños preescolares. *Revista Mexicana de Análisis de la Conducta, 13,* 63-74.

Santoyo, V. C., & López, C. E. (2003). Dilema de bienes públicos en unidades habitacionales: Una perspectiva integrativa. *Revista Mexicana de Psicología, 20*, 165-175.

Siegel, S., & Castellan, N. J. (1970). *Estadística no paramétrica aplicada a las ciencias de la conducta*. México: Trillas.

Wilson, J. W., & Herrnstein, R. J. (1985). *Crime and human nature*. New York: Simon & Schuster, Inc.