SOCIAL SCIENCES

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Humans display a reduced set of consistent behavioral phenotypes in dyadic games

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Socially relevant situations that involve strategic interactions are widespread among animals and humans alike. To study these situations, theoretical and experimental research has adopted a game theoretical perspective, generating valuable insights about human behavior. However, most of the results reported so far have been obtained from a population perspective and considered one specific conflicting situation at a time. This makes it difficult to extract conclusions about the consistency of individuals' behavior when facing different situations and to define a comprehensive classification of the strategies underlying the observed behaviors. We present the results of a lab-in-the-field experiment in which subjects face four different dyadic games, with the aim of establishing general behavioral rules dictating individuals' actions. By analyzing our data with an unsupervised clustering algorithm, we find that all the subjects conform, with a large degree of consistency, to a limited number of behavioral phenotypes (envious, optimist, pessimist, and trustful), with only a small fraction of undefined subjects. We also discuss the possible connections to existing interpretations based on a priori theoretical approaches. Our findings provide a relevant contribution to the experimental and theoretical efforts toward the identification of basic behavioral phenotypes in a wider set of contexts without aprioristic assumptions regarding the rules or strategies behind actions. From this perspective, our work contributes to a fact-based approach to the study of human behavior in strategic situations, which could be applied to simulating societies, policy-making scenario building, and even a variety of business applications.

INTRODUCTION

Many situations in life entail social interactions where the parties involved behave strategically; that is, they take into consideration the anticipated responses of actors who might otherwise have an impact on an outcome of interest. Examples of these interactions include social dilemmas where individuals face a conflict between self and collective interests, which can also be seen as a conflict between rational and irrational decisions (*1*–*3*), as well as coordination games where all parties are rewarded for making mutually consistent decisions (*4*). These and related scenarios are commonly studied in economics, psychology, political science, and sociology, typically using a game theoretic framework to understand how decision-makers approach conflict and cooperation under highly simplified conditions (*5*–*7*).

Extensive work has shown that, when exposed to the constraints introduced in game theory designs, people are often not "rational" in the sense that they do not pursue exclusively self-interested objectives (*8*, *9*). This is especially clear in the case of prisoner's dilemma (PD) games, where rational choice theory predicts that players will always defect but empirical observation shows that cooperation oftentimes occurs, even in "one-shot" games where there is no expectation of future interaction among the parties involved (*8*, *10*). These findings beg the question as to why players sometimes choose to cooperate despite incentives not to do so. Are these choices a function of a person's identity and therefore consistent across different strategic settings? Do individuals draw from a small repertoire of responses, and if so, what are the conditions that lead them to choose one strategy over another?

Here, we attempt to shed light on these questions by focusing on a wide class of simple dyadic games that capture two important features of social interaction, namely, the temptation to free-ride and the risk associated with cooperation (*8*, *11*, *12*). All are two-person, two-action games in which participants decide simultaneously which of the two actions they will take. Following previous literature, we classify participants' set of choices as either cooperation, which we define as a choice that promotes the general interest, or defection, a choice that serves an actor's self-interest at the expense of others.

The games used in our study include PD (*13*, *14*), the stag hunt (SH) (*4*), and the hawk-dove (*15*) or snowdrift (*16*) games (SGs). SH is a coordination game in which there is a risk in choosing the best possible option for both players: cooperating when the other party defects poses serious consequences for the cooperator, whereas the defector faces less extreme costs for noncooperation (*17*). SG is an anticoordination game where one is tempted to defect, but participants face the highest penalties if both players defect (*18*). In PD games, both tensions are present: when a player defects, the counterpart faces the worst possible situation if he or she cooperates, whereas in that case, the defector benefits more than by cooperating. We also consider the harmony game (HG), where the best individual and collective options coincide; therefore, there should be no tensions present (*19*).

Several theoretical perspectives have sought to explain the seemingly irrational behavior of actors during conflict and cooperation games.

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