LETTER

Flexible strategies, forgiveness, and the evolution of generosity in one-shot encounters

By using agent-based simulations, Delton and colleagues (1) suggested in PNAS that cooperation by humans in one-shot interactions could have evolved as a byproduct of selection for reciprocity when it is uncertain if interactions will be repeated. We believe their work should be commended both for the novelty of the hypothesis proposed and the explicit cognitive framework in which the model is posed, providing new insight into an important interdisciplinary problem. However, as a result of the authors' focus on decision-making in the first round of interaction, the possibility of subsequent strategy updating is ignored and, as a result, only a small region of the possible strategy space is examined. We believe it is these constraints that have determined the outcome of cooperation in one-shot interactions, which are probably not as general as the authors claim.

The main limitation of the model is that individuals must decide on their strategy for all subsequent rounds during the first round of interaction, choosing between tit-for-tat (or grim) and always defect. The authors stated that decision-making with imperfect knowledge leads to errors (1), yet players were not allowed to correct their mistakes. If we follow the logic of Delton et al. (1) and assume that a reciprocal cooperative strategy is optimal when interactions are repeated, then a player finding him- or herself in a second interaction should always assume a reciprocal cooperative strategy, correcting for any error in the first interaction. If correction of errors becomes possible, then selection for forgiveness of errors should be expected, thereby reducing the cost of an early mistake (2). It is well known that more forgiving strategies (such as more forgiving versions of tit-for-tat and Pavlov) are favored over tit-for-tat when errors occur (2–5). As forgiveness of errors occurs more frequently, each single interaction has less importance in the long-term payoff from the game, eroding the effect that Delton et al. reported (1).

An interesting question directly resulting from the approach of Delton et al. (1) is: What kinds of strategies should evolve when the probability of repeated interaction is a function of the number of previous interactions? We would suggest that the inability of tit-for-tat and grim to forgive an opponent's errors would make them unlikely candidates. To assert the generality of the mechanism proposed, a much broader investigation of the strategy space would be required. The importance of first-interaction decisions for long-term cooperation is certainly influenced by the strategic composition of the population (i.e., the type of society). Allowing individuals' strategies to freely evolve would allow for the determination of the societal compositions that can favor cooperation in one-shot interactions. We propose that one-shot cooperation would be more likely to evolve in an unforgiving Machiavellian society, as Delton et al. (1) have shown. Ironically, a more forgiving society would undermine the importance of generosity, leading to a conflict between these beneficent traits.

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