

The Effects of Reducing Information on a Modified Prisoner's Dilemma Game

Jay C. Brown (Jaybrown@andrew.cmu.edu)
Carnegie Mellon University
Department of Psychology
Pittsburgh, PA 15213

Marsha C. Lovett (Lovett@andrew.cmu.edu)
Carnegie Mellon University
Department of Psychology
Pittsburgh, PA 15213

Abstract

Participants played a modified prisoner's dilemma game in which competition was created using a single player. The competition was between the player at the moment and the player in the future. The complexity of the game was increased across experiments. The transition from Experiment 1a to 1b saw the removal of information about future consequences and past behavior. Experiment 2 removed information about current outcomes. As the complexity of the game increased (both quantitatively and qualitatively) and therefore the external validity increased, the ability to "solve" the game decreased.

Introduction

Many choices we make are between things that make us feel good at the moment and things that are actually better for us in the long run. Choosing to consume alcohol at a party certainly feels better (at the moment) than not consuming alcohol, but in the long run (hangovers, loss of peer respect, etc.) we are certainly better to refrain from this consumption. When purchasing an automobile, assuming equal price, a sports car is definitely flashier than a mini-van, but the mini-van will probably last longer, be more practical, and cost less in insurance. Purchasing the sports car may make us feel better at the moment, but the total utility (over the life of the vehicles) would unquestionably be higher for the mini-van.

Impulsiveness is defined as the choice for the outcome that feels good at the moment (consuming alcohol; the sports car). Self-control is the choice for the outcome that is actually better in the long-run (refraining from alcohol consumption; the mini-van). Many factors affect our impulsiveness and ability to exhibit self-control. The experiments presented here address several of them.

A goal of this paper is to explore how people learn to choose between impulsivity and self-control. One can view this learning as an adjustment of strategy choices after feedback. Given the task studied in this paper, another relevant perspective views the learning as a growing understanding of cooperation in an iterated prisoners dilemma game.

In a traditional prisoner's dilemma game, two players each choose between two options (often called cooperate and defect) creating four possible outcomes

(Rapoport & Chammah, 1965). These outcomes are associated with different rewards, labeled A, B, C and D, that must obey the following rules:

$$B > A > D > C$$

$$2A > B + C > 2D$$

Both players will receive outcome A (moderately good) if both choose to cooperate. Both players will receive outcome D (moderately bad) if both choose to defect. However, if Player 1 chooses to cooperate and Player 2 chooses to defect, then Player 1 will receive outcome C (the worst) while Player 2 will receive outcome B (the best). Defection tends to dominate in both one-shot and iterated playing of this game. However, if the players know each other, and, more importantly, trust each other, then cooperation can arise and persist. Rachlin, Brown and Baker (2001) have shown that Player 1 will cooperate only if he or she believes Player 2 will reciprocate that cooperation.

This result suggests that converting the two-player version of the game to a single-player version¹ would lead to high levels of cooperation. Nevertheless, previous work has shown that individual players chose to "cooperate" with themselves only 54% of the time (Brown & Rachlin, 1999). Why is this percentage so low? Consider the competition engendered by the single-player game: it is between the self at the moment and the self in the future, which is essentially a choice between impulsivity and self-control. The present experiments explore the processes by which individuals choose between these options in the single-player game.

Experiment 1a

The first experiment was designed to be a computer-based replication of previous work (see Brown & Rachlin, 1999 for full details) to obtain greater control

¹ A single-player prisoner's dilemma game, where that player makes two or more sequential choices, is identical to a two-player game in which the "other" player uses the tit-for-tat strategy perfectly (see Axelrod, 1987). In both instances, levels of uncertainty exist for the player at the moment of choice as to the future outcomes of the game. Whether that uncertainty arises from a lack of knowledge of another player's future actions or one's own future actions is inconsequential.