STUDENT PAPER WINNER

DELAY DISCOUNTING AND PERFORMANCE ON THE PRISONER'S DILEMMA GAME

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The degree to which delayed reinforcers are discounted in value (delay discounting) may help in understanding impulsive and self-control choices (Green, Fry, & Myerson, 1994). Specifically, when choosing between a small immediate and a large delayed reinforcer, an impulsive choice will occur if the value of the large delayed reward is discounted so much that it falls below that of the small immediate reinforcer. If the large delayed reinforcer is discounted to a lesser degree, however, its present value will exceed that of the small immediate alternative, and a self-control choice thus will be made.

The prisoner's dilemma game is a popular model of social interaction and conflict situations involving two players who must independently choose to either "cooperate" or "defect." The consequence of each choice depends on the choice made by the other player. When both players cooperate, they receive a moderate payoff (3 points each). When both defect, they receive a smaller amount (2 points each). When one player cooperates and the other defects, the cooperator earns the lowest possible payment (1 point), while the defector earns the highest payment (4 points) (McClintock & McNeel, 1966).

An interesting choice exists after the player defects against an opponent playing the tit-for-tat strategy (always copying the player's last move). Choosing to defect again will earn the player 2 points, while cooperating will result in 1 point. Choosing to cooperate, however, means that the opponent will do the same on the next trial: cooperating from this point forward will result in 3 points per trial. Thus, the player must choose between a smaller reward relatively soon (2 points now) and a larger reward later (1 point now and 3 points on all subsequent trials). Rachlin (1997) has suggested that individuals who greatly discount the value of delayed reinforcers (i.e., those making impulsive choices) are more likely to defect, and thereby choose the smaller more immediate reward.

The present research examined the relation between delay discounting and performance on the prisoner's dilemma game against an opponent playing tit-for-tat. Thirty-five participants completed a discounting exercise developed by Rachlin, Raineri, and Cross (1991) involving choices between immediate and delayed monetary rewards. Indifference points, or points at which the immediate and delayed rewards were of equal subjective value, were established across eight delay periods. Following the discounting exercise, each participant played 40 trials of the prisoner's dilemma game against a computer opponent.

Mazur's (1987) hyperbolic discounting function was used to analyze participants' indifference points between the immediate and delayed monetary rewards across the eight delay periods:

$$v_d = A / (1+kd). \qquad (1)$$

In Equation 1, v_d is the present discounted value of a delayed reward (i.e., the current subjective value of the reward), A is the amount (magnitude) of the delayed reward, k is an empirically derived constant proportional to the degree of delay discounting, and d is the duration of the delay. This hyperbolic discounting function provided an excellent fit of these data, accounting for 89% of the variance.

A one-tailed Pearson's test of correlation revealed a significant positive relation between the between the log k values and percentage of defections on the prisoner's dilemma game ($r = 0.415$, $p = 0.01$). These data support the contention that high levels of impulsivity are related to defecting against an opponent playing tit-for-tat on the prisoner's dilemma game.

References

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