Discounting of Delayed and Probabilistic Rewards in Gambling and Non-gambling College Students

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Introduction

Individuals make decisions on a daily basis that involve delayed and/or uncertain outcomes. For instance, one must decide whether to cash his or her paycheck and spend it all right away or take some of the paycheck and put it into a retirement account. Another situation may involve making a decision between a certain, but small, outcome and an uncertain, but larger, outcome. This choice situation is analogous to the type of situation a contestant on a game show (e.g. NBC's Deal or No Deal) may encounter when deciding between taking a certain, smaller amount of prize money or an uncertain, but much larger sum of money.

A hyperbolic function has been found to be a very good descriptor of the relation between the subjective value of a reward and the delay to/odds against receiving the reward. For both delayed and uncertain rewards the function is:

$$V = A / (1 + k D), \qquad \text{Eq. 1}$$

where V equals the subjective value of some reward of amount A with D delay to (or odds against) its receipt and k is the discount rate parameter (Green & Myerson, 2004). The equation accounts for the typical finding that as delay to (or odds against) the receipt of an outcome increases, the subjective value (V) decreases.

With losses as the outcome, people behave differently than they do with gains as an outcome; delayed losses are discounted much less steeply than are delayed gains. That is, individuals are more willing to wait and pay a larger amount of money than they are to wait and receive a larger amount of money. Uncertain losses are discounted less steeply than uncertain gains. That is, individuals are risk averse with both payments and rewards (Estle, Green, Myerson, & Holt, 2006). Previous research also suggests that Eq. 1 is a good description of the discounting of both delayed and probabilistic losses.

Holt, Green, & Myerson (2003) found college-aged gamblers and non-gamblers to be indistinguishable in terms of delay discounting. This suggests that, with positive outcomes, gamblers and non-gamblers are similar in terms of ability to delay gratification. Holt et al. also found that gamblers discount probabilistic rewards less steeply than non-gamblers. These findings indicate that, with positive outcomes, gamblers are more willing to take risk than non-gamblers.

The fact that gamblers delay gratification similar to non-gamblers, but are more risk taking than non-gamblers implies that a term like impulsivity should be used with caution. Therefore, a trait of impulsivity does not necessitate that an individual has both an inability to delay gratification and a tendency towards taking risk.

The present study extends the discounting research with gamblers to include losses as an outcome.

Method

A total of 38 undergraduate students were asked to make choices between immediate and delayed rewards and losses as well as between certain and uncertain rewards and losses. Of the 38 participants, 8 were identified as gamblers and 30 were identified as non-gamblers. Gamblers were defined as any participant with a South Oaks Gambling Screen (SOGS) score of 4 or higher (scores have a possible range of 0 to 20). Non-gamblers were defined as any participant with a SOGS score of 0.
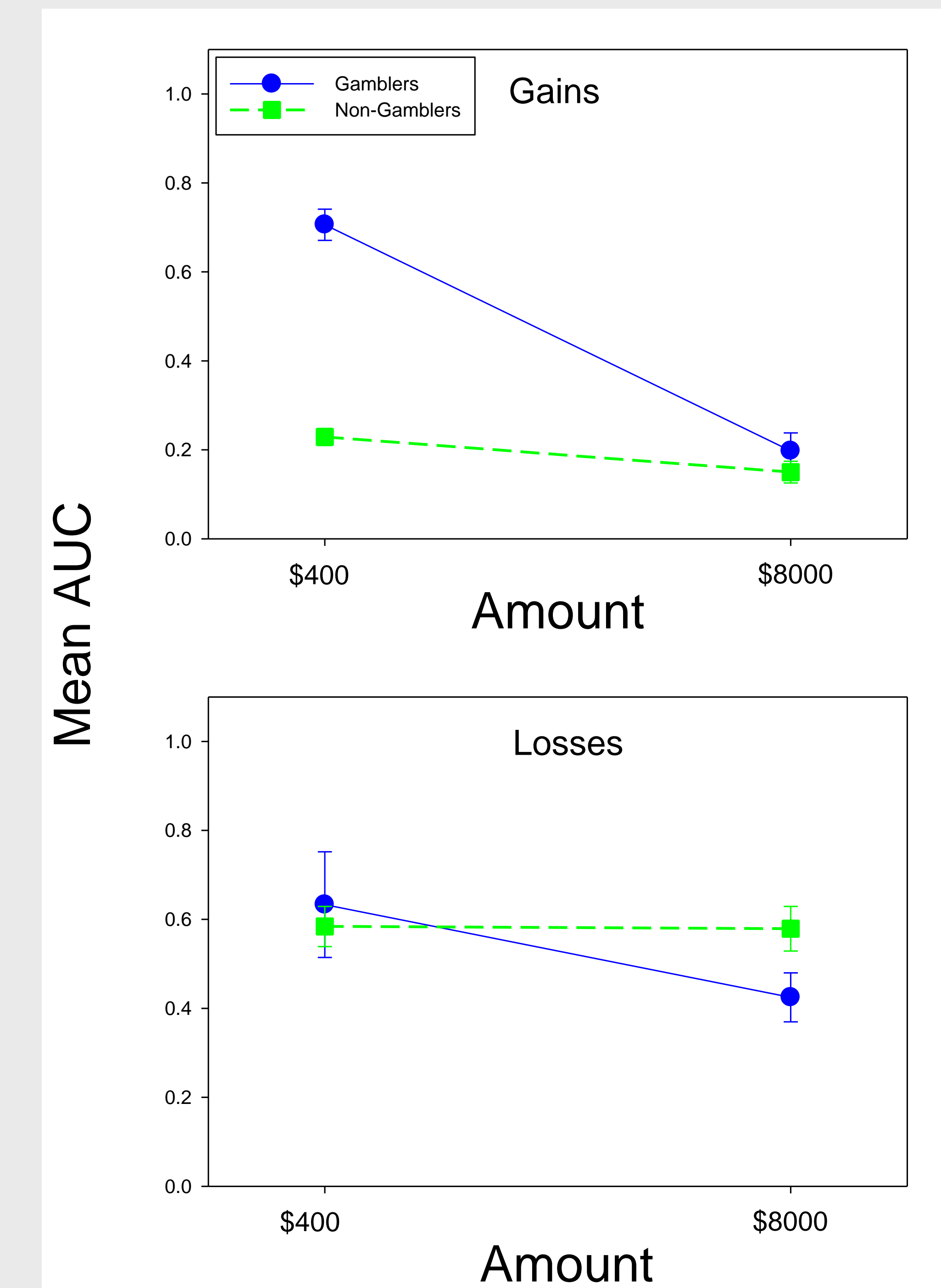
Participants made choices using a computer-based decision-making task. Through this task we were able to determine an estimate of the subjective value of a delayed or uncertain reward/loss.

Results
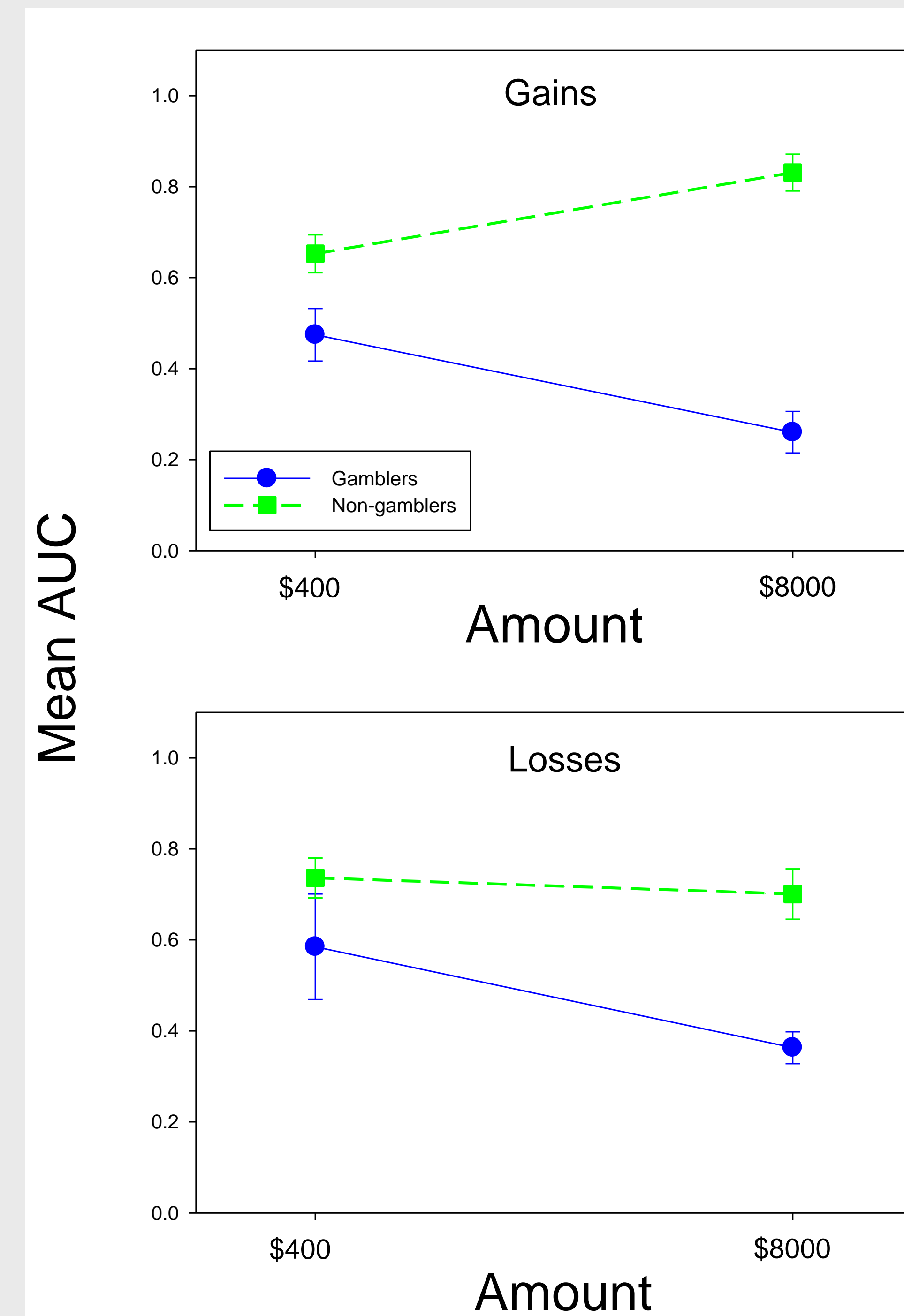
The figures show the mean area under the curve for both delayed gains and losses and uncertain gains and losses. A larger area under the curve represents shallower discounting, whereas a smaller area under the curve represents steeper discounting. For delayed outcomes, gamblers discounted both gains and losses more steeply than non-gamblers. For uncertain outcomes, gamblers discounted gains more shallowly than non-gamblers and losses more steeply than non-gamblers.

Discussion

When making choices that involve delayed outcomes, Holt et al. (2003) found college-aged gamblers and non-gamblers to be indistinguishable. That is, the Holt et al. data suggest that college-aged gamblers and non-gamblers are similar in their ability to delay gratification.

The present data, with *losses* as an outcome, suggest that gamblers are willing to accept a larger delayed payment than an immediate smaller payment as compared to non-gamblers. This pattern indicates that, relative to non-gamblers, the gamblers are willing to defer payment even if the immediate payment is much smaller.

Holt et al. (2003) found gamblers to discount uncertain rewards less steeply than non-gamblers, showing that gamblers were more risk-taking than were non-gamblers.

The present data, with *losses* as an outcome, suggest that gamblers are willing to take larger risks as compared to non-gamblers. Closer inspection of the data indicates that the difference between the gamblers and non-gamblers is larger for the losses than it is for the gains condition. This pattern of responding may be a unique indicator of gambling problems.

Acknowledgements