



# A Psychophysical Approach to Discounting: Sex and Food

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## Introduction

Discounting has been defined as a decrease in the subjective value of an outcome as the delay to or uncertainty of receiving the outcome increases. Previous research on discounting indicates that when outcomes are either delayed or uncertain, consumable primary reinforcers (reinforcers that fill a biological need and that one can satiate on) are discounted similarly to each other (Estle, Green, Myerson, & Holt, 2007; Odum & Rainaud, 2003). For example, Estle et al. (2007) found that delayed candy, beer, and soda were all discounted similarly to each other. Candy, beer, and soda were also discounted similarly when the probability of receipt was manipulated.

There has been relatively little discounting research on primary reinforcers other than food and drugs. One notable exception is research conducted by Chapman and colleagues (1995, 1996) where the discounting of "health" was measured. In the Chapman studies, the units of health were established by participants reporting the amount of "health" they found equivalent to a specified dollar amount.

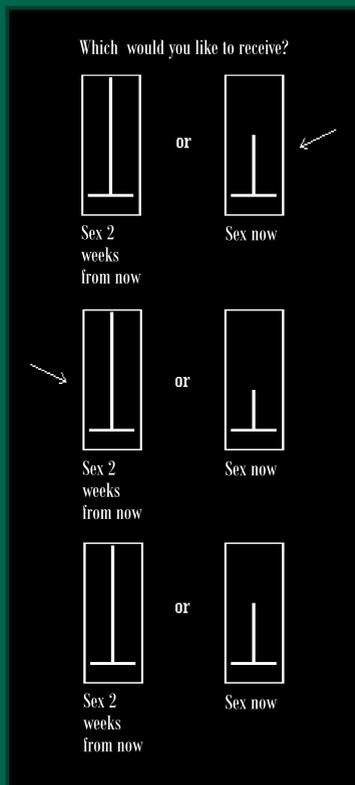
The present study extends previous research by using a psychophysical approach to examine how a previously uninvestigated primary reinforcer (sex) is discounted relative to another previously investigated primary reinforcer (food). The present study also extends the generality of previous research by using a non-food related primary reinforcer. All outcomes were quantified in terms of vertical lines of different lengths, as opposed to numerical values, to allow for the comparison of qualitatively different outcomes on a quantitatively similar scale.

## Method

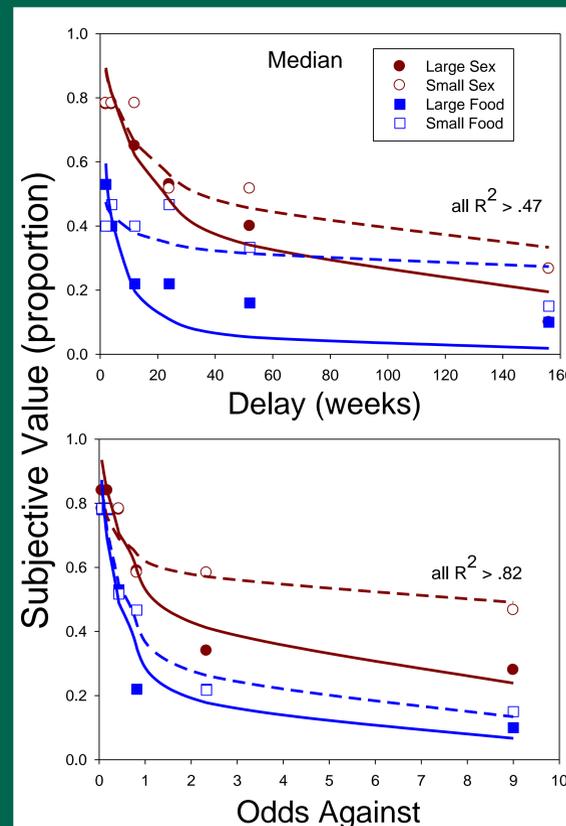
59 participants accessed a web-based choice task where they were presented with vertical lines where line length was meant to represent the "value" of each available hypothetical outcome. When food was the outcome, "food" was defined broadly as a meal in which a full line represented the maximum ideal eating experience. When sex was the outcome, "sex" was defined broadly as an intimate situation in which a full line represented the maximum ideal sexual experience. Any reduction in the length of the line represented proportionally less value. For example, a line at half the maximum length represented half of what the participant would consider to be an ideal situation for that specific outcome.

A repeated measures design was used where each participant experienced both delay and probability discounting tasks for each outcome type (food and sex) at both smaller and larger amounts.

After each successive choice, the length of the line representing the value of the certain (or immediate) hypothetical outcome was adjusted in such a way that when the greater, less probable (or more delayed) outcome was chosen, the value of the certain (or immediate) outcome was increased in an attempt to elicit a change in preference. If the certain (or immediate) outcome was chosen, its value was decreased in an attempt to elicit a change in preference. By the fourth decision in each choice situation, an indifference point between the two lines was reached, which served as an estimate of the subjective value of the specific outcome.

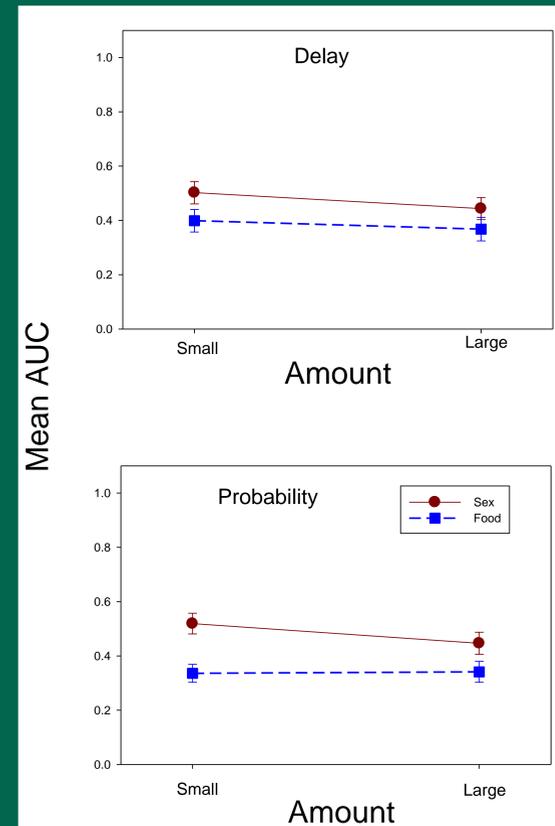


## Results



The top panel shows the median subjective values when the outcomes were delayed. A hyperboloid function [ $V = A / (1 + kX)^s$ ] provided a good fit to the obtained data (best fitting lines are shown). Three of four R-squared values were greater than .84. The exception was the fit for the small food condition where the R-squared value was .47.

The bottom panel shows the median subjective values and best fitting lines when the outcomes were uncertain (all R-squared values > .82).



The figure shows the mean area under the curve for both delayed and probabilistic outcomes. A larger area under the curve represents shallower discounting, whereas a smaller area under the curve represents steeper discounting. For delayed outcomes there was a reliable effect of amount ( $p < 0.05$ ) and no reliable effect of type ( $p = 0.07$ ) or type x amount interaction (2x2 repeated measures ANOVA). For probabilistic outcomes there was a reliable effect of type ( $p < 0.01$ ) and no effect of amount or interaction (2x2 repeated measures ANOVA).

## Discussion

- The subjective value of both food and sex decreased as a function of the delay to (or probability of) its receipt.
- With delay discounting there were no reliable differences between the outcome types; however, there was a trend towards a difference, with food being discounted more steeply than sex. Previous research has found primary reinforcers to be discounted similarly to each other. We found a reliable amount effect, with larger amounts being discounted more steeply than smaller amounts. Previous research has found that small amounts are discounted more steeply than large amounts with both primary/consumable reinforcers and money as outcomes.
- With probability discounting there were reliable differences between the outcome types. Sex was discounted less steeply than food. That is, participants were more willing to forgo a certain, but less than ideal, sexual experience in order to have a chance at an ideal sexual experience than they were to forgo a certain, but less than ideal, eating experience in order to have a chance at an ideal eating experience. This contradicts previous evidence that primary reinforcers were not discounted differently from one another when outcomes were uncertain.
- No reliable difference was found between outcome types when they were delayed but a difference was found when outcomes were uncertain, which is different than what past research on primary reinforcers has found. The current results suggest that primary reinforcers may not all be treated equally.