

# Genetic Inheritance of Time-discounting Behavior: A Bayesian Approach Using Markov Chain Monte Carlo Method

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## Abstract

Although many studies have focused on the determinants of the subjective time discount rate, few have addressed the influence of genetic factors. Using the classical twin approach, wherein correlations between monozygotic twins and those between dizygotic twins are compared; we explore to what extent genetic factors account for interpersonal variations in the subjective time discount rate. The data are based on a questionnaire survey of 104 aged Japanese twin pairs. By eliciting subjective time discount rates for an immediate future choice (i.e., 2 days or 9 days) and those for a more distant future choice (i.e., 90 days or 97 days), we conclude that genetic factors do not statistically display different contributions to the determination of time discounting between immediate and distant future choices. For immediate future choice, 24% of the variation can be accounted for by additive genetic factors and 26% of the variation can be accounted for by common environmental factors. And, for distant future choice, 23% of the variation can be accounted for by additive genetic factors and 22% of the variation can be accounted for by common environmental factors. Moreover, we find that for immediate future choice individual-specific environmental contribution becomes larger with age. As an important implication, education and upbringing in childhood help to control impulsive behavior under hyperbolic discounting in later years. To obtain the estimation results, we adopt a mixed-effects Bayesian ACE model using Markov Chain Monte Carlo method and extend it to heteroscedastic random effects version.

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