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Assessing the Reliability of a Novel Procedure to Measure Impulsivity and Self-Control in Rats

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INTRODUCTION

Choice outcomes are discounted by imposed delays. This effect, termed *delay discounting*, is often demonstrated by a higher choice preference for a smaller reinforcer amount delivered sooner, rather than a larger amount delivered after a longer delay.

Degree of delay discounting has been correlated with behaviors exhibited by traditionally impulsive populations, including substance abusers and problem gamblers. Additionally, neural mechanisms involved in choices between delayed outcomes has attracted much attention in recent years.

One limiting factor in assessing discounting is that quantitative determinations of an individual's degree of impulsivity can be quite time consuming. Despite this, few studies have investigated new procedures that could attain a reliable discounting measure in a shorter period of time.

The current study assessed the reliability of a novel delay discounting procedure, which our lab has designed to assess choice behavior in approximately one week. If this new method produces orderly and reliable results, it will be beneficial for use in future discounting research.

METHODOLOGY

Naïve adult Sprague Dawley rats (n = 14) served as subjects. Sessions were conducted in standard operant chambers containing nose-poke response keys, stimulus lights, and pellet dispensers (see Figure 1). Sessions were conducted 7 days per week at approximately the same time day.

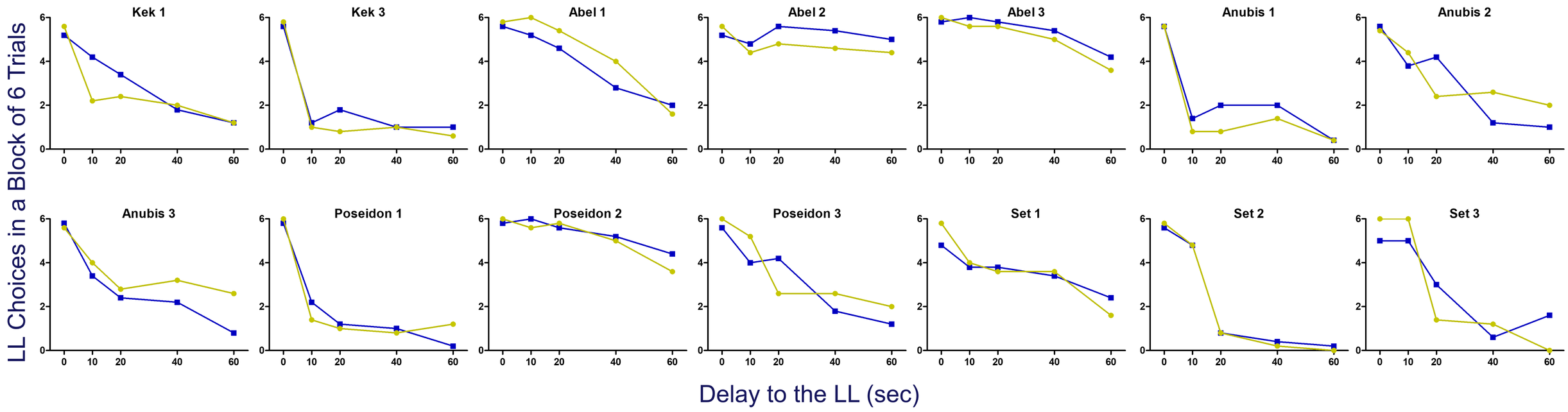
For the discounting procedure, subjects were always choosing between having one food pellet delivered immediately (smaller-sooner - "SS") or three food pellets delivered after some delay (larger-later – "LL"). Sessions were split into 5 blocks of 6 choice trials. Each day, the delay to the LL food option increased and was either 0, 10, 20, 40, or 60s. With the delay increasing daily, it took approximately one week to complete the procedure. This procedure was replicated several times to assess test-retest reliability.

FIGURE 1

RESULTS

Figure 2: Rat subject's individual choices for the LL outcome in 6-trial blocks, as a function of the LL delay. Separate gold curves represent the procedural replication approximately one month after the initial curve generation in blue.

FIGURE 2



DISCUSSION

Historically, widely-utilized procedures to assess delay discounting take several months to complete. However, the novel procedure developed by our lab allows researchers to generate orderly curves in only one week. These results also indicate that the novel task produces data that is reliable over time across repeated measurement.

This new method holds promise for shortening the time to achieve individual discounting curves. This has clear implications for researchers who utilize delay discounting procedures, and may be particularly valuable for those examining potential correlates with other time-sensitive variables in behavioral, pharmacological, or aging research.

We would like to thank the ***Office of Research and Sponsored Programs at the University of Wisconsin – Eau Claire*** for their continued support of our research.