Individual variability in rat motivation to access a food reward

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Introduction

Individual rats vary in their motivation for food rewards, posing a challenge when interpreting behavioural responses in tests that rely on food rewards. Approach-avoidance tests pair an animal's motivation to approach a reward with their motivation to avoid a negative stimulus. Approach-avoidance can be used to assess aversion to euthanasia agents like CO$_2$. The strength of aversion to CO$_2$ has been shown to vary between individuals.

Experimental aims:

1) obtain an independent measure of individual variation in rat motivation for a sweet food reward
2) assess the relationship between this measure of motivation and measures of individual aversion to CO$_2$

Methods

1. Sweet Reward Motivation:
   - 11 female Sprague-Dawley rats, each tested 3 times
   - 21 Cheerios were hidden under a thin layer of sand and increasingly dispersed in each consecutive trial
   - Trials scored for time rats spent searching and number of Cheerios found

2. Approach-Avoidance:
   - 8 rats with 7-10 exposures to CO$_2$ (20% cage vol min$^{-1}$)
   - When a rat started eating from a dish of 20 Cheerios, CO$_2$ flow began and the rat could leave at any time
   - Average CO$_2$ aversion per rat determined through latency to leave the bottom cage

Results

![Graph showing time spent searching for Cheerios](image1)

Figure 1. Amount of time rats spent searching for Cheerios in each sweet reward motivation trial. Each line represents an individual rat (Repeatability: $R=0.59$, $p<0.001$, $n=11$ rats).

![Graph showing latency to avoid CO$_2$](image2)

Figure 2. Relationship between average time rats spent searching for Cheerios in the sweet reward motivation test and average latency to avoid CO$_2$ in approach-avoidance tests (Pearson's correlation test: $r=-0.15$, $p=0.72$, $n=8$ rats).

Conclusions

Rats show consistent individual differences in their motivation to obtain a reward; behavioural tests that rely on rewards should account for this individual variation.

Aversion to CO$_2$ in approach-avoidance is not related to motivation for a reward; individual differences in aversion may instead be due to differences in CO$_2$ sensitivity.

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