

Weiss & Neuringer: Reinforced Variability (7-24-12)

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Reinforced Variability: Effects on Choice and Performance in Choice D.D.P.

Alison Weiss and Allen Neuringer

Department of Psychology, Reed College, 3203 SE Woodstock Blvd., Portland,
Oregon, 97202

Abstract

In an open-field test, the Long-Evans (LE) strain of rats was identified as "bold" and the PVG strain as "shy." Some members of each strain then experienced 14 sessions of a common enrichment procedure, namely exposure to a series of novel objects (Exposed). Others in each strain were explicitly reinforced with food pellets for variable interactions with the same objects (Reinforced). Both experience and strain influenced object interactions. In particular, Reinforced rats interacted more variably with the objects – contacting, probing, pushing and so forth – than did the Exposed; and LEs interacted more variably than PVGs. Foraging proficiency in the same rats was then studied in a transfer of training test. Food pellets were hidden among never-before

1. Introduction

Rats will often approach and explore novel objects, a reaction common to many species [1]. However, not all rats explore equally, and strains of rats, as well as individuals within a strain, differ [2,3]. This, together with other related findings, has led researchers to characterize some animals as 'bold,' or those who readily approach and explore spaces and objects, and others as 'shy,' or those who tend to be avoidant [4,5]. In the present study, rats from bold and shy strains are explicitly rewarded for variable interactions with novel objects. Of particular interest is whether reinforcing response variability will cause shy animals to approximate behaviors that characterize bold.

1.1. Three questions

We asked three questions: First, what are the effects of variability reinforcement on rats' explorations of novel objects? Second, does variability

been characterized as shy and Long-Evans (LE) as bold. We know of no direct comparison between the PVG and LE strains, but studies have compared each

2.2 Methods

2.2.1. Animals

Fourteen Long-Evans (LE) and 14 PVG rats, all females, were obtained from Harlan Sprague-Dawley at three to four weeks of age. Each strain was comprised of seven littermate sister pairs from different litters. The sisters were housed together (one sister pair per cage) with tail markings distinguishing the

Therefore, on two common measures of the shy-bold axis –choosing the central part of the open field and rearing – LFs were assessed as relatively bold and

4.2.2. *Materials*

Experimental chambers were the same as in Experiment 1, i.e., the open-

32 1/2" x 18" x 15" stainless steel chambers with 45 mm food pellets attached to

the front wall of each chamber.

objects in the center of each (Figure 2). The rats were placed midway between the object and the pellet-dispenser front wall, facing the object.

4.2.4.1 Reinforcement of Variable Responses (Reinforced)

Seven LEs and seven PVGs were reinforced with food pellets for variable responses directed at the target object. The rats were initially reinforced for

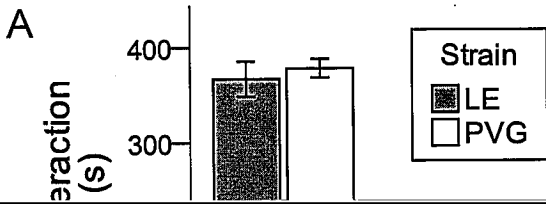
tower in arena.

Object 9

metal screen tube with
natural corks

Contact tube/corks with nose/paws, jump
over tube, drag object through arena with

of the types of responses that the rats made to the objects: the less common a given rat's response, compared to all 28 rats in the experiment (including its own

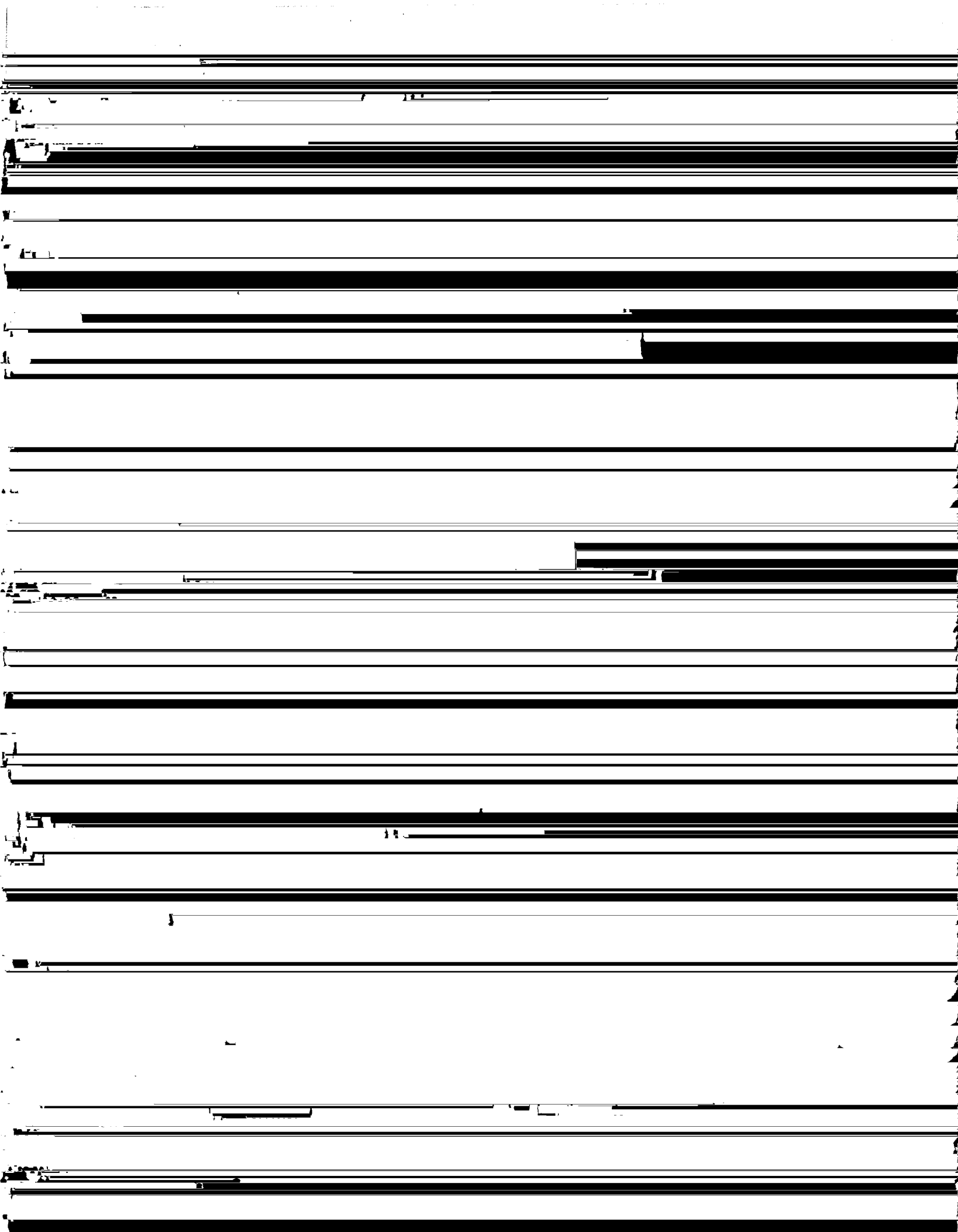


variations contingency was based on non-repetitions in real time, or recency. We conclude that both genetic strain and reinforcement contingencies influenced the variability of rats' explorations of novel objects.

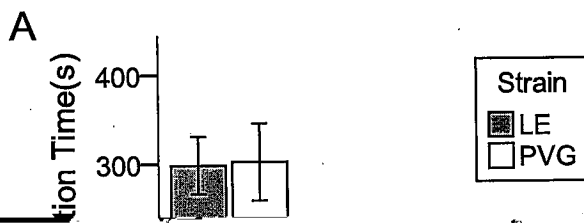
6. Experiment 3: Hidden Food Test

6.1. Introduction

... .. for food on water animals after interact with novel before



variable responses to novel objects now uncovered and consumed more hidden food pellets than rats who had equal opportunity to interact with the same objects; a bold strain of rats was more adept at this task than a shy strain; and these two contributors to foraging proficiency did not interact



repetitively and responses are easily predicted. In that case, reinforcement is contingent on low variability. Repetition lies at one end of the variability continuum, and if reinforcement depends upon responses approximating a random model then responding approaches, or in some cases equals that

[140] Intermediate levels of variability can be reinforced as well [7]. More

variable interactions overcame the naturally shy exploratory tendencies of PVGs,
[redacted] compared to Fused animals. Genetics contributed as well in that

8.1. Caveats

Reinforcement of variable response interactions necessarily involves

Figure Legends

shown by open bars. in the open field test. (A) Average time (s) spent in the
central zone of the open field. (B) Average number of rearing responses. (C)
Average seconds spent moving. Error bars show standard errors

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Table(s)

Table 1

Description of each object used in Experiment 2 and a list of common responses.

Object 1	black rubber cork	Touch with paw(s), bite or nawn on edge, push/roll with nose, push/roll with paws, carry in mouth across box.
Object 2	lacrosse ball	Contact with nose/paws, roll ball away from body, roll ball towards body, rear on top of ball.
Object 3	tinker toy	Contact or roll with nose/paws, knock over.