

# Appetitive latent inhibition in rats: Preexposure performance does not predict conditioned performance

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## Abstract

Nonreinforced preexposure to a conditioned stimulus impairs subsequent conditioning with that stimulus. The goal of these studies was to assess the extent to which acquisition performance could be predicted from preexposure performance using a correlational approach. For both preexposure and autoshaping, four measures of performance were computed, including overall average lever pressing, lever pressing in the initial session, percentage change in lever pressing, and slopes. These measures were correlated in a large sample of rats trained in an autoshaping situation. None of the three measures of autoshaping performance was consistently predicted by any of the three measures of preexposure performance. These results are consistent with the view that latent inhibition is not reducible to long-term habituation.

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## 1. Introduction

Repeated presentations of a relatively mild stimulus have at least two consequences on behavior. First, any response initially instigated by the stimulus tends to diminish in strength as the stimulus is repeatedly presented—a phenomenon called habituation. When habituation training is extended over many trials distributed across several sessions, it can lead to a relatively stable decrease in performance—so-called long-term habituation (LTH; Wagner, 1979). Second, the same procedure of repeated, nonreinforced presentations of a relatively mild stimulus, also impairs the stimulus' ability to control behavior when, in a subsequent phase of training, that stimulus (called a conditioned stimulus, CS) is paired with an outcome of considerable salience (an unconditioned stimulus, US). This phenomenon is called latent inhibition (LI; Lubow, 1989). Because LTH and LI are induced by the same treatment, it is natural to assume that they may share some underlying mechanism. However, there is surprisingly little, if any, evidence that favors this intuition.

Wagner (1979), for example, argued in favor of a common mechanism acting in both LTH and LI. Wagner's theory assumes that the response to any event is directly related to the extent to which that event is surprising. During CS-only training, a context → CS association develops that allows the context to associatively reinstate a representation of the CS. As a result, the actual CS elicits less responding because it is expected on the basis of contextual cues (i.e., primed into short-term memory). To test this hypothesis, Hall and Channell (1985) trained rats in an experiment involving three phases. In phase 1, two groups received preexposure to two contexts, X and Y, in alternate sessions. In one group, a light CS was presented in X, but not in Y, whereas for the other group, the light CS was not presented at all. During preexposure, the orienting response to the light habituated to a low level. In phase 2 (a single test session), both groups received the light CS in context Y. For the group preexposed to the light in X, the orienting response continued to be at a low level. However, for those rats that experienced the light for the first time, there was a substantial amount of orienting behavior (notice that familiarity with context Y was equated across groups). Finally, in phase 3, rats from each group were divided into two subgroups, one receiving light–food pairings in context X and the other in context Y. Goal tracking was recorded as the conditioned response. The results of this final phase demonstrated that the slowest acquisition in the four

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groups was obtained in the group preexposed to the light CS and then exposed to light–food pairings in the same context. Thus, Hall and Channell (1985) observed that the same context-shift manipulation, applied to the same animals, eliminated LI while leaving LTH unchanged (see also Hall and Honey, 1989). A similar dissociation was obtained using a retention interval (Hall and Schachtman, 1987). In this case, LTH was eliminated by a long retention interval, whereas LI persisted unchanged.

Several published articles reported information on performance in both preexposure and conditioning phases, but they provide no information about the potential relationship between the two. For example, in a conditioned suppression experiment involving hippocampal lesions (Kaye and Pearce, 1987a), rats were exposed to three phases of training. For our purposes, only the performance of sham-operated groups is relevant. In phase 1, all the rats received lever-pressing instrumental training with food as the reinforcer. In phase 2, rats received nonreinforced presentations of either a light or a tone, superimposed on the lever-pressing baseline. There was no sign of suppression during 10 sessions of preexposure. In a final phase, all the rats received tone–shock pairings, with the tone CS being novel for those rats preexposed to the light. Suppression was greater for the novel CS group than for the preexposure group—interpreted as LI. In an appetitive experiment also involving hippocampal lesions (Kaye and Pearce, 1987b), rats received training also in three phases. As in the previous case, only the performance of sham-operated animals is relevant here. In phase 1, they were trained to approach and drink milk from a dipper. In phase 2, one group was preexposed to the light, whereas the other was preexposed only to the context, in the absence of milk delivery. Approach to the light and to the dipper scored during light presentations demonstrated habituation of these responses across the 12 sessions of phase 2. Finally, in phase 3, when all rats received light–milk pairings, acquisition was retarded after light preexposure when assessed in terms of the CS-tracking response (light approach), but not when assessed in terms of the goal-tracking response (dipper approach). In these and other similar experiments, no information was reported about a possible correlation between preexposure and conditioning performance (see Lubow, 1989).

## 2. Experiment 1

If LTH and LI are related by common mechanisms, then individual differences in habituation should map onto individual differences in conditioning after nonreinforced preexposure. This issue arises most clearly in training situations in which the same response is recorded during preexposure and conditioning. This was not the case in some of the experiments cited previously in which preexposure performance was reported (e.g., rearing in preexposure and magazine entries in conditioning; Hall and Honey, 1989). In the autoshaping situation used in this experiment, a lever (the CS) is inserted into the conditioning box during a brief period and its retraction coincides with the response-independent delivery of a food pellet (the US). Habituation and conditioning can both be expressed in terms of the rate of lever-pressing responding. Touching, biting, licking, and any other contact responses that move the lever and

close the circuit are automatically recorded. Previous research demonstrated that nonreinforced preexposure to lever insertion retards subsequent conditioning under the same conditions used in the current experiment (Boughner et al., 2004). For the purpose of this experiment, the autoshaping procedure is interesting because it allows an assessment of the relationship between the effects of nonreinforced preexposure training (habituation) and acquisition training (conditioning) on the same, lever pressing response.

### 2.1. Method

#### 2.1.1. Subjects

The subjects were 36 male, experimentally naive Wistar rats, approximately 90 days old at the beginning of the experiment. All the rats used in the experiments reported in this paper were obtained from the TCU breeding colony. Rats were maintained at 85% of their ad libitum weights throughout the experiment by limiting their daily food allowance. Each animal was housed in an individual home cage with ad libitum water. The housing vivarium was subject to a 12 h light:12 h dark cycle (light on at 07:00 h). Training sessions were administered between 12:00 and 17:00 h.

#### 2.1.2. Apparatus

Six standard operant chambers (MED Associates) were used. Four of them measured 20.1 cm wide, 28 cm long, and 20.5 cm high. The floor of the boxes consisted of a grid floor made with stainless steel bars of 0.4 cm in diameter and spaced 1.6 cm apart. The food cup was located on the front wall of the chamber, 2 cm above the floor. A retractable lever was located 2 cm to the left of the feeder and 7 cm above the floor. The other two boxes measured 23.5 cm wide, 29 cm long, and 19 cm high. The floor of these boxes was made of stainless steel bars, 0.2 cm in diameter and spaced 1 cm apart. The food cup was located on the front wall of the chamber, 2 cm above the floor. A retractable lever was located 1 cm to the left of the feeder, 6 cm above the floor. In all the boxes, lever protraction and retraction took approximately 0.25 s. Pellet dispensers delivered 45 mg Noyes pellets (rodent formula A/I). Each box was enclosed in a sound-attenuating chamber equipped with diffuse light (GE 1820), a speaker that administered white noise, and a fan for air circulation. Background masking noise (speaker and fan) was 75 dB (SPL, scale B). A computer located in an adjacent room controlled session events and recorded lever pressings. The lever was adjusted so that minimum pressure applied on its surface would close a circuit and produce a short pulse detected as a response by the computer. The duration of the lever pressure was not taken into account; each press was counted as a single response.

#### 2.1.3. Procedure

Rats were randomly assigned to four groups ( $n = 9$ ). Group P (preexposure) received 480 trials of nonreinforced preexposure to the CS distributed in 24 sessions, each one involving 20 trials. Group X (context control) received 24 sessions of nonreinforced preexposure to the context; the amount of exposure to the context

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