

STUDIES IN LEARNING AND MOTIVATION: I. EQUAL REINFORCEMENTS IN BOTH END-BOXES, FOLLOWED BY SHOCK IN ONE END-BOX

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INTRODUCTION

A number of studies have been published during the last several years designed to test certain aspects of the sign-Gestalt theory of learning—in particular the phenomenon of 'latent learning.'¹ Based for the most part on an experimental test proposed some time ago by White (16), these recent studies have used a rather simple experimental situation. A rat is placed in a one-choice T-maze or Y-maze containing food at one end and water at the other. If the animal is run thirsty until he has learned to turn towards the side containing water—adequate measures being taken to insure objectively equal experience with both sides—, what will be his response later when he is satiated for water but deprived of food and again run in the maze? The experimental answer to this question was first provided by Spence and Lippitt (10), who found that, in correspondence with the predictions of Hull's (3) reinforcement theory, all their animals continued to run to the side on which they had been originally rewarded.² These authors inter-

preted their results as indicating that the animals had not learned the location of the food during their original training period. For the most part this conclusion seems to have been confirmed by later investigators. Walker (14) and Kendler (4) obtained similar results using somewhat different maze set-ups from one another and from the original Spence and Lippitt maze, and Kendler and Mencher (5) showed that such results could not be ascribed to a mere lack of perceptual acquaintance with the food as Leeper (6) had suggested. On the whole, then, it seems probable that rats do not readily learn the location of one type of goal-object when under another different drive. We must conclude that at least in such situations it is relatively difficult to obtain evidence of latent learning.³

The failure of such experimental situations to demonstrate latent learn-

thirst S_D to the hunger S_D should have caused some breakdown in the tendency to take the water side. Spence and Lippitt get around this by speaking of a 'generalized drive' resulting from thirst and being the same when the hunger was subsequently introduced.

¹ The concept of latent learning was originated by Blodgett (1) and he presented the first experimental evidence for it. His findings were subsequently confirmed by others, for example, Tolman and Honzik (12). And the senior author (11) relied upon these early findings *re* latent learning as basic support for his sign-Gestalt, or expectancy, theory of learning.

² It is to be emphasized that these results actually correspond with Hull's theory only if it be assumed that the specific S_D for thirst did not become an important item in the original habit formed. Otherwise, the change from the

³ A further experiment by Walker (15), as yet unpublished, reported at the A.P.A. meetings, September 1948, did, however, demonstrate latent learning in a similar set-up. Hungry rats did learn the location of food when run thirsty to water, so that when later made hungry they chose the food side. In his set-up there were no forced trials. Water was on both sides. But in getting to the water in the preliminary training they went through a food compartment on one side and did not on the other. And then when made hungry they chose the side where the food compartment was. (Private communication from Walker.)

ing has been considered by some writers as an argument against the possibility of latent learning under any conditions and therefore as a severe blow to the sign-Gestalt theory of learning. However, while it is true that a prediction made by sign-Gestalt theorists has been tested and found erroneous, this does not necessarily invalidate the basic concepts underlying the theory. For the sign-Gestalt theory does not necessitate the assertion that latent learning will occur in every instance, but insists merely that reinforcement is not a necessary condition of *all* learning. On the other hand, the reinforcement theorist is forced by the very nature of his doctrine to deny the possibility of latent learning in any instance whatever.

It was the purpose of the present investigation to find an experimental situation relatively similar to the Spence and Lippitt set-up that would demonstrate latent learning, and to attempt to determine some of the factors which might contribute to its presence or absence in such situations.

Let us consider the different interpretations suggested for a rat's mastery of a T-maze. According to the reinforcement theory what is learned is a sequence of responses leading to reinforcement. In terms of the choice situation, what is learned is the correct turning response as opposed to the wrong one. The correct one leads to a reinforcing state of affairs, the wrong one does not, and accordingly the stimulus complex presented at the choice point acquires a greater tendency to evoke the reinforced turn. Presumably no differentiation between the responses could be obtained if either response were equally rewarded or reward withheld from both—nothing should be learned in such a situation. On the other hand, the

sign-Gestalt theory holds that the rat learns not only the correct turn, but also other perceptual relationships within the maze, regardless of their reward value; he forms what the senior author has recently called a 'cognitive map' (13). In other words, the animal acts as if he has some 'notion' as to what each side contains—this 'notion' being demonstrated (either during the training situation as in the orthodox maze learning curve or in later performance as in the latent learning experiments) by the appropriate turn at the choice point. It is clear that our knowledge is as yet inadequate to predict the precise nature of rats' 'notions'—i.e., which perceptual differences will be learned in this manner, under what motivational states, and the like. However, the sign-Gestalt theory can at least make the very general statement that *some* perceptual relationships will tend to be learned.

Perhaps one can then restate the latent learning hypothesis in its most general form: Under *certain* conditions, *some* discriminanda or the *relationships between some discriminanda* will be learned by the organism even though these discriminanda bear no differential relationship to reinforcement. This is admittedly a very general and a very cautious statement of the hypothesis. However, it is considered fruitful in so much as it offers a framework for further investigation of the particular conditions surrounding its application. And despite this statement's generality, reinforcement theory would nonetheless be forced to deny it.

PURPOSE AND GENERAL PLAN OF EXPERIMENT

I. The primary purpose of the present experiment was to find a

situation within which the discriminanda differences are such as to be learned by rats, even though these differences are not related to reinforcement.

The plan of experiment was modelled somewhat after the Maier reasoning experiments (7), involving the integration of two experiences:

A. Situation 1: The animals were run in a maze containing two highly differentiated end-boxes. This differentiation, however, was not related to reinforcement.

B. Situation 2: Subsequent to Situation 1, the animals were placed in one of the end-boxes and were given an electric shock, while finding food in the other end-box. This Situation was presented in another room.

C. Test situation: Subsequent to Situation 2, the animals were again placed into the maze, and their choice rewarded.

II. An additional attempt was made to determine whether differences in strength of motivation in the original learning would have any bearing on the later avoidance in the test situation of the side leading to the end-box in which the animals had experienced the shock.⁴

APPARATUS

The design of the apparatus to be used for this experiment posed a certain problem. It was

⁴ An as yet unpublished experiment of this same design was earlier carried out in the California laboratory by R. J. Schweers. The results he obtained were similar to those we shall report. Schweers, therefore, deserves credit for suggesting our experiment.

An abstract of an experiment of a somewhat similar nature by Seward (9) has also appeared. His animals were first allowed to explore a T-maze having two different end-boxes and then rewarded in one of them. The animals were then started from the entrance to the maze and a large majority then ran to the side on which they had been fed. In short, he also obtained latent learning.

necessary to design a maze the end-boxes of which were as perceptually differentiated as possible, yet to be sure at the same time that these differences were not perceptible from the choice point. Failure to control this latter factor adequately would render any results inconclusive, inasmuch as positive results might then be due either to true latent learning under Situation 1, or merely to the recent experience under Situation 2. The latter results could easily be explained on a reinforcement basis—as a response away from a stimulus at the choice point that had been contiguous with punishment in Situation 2. On the other hand, if a difference be not apparent from the choice point, then a positive reaction (i.e., the animal running away from the side containing the end-box he was shocked in) can only be attributed to learning under Situation 1, a possibility denied by reinforcement theory.⁵

The apparatus used consisted of a simple alley maze, as shown in Fig. 1. The two end-sections A and B contained the two end-boxes and a 22-in. runway to each. Both of the end-sections could be detached from the maze in their entirety. A small box was set into the far wall of each of the two end-boxes to serve as a food container. The floor of both end-boxes was fitted with a wire grill, to allow shocking the animals during the second part of the experiment.

One-way doors made of aluminum were hinged at points R, S, T, U, V, W, X, and Y to prevent retracing. Doors T and U could be locked by the experimenter when necessary to

⁵ It is to be pointed out that the design of our experiment is closely related to that of an earlier experiment by Honzik and Tolman (a). In the Honzik and Tolman experiment hungry rats also ran a T-maze obtaining food at either end of the arms of the T. In this experiment, however, one of the arms of the T was shorter than the other, so that the animals developed a strongly preferred side. The animals were then shocked in the end-box on this preferred side—with this end-box, however, *in situ* and not as in the present experiment in another room. When then started again on the leg of the T a large proportion of the animals ran to the other, or non-shocked, side. However, it appeared from a series of control experiments also carried out that these results were dependent upon general visual cues. And, since there was directional lighting in the room, it appears to the present writers that such results may well have been due to some common features between the visual cues at the end-box where the animals were shocked and those on the path which led to this end-box. Hence the present prescriptions were not fully fulfilled by the Honzik and Tolman experiment.

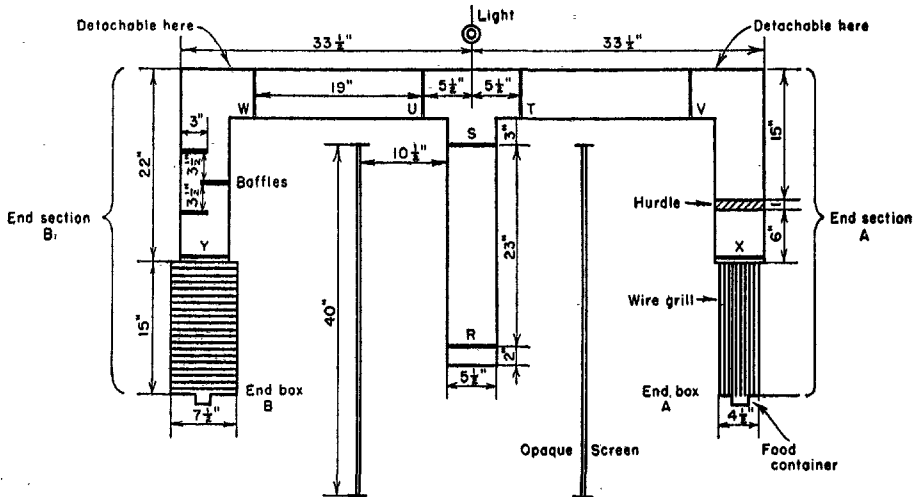


FIG. 1. Floorplan of maze

R, S, T, U, V, W, X and Y are one-day doors. Some other dimensions of the apparatus not indicated on the diagram are as follows:

The maze walls were 6 in. high. The hurdle in End-section A was 2 1/2 in. high. The wires in each grill in the end-boxes were separated by 1/2 in., there being nine wires in End-box A, 20 in End-box B. All the one-way doors were hinged at a point 5 1/2 in. from the floor, excepting only one-way door X, which was smaller and was hinged at a point 3 1/2 in. from the floor.

permit forced trials to the opposite side. Doors X and Y were painted black, all others were white.

An effort was made to create the greatest possible perceptual differences between the two end-sections. End-section A was painted black and was totally unilluminated except for whatever stray light might enter through the small food container opening. The end-box in section A was narrower than that in section B and the grill was fitted in parallel lines to the end-runway. Furthermore, a little hurdle, about 2 1/2 in. high and 1/2 in. thick, was placed in the middle of the runway, and the one-way door X, leading from the end-runway to the end-box, was smaller and hinged lower than the corresponding one for end-box B.

In contrast end-section B was left unpainted, and the end-box of the section was strongly illuminated by a 60 watt bulb set into a housing on the cover of the end-box. The wire grill in end-box B was fitted perpendicularly to the runway. In addition three baffles were placed in the end-runway of that section, which forced a sort of snaky movement from the animals in contrast to the jumping movement necessitated by the hurdle in section A. The one-way door Y, leading from the runway to end-box B, was larger than the corresponding one in Section A

and had a velvet black curtain attached to it on the inside.

The black curtain and the baffles, furthering on the one hand the perceptual differentiation of the two end-sections, also served the additional purpose of preventing light from the illuminated goal-box reaching the choice point area. To separate further the end-box cues from those provided at the choice point, two opaque screens 26 by 38 in. were set up between the initial runway and the end-sections, as shown in Fig. 1. Both end-sections were covered with black cloth. The only source of general illumination in the room came from a 150-watt bulb, mounted in a reflector directly behind the choice point, and facing upwards.

To test for any possible illumination differences at the choice point, photographs were taken of the choice point area under the actual illumination conditions of the experiment. Two strips of white paper were placed in the center of the choice point, facing 45 degrees to each side, and were photographed to indicate the difference in illumination at each side of the choice point. The photographs were later covered up with tape so that only the two strips were visible, and presented to judges who were asked to indicate which of the two sides was brighter. Judgments of 'equal' were permitted. Of 15 judges,

most of whom were psychology graduate students, but who were totally ignorant of the purpose of their judgments, 3 judged *A* brighter than *B*, 3 judged *B* brighter than *A*, and the remaining 9 judged them equal.

A test of possible temperature differences at the choice point was also made by the insertion of thermometers. No differences were found.

ANIMALS

A total of 31 experimentally naive, male virgin rats from the U.C. laboratory, ranging in age from four to six months of M by M Tryon stock, were used for this experiment. All animals were placed on a 24-hour food deprivation schedule for several days prior to the onset of the experiment, and were fed daily about three a.m. on the regular dry food fed the colony.

PROCEDURE

A. Preliminary Training

Prior to the actual experiment the animals were trained on a 28-in. straight alley, containing two white one-way doors, and leading to a goal box with a food container set into the far wall. The end-box used was essentially similar to those used in the maze proper, except that it was of intermediate width, 6 by 15 in., and contained no wire grill. The cover of the end-box was made of mesh wire, and the rats were run under ordinary conditions of room illumination—six overhead lamps providing the illumination of the room and the end-boxes for this phase of the experiment. The rats were all run under 24 hours of hunger. Each animal was run about four times nightly, for seven nights.

The food given to the animals in the end-boxes was in the form of small pellets, consisting of a mixture of their regular dry food, and some lactose added as a binding agent. Each of the pellets weighed 135 milligrams, and contained 10 parts of ordinary dry food to 4 parts of lactose. During this preliminary training situation the animals were permitted to consume as many pellets as they chose.

B. Procedure of Experiment Proper

Situation 1.—The animals were divided into two groups, run under 48 and 12 hours food deprivation respectively, on alternate mornings between 12:30 and 6 A.M. Each animal received two trials per experimental day, one free and one forced for nine experimental days. In the free trial, which was presented first each day, the animal chose whichever side it wanted. On the subsequent forced trial, the door (T or U) leading to the side chosen on the preceding free trial was locked.

Food was placed in both end-boxes. To insure equal food reinforcement on both sides, equal amounts of food were presented at all times—two pellets per trial for each animal.

The animals were given an upper limit of one hour to pass through the maze. If an animal failed to do so twice in succession, it was discarded from the experiment. In this manner 6 rats were lost, 4 from the 12 hour hunger group, and 2 from the 48 hour animals. The data presented are for the 25 rats remaining—13 rats in Group I (48 hours of hunger) and 12 in Group II (12 hours of hunger).

Situation 2.—About 26 hours following the completion of their ninth day's trials, all of the animals in each group were subjected to Situation 2—being shocked in one of the end-boxes. For this phase of the experiment, all animals were under a 24-hour hunger drive.

For this purpose, the entire end-sections A and B were removed from the maze and placed on *separate tables in another room*. The two tables were about five feet apart and arranged at right angles to each other. The sole illumination of the room was provided by the same lighting arrangement as was used in Situation 1, the light being mounted equidistant from each of the end-sections.

Each animal was first placed at the entrance of one of the end-sections, and received food when he reached the end-box. After a one-min. interval, he was then placed at the entrance of the other end-section, and received a violent electric shock about five sec. after he entered its end-box. He was detained in this end-box for one min., being shocked at intervals for a total of 20 sec. After about five min. he was placed in the same end-box again by hand, and was again shocked for 20 sec. out of a total 60 sec. of further detention there.

Half of the animals were shocked in end-box A and the other in end-box B. To equate for possible effects of position preferences, the free choices during the nine days of running in Situation 1 were tabulated. An index of side preference was then assigned to each animal on the basis of the total number of free runs to end-box B during those nine days. The animals in each of the two hunger-deprivation groups (12 hours and 48 hours) were then split into two sub-groups, one sub-group being shocked in end-box A and the other in end-box B, in such a manner that the average position preference was approximately the same for the two sub-groups within each main group.

Test situation.—Approximately two hours after completion of Situation 2, the animals were run again on the maze, set up exactly as in Situation 1, in the same room in which Situation

1 was conducted, and with the end-sections fitted back into place. All animals in both groups had been deprived of food for 26 hours, except for 2 pellets of food which had been consumed in the harmless end-box in Situation 2.

RESULTS

In the test situation the great majority (22 out of 25) of the animals turned to the side opposite to that which contained the end-box they had been shocked in. Only three animals entered the wrong side at the choice point. One of these, an animal from Group I (48 hours of deprivation in the original learning situation), after having entered the wrong door at the choice point, squealed and started to bite and scratch at the door which it had just passed through, furiously trying to open it, managing eventually to squeeze through a slight clearing between the top of the door and the maze cover, and then dashed over to the correct side.

No particular difference was found in the test situation between Group I (48 hours of food deprivation in Situation 1) and Group II (12 hours of deprivation in Situation 1). Eleven out of 13 animals in Group I, and 11 out of 12 animals in Group II, made the correct turn at the choice point. Accordingly it was thought justifiable to combine the results of both groups for a test of significance. The probability of non-chance selection of the harmless side is indicated by a chi-square of 14.47, which is highly significant for one degree of freedom.

No particular distinguishing feature was noted for the three rats that ran to the wrong side. Neither their position preference, nor their time of running during the original training situation, yields any basis of differentiation from the rest of the animals.

DISCUSSION

The results seem to indicate that the primary purpose of the experiment had been achieved. A situation was found, within which the discriminanda differences and relations are such as to be learned by rats, even though these differences are not differentially related to reinforcement. While it is true that the animals were rewarded in the maze, they were rewarded equally on both sides, so that neither the right nor the left turn was reinforced differentially. The fact that one end-box was lit up, contained baffles, etc., had no bearing on the reward received.

Of course it might be argued that the discriminanda differences of and by themselves constituted a reinforcement. A case for this is easily made, since at least some animals seemed to acquire position preferences for the one or the other side. Reinforcement theory would hold then that a particular turn became reinforced at the choice point, due to the animals' dislike of strong light, or of baffles, etc.

Nevertheless, this assumption does not explain the behavior of the animals during the test situation. For, even if the choice responses were differentially reinforced, we should only expect a continuation of the acquired preference, rather than the obtained shift to the harmless side. Furthermore, only about half of the animals showed any particular side preference, but even those animals that seemed to be indifferent to the sides, during the original training situation (Situation 1), made the correct choice during the test situation.

Of further interest is the fact that, due to the particular arrangement of the baffles in end-section B, the last

turning responses of the animals just before entering the end-box must be a right turn. The first trial in Situation 2 involved placing the animal at the beginning of the end-section, so that this turn had to be made just before entering the box and being shocked. By reinforcement theory, one might expect that this response, being followed by shock, would tend to be avoided. However, in the test situation, this response is precisely the one utilized by those animals that were shocked in end-box B. End-section B being located on the left of the choice point, a right turn was required to run towards the other side.

In short, the animals acted as if they had remembered that the bright, baffle-containing box was on the left, and the dark, hurdle-containing box on the right. It is obviously impossible to state which of the various available discriminanda differences were remembered by the animals. Nor is it our purpose now to determine in detail precisely what cues were responded to and noticed—the main point is that enough stimulus differences were provided so that the animals could notice something. Thus, it seems that the very general statement of the latent learning hypothesis presented above has been verified. And despite the extreme generality of this statement, it seems to us relatively difficult to envisage an interpretation derived from the reinforcement theory from which these same results could have been equally easily predicted.

It must be admitted, however, that as yet no specific predictions can be made concerning the nature of the factors under which latent learning will appear, and those under which it will not. Eventually, sign-Gestalt theory will have the responsibility of providing more specific sub-hypothe-

ses which will predict such outcomes. Thus, the results of the present experiment, in establishing the occurrence of latent learning in one situation, point to the need of a program of systematic research to discover the essential factors that will facilitate or inhibit its occurrence in any situation.

While certain speculations can be made concerning the nature of these relevant variables, such speculations are as yet more in the nature of hunches than of adequate theoretical formulations. We would suspect, for example, that the degree of motivation of the animal, the presence of an appropriate goal-object when he is to learn the location of an inappropriate one, the perceptual outstandingness of the object to be learned and the ability of the rat to discriminate or not to discriminate his drives are all factors of importance in determining whether or not latent learning will occur. And the present experiment did in fact seek to test one of these more specific possibilities—namely that different degrees of motivation will in some degree determine whether or not latent learning is obtained. However, our results showed no differences between the 12-hour and the 48-hour groups. We would believe, however, that these findings of ours do not necessarily rule out the possibility of motivation effects in other experiments. Perhaps the present problem was too simple and hence obscured whatever results from the motivation differences might have otherwise have appeared. A further experiment is planned, utilizing an experimental situation that presents a greater problem to the animal—less markedly differentiated end-boxes and less experience in the maze.

Finally, all these considerations suggest a reinterpretation of the Spence and Lippitt and Kendler ex-

periments. Intended to demonstrate the non-existence of latent learning, they seem rather to point to a program of further research to determine more specifically under what conditions latent learning will and will not occur. Such further research would lead perhaps to more specific sub-hypotheses concerning the nature and genesis of sign-Gestalten.

It is to be recalled that some years ago Miller (8) performed an experiment which had features similar to ours, the results of which he explained in reinforcement terms plus the assumption of anticipatory goal-responses. Miller ran animals in a straight-away either to a food device or to a water device. The final movements necessary to obtain food or water were quite different in the two end-devices. In the food device the animals had to climb up and make a sharp turn to the right to secure food. In the water device they went straight in and made a sharp turn to the left. In the main experiment half of the animals were shocked in the food device in a separate position and half in the water device. When put back on the initial straight-away those animals which had originally run the straight-away to food and had been then shocked in the food device now ran more slowly than those others which had also originally run to food and had been then shocked in the water device. And comparable results were obtained for the two sub-groups that had been trained to water one of which was shocked in the water device and the other in the food device.

Miller explains his results by assuming that a component of the given goal-response of turning right for food or turning left for water for which the animal had originally been trained on the alley became conditioned to the stimuli presented along the course of the alley. He also assumes that the internal proprioceptive stimuli resulting from such goal-responses become part of the stimuli to which the avoidance response (due to the shock) become conditioned. Then, when the

animals are put back in the original straight-away, the stimuli from this straight-away evoke an anticipatory element of the final goal-response. This anticipatory element of the conditioned goal-response produces its own proprioceptive stimulus consequences. These now evoke, due to the experience of having been shocked in the box, a conditioned avoidance response which latter expresses itself in the animals' now running more slowly down the alley.

An especial feature of Miller's argument is that the two very distinctive goal-responses made by the animals in the two end-boxes produce two very distinctive anticipatory goal-responses with two very different resultant proprioceptive stimuli. One of these sets of proprioceptive stimuli gets conditioned in the shock situation to avoidance and the other does not.

Now it must be admitted that our own experiment involved a somewhat similar set-up. The approach to end-box A involved a hurdle and the approach to end-box B involved baffles. Hence, Miller could argue that our rats also had acquired two different anticipatory goal-responses—one conditioned to the stimuli at door T and the other conditioned to the stimuli at door U; and that in the shocking experience those animals which were shocked in end-box A got the proprioceptive stimuli resulting from the A goal-responses conditioned to avoidance whereas the others, who were shocked in end-box B, got the proprioceptive stimuli resulting from the B goal-response conditioned to avoidance. Then when put back in the maze and coming to the choice point and releasing their anticipatory goal-responses the A-shocked group had avoidance evoked when they faced the stimuli of the right hand path and the B-shocked group had avoidance evoked when they faced the stimuli of the left hand path. We cannot altogether deny the possibility of such an explanation. Absolutely to settle the issue it would be necessary to repeat our experiment where the two end-boxes differed in 'perceptual' characters only and where absolutely no differences of goal response in

the two boxes would be involved. However, it may be noted that in Seward's experiment (see above, footnote 4) it was found that white and black goal boxes when the rats were fed in one and not in the other gave as positive latent learning results as did a pair of goal boxes which did produce different types of overt responses.

However, it may be asked what about blinking, pupillary reactions or the like? Is it possible to have a perceptual 'awareness' of any sort without concomitant motor responses? If it is Miller's (or Seward's) argument that there are such differentiating motor accompaniments for all perceptual processes, then these authors can perhaps hold, if they want to, that what we have called sign-Gestalten are based upon chains of minimal anticipatory responses going on at a very covert level. We, personally, are interested in the functional significance of latent learning and the resultant functional concept of sign-Gestalten and not in extremely hypothetical notions concerning the underlying neurology.

SUMMARY

1. Twenty-five hungry pigmented M and M Tryon stock rats were run in a covered T maze to equal food reinforcements at the two ends of the T. The two end-sections were strongly differentiated. The end-boxes were of different size and one had a bright light shining into it and the other was dark. The two entrance sections to these end-boxes also differed. One had baffles and the other a hurdle, and the doors into the end-boxes were somewhat different in size and manner of being hinged.

2. After equal training on the two sides—one free trial and one forced trial per day for nine days—the two end-sections were placed in another room. Half of the rats were shocked in one of the end-boxes and half in the other.

3. When placed back on the maze 22 out of a total of 25 rats immediately avoided the side leading to the box in which they had just been shocked. In this test trial all animals were run under equal drive strength—i.e., 26 hours of food deprivation.

4. In the original training the total group had been divided into two motivation groups—one 48 hours hungry when originally trained in the maze and the other 12 hours hungry. No differences in the later avoidance of the side leading to the box in which the animals had been shocked appeared between the two motivation groups.

5. Our general theoretical position is that, although the Spence and Lippitt (10), Kendler (4), Kendler and Mencher (5) and Walker (14) experiments have indicated that 'latent learning' under the conditions of their experiments did not appear, this does not disprove the possibility of latent learning appearing under other conditions. All that the sign-Gestalt (or field expectancy) theory of learning assumes is that under some conditions, latent learning—that is learning which does not involve the differential reinforcement of responses—can nevertheless take place.

6. The present experiment seems to have provided such a set of conditions.

7. It is suggested that many further experiments varying such factors as the type of maze set-up, the amounts of initial training, degrees of motivation, forced or non-forced trials, the presence or absence of a reward object for the drive under which the animals are initially trained, and the like are needed in order to discover the precise conditions under which a non-differentially rewarded picking up of discriminanda and discriminanda re-

lationships (i.e., latent learning) will or will not tend to appear.

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