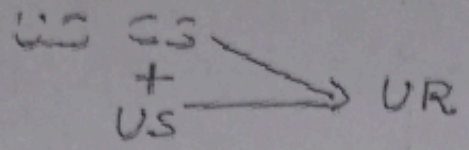
During Conditioning



After Conditioning

CS ——→ CR.

Laws of Classical Conditioning

a) Laws of Acquisition/- A conditioned responce is established by a series of contiguous pairings of C.S. & U.S.. Contiguity means simultaneity or near simultaneity of the presentation of CS & U.S.

Temporal Relationships in Conditioning

1) In simultaneous conditioning, CS & US are presented at the same time & continue together until CR occurs.

2) In delayed conditioning, CS is presented anywhere from a few seconds or upto a minute before US & ~~may~~ the two continue with it till the response is given.

3) In trace conditioning, CS is presented first & then after a brief delay U.S. follows.

4) In backward conditioning U.S. is given before C.S. This conditioning is not easy to accomplish The C.S. in classical conditioning is spoken

as a signal heralding the onset of U.S.
The optimal time for the pairing between C.S. & U.S. is 0.5 second (Kimble)

Law of Extinction:-

If C.S. is repeated without U.S, C.R gradually weakens & disappears. This disappearance of C.R. is not a permanent abolition of the habit is supported by the fact that

a) Reconditioning is faster.
b) Spontaneous recovery occurs.

Spontaneous recovery refers to re-appearance of C.R. after a period of rest following experimental extinction. The magnitude of C.R. is much stronger than what was at the end of extinction if C.S. appears again after some time interval. This increase in magnitude of C.R. after a period time with no explicit training is known as spontaneous recovery. The fact that Reconditioning is faster is demonstrated by the fact that lesser no. of trials are needed to acquire the response of same strength.

CLASSICAL CONDITIONING

Classical conditioning refers to the process in which a neutral stimulus when regularly presented prior to the stimulus that naturally elicits a response begins to acquire the power to elicit a response similar to one given to the stimulus that naturally elicits the response (ie natural/original stimulus). This so happens because the two stimuli become associated. Both CONTIGUITY & PRACTICE are important for this association to take place between the neutral & the original stimulus.

The essential operation in classical conditioning is the pairing of C.S & U.S. CS or conditioned stimulus is neutral in the sense that it elicits only a general altering & not a specific response. The other, which consistently elicits a specific response is called Unconditioned Stimulus (U.S.). The response elicited by U.S. is called Unconditioned Response (U.R. As a result of the pairing of U.S. & C.S. the previously neutral conditioned stimulus comes to elicit the response. This is called the conditioned response (C.R.)

EXPT - Before Conditioning

CS ⟶ No Response

US ⟶ U.R.

point is that as per this C.R. should be same as U.R. or nearly similar to U.R. but experiments have shown that it is not so, for instance if Bell is paired with shock then response to bell may be freezing whereas response to shock will be running here & there.

INFORMATION EXPECTATION THEORY/-

According to this theory the C.S. serves as a signal for the U.S. Thus whenever C.S. is presented U.S. is expected & it is this expectation that makes the learner respond. U.S. is a novel event & the surprising U.S. induces the learner to look back through the recent memory. As C.S. is the event consistently found on each trial before the U.S. an association or a link between memory trace of C.S. & U.S is established. Now when C.S. occurs U.S. is expected. The C.R. is made in anticipation of U.S.

2) OF Extinction and Spontaneous Recovery.

STIMULUS SUBSTITUTION THEORY

Conditioning involves two opposing tendencies Excitatory & Inhibitory. During ~~excitatory~~ acquisition excitatory tendencies get an

upper hand & during extinction inhibitory tendencies get an upper hand. Spontaneous recovery takes place when inhibitory tendencies ~~get an upper hand~~ decline over time & therefore after a period of rest animal shows a stronger response than he did during last few trials of extinction.

INFORMATION EXPECTATION

This theory suggests that regular presentation of C.S. alone implies that CS is no longer paired with U.S. C.S. therefore ceases to be a signal for U.S. The C.S. becomes a neutral stimulus as it was before conditioning occurred. & less attention is paid to it. Spontaneous recovery occurs because with the passage of time the situation changes & CS once again raises expectation of the arrival of US as it had done in past before extinction & it is in this anticipation that the response is given.

Laws of Generalization:- CR once established may be elicited by stimuli similar to the original C.S. A C.R. established to the tone may also be elicited by a soft buzzer. A generalised C.R. shows a gradient with greater magnitude of response to stimuli of higher degree of similarity & an increasingly weaker response to stimuli of lower degree of similarity.

Laws of Differentiation:- Differentiation can be established by differential reinforcement. If CS^+ is always followed by US while CS^- is never followed by U.S. the animal learns to respond to CS^+ & not to CS^-. Gradually CS^- never elicits CR. When CS^+ & CS^- are very close to each other in various characteristics & is beyond the ability of the animal to discriminate it leads to **experimental neurosis**.

Law of Higher Order Conditioning

A CS after having acquired the ability to elicit a CR may acquire serve as US for a new neutral stimulus.

Stage I (during classical conditioning)

CS_1 (metronome) → alerting response

US (food) → UR (salivation)

After classical conditioning

CS_1 (metronome) → CR (salivation)

Stage II (during higher order conditioning)

CS_2 (black square) → Alerting response

CS_1 (metronome) — CR (salivation)

After higher order conditioning

CS_2 (black square) — CR (salivation)

It is not easy to go beyond second order conditioning because the extinction of the originally conditioned response occurs unless it is intermittently reinforced.

PSEUDO CONDITIONING

Sometimes the experimental conditions themselves become in effect the CS. This is especially true for conditioning of fear responses. If for example a bell is paired with a shock,

INSTRUMENTAL CONDITIONING

Instrumental conditioning is the learning procedure wherein the learner is instrumental in bringing about some change in the environment which makes the action more or less likely in future. It is also called as Operant conditioning because the response operates on the environment & the consequence of this operation influences the likelihood of the response being repeated.

The key element in IC procedure is the 'Reinforcement' which refers to any environmental event which is a consequence of a response & which increases the likelihood of the response being made again. Reinforcement can be either positive or negative. A positive reinforcer is one which when added following a response, results in an increased likelihood of the response being repeated.

A negative reinforcer is the event the termination of cessation of which is contingent on a response & which increases the likelihood of a response being repeated

Punishment is a stimulus whose onset is contingent on a response & which

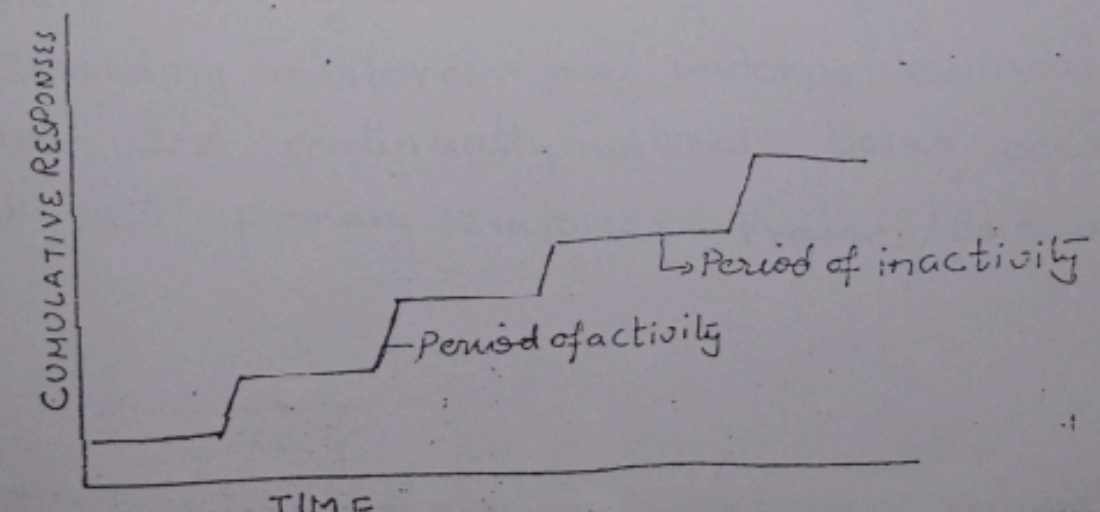
: reduces the likelihood of response being repeated again. In contrast to this, in Omission Training is the positive reinforcement is withdrawn following a response in order to decrease the likelihood of response being repeated. Both Punishment & Negative reinforcement use aversive stimulus but in negative reinforcement it is the ending or termination of noxious stimuli that is contingent on a response whereas in punishment it is the onset of the aversive stimuli that is contingent on the response.

SKINNER'S EXPERIMENT

Skinner devised 'Skinner Box' (also called as Operant Chamber) in order to study the reinforced responding without breaking the experiment into discrete trials. It is a simple box with a device at one end which can be worked by the animal. In the case of rabbits & cats & monkeys it is a

lever & for pigeons it is a small panel called the key, which can be pecked. On pressing this device the animal gets the food pellet.

Skinner placed an hungry animal (rat) into the box & then delivered it few food pellets one by one. This is necessary if food reinforcement is to be effective later. Next experimenter stopped releasing pellets & rat is left alone in box. After a period of initial inactivity the hungry rat explores the box. Eventually it presses the lever accidentally. A food pellet is released. After eating the pellet the rat continues exploring & after a while it presses the lever again & a pellet is released. Then it again presses the lever & soon operant behavior is in full swing. The no. of responses given within a particular unit of time - ie rate of response is the measure of operant conditioning.



Shaping:-

By shaping S.C. (Skinner conditioning) can be speeded & it is possible to make animal learn quite complex responses. Essential feature of shaping is to teach the animal closer & closer approximation of final response. Thus because he is gradually made to reach the desired behavior by reinforcing the steps, that leading to desired response. It is therefore also called as method of successive approximations.

PRIMARY & SEC. REINFORCERS:-

P.R. are the reinforcers that naturally increase the likelihood of response. No previous training with them is required for these reinforcer to have their effect - eg. food.

SECONDARY REINFORCERS:-
or
Conditioned Reinforcer - These are a group of +ve or re-inforcer that do not work naturally. For them to have effect learner must have had experience (with them. they get their reinforcing properties, because of their consistent pairing with Primary reinforcers & therefore Secondary reinforcer may undergo extinction, if they are used continually without being occasionally paired with primary reinforcer - Praise / Encouragement

EXTINCTION

Extinction involves withholding of reinforcement so that when a response is made no reinforcement follows. This removes or weakens the responses learned & strengthened in the operant conditioning situations of the laboratory & everyday life.

Pl. see Avoidance & escape learning from Morgan & King.

APPLICATIONS

① Instrumental conditioning is responsible for behaviour attitude formation & change

② Many of our behaviours are acquired by the procedure of instrumental conditioning.

TYPES OF INSTRUMENTAL CONDITIONING

(1) REWARD TRAINING - In this training discriminative cue is available & the animal produces a response & the reinforcement is based on reward.

(2) DISCRIMINATION TRAINING - In this, discriminative cue is available. The response comes to be produced & the reinforcement is based on reward.

(3) ESCAPE TRAINING - In this, discriminative cue is not available. The response comes to be produced & the reinforcement is based on punishment.

(4) AVOIDANCE TRAINING - In this training, the discriminative cue is available The response comes to be produced & the reinforcement is based on punishment.

(5) OMISSION TRAINING - In this discriminative cue is not available. The response come to be withheld & the reinforcement is based on reward.

(6) PUNISHMENT TRAINING - In this discriminative cue is not available. The response come to be

independent of each other, they are termed 'concurrent schedules.

Simple Schedules are of two types (i) Interval Schedule (ii) Ratio schedule. A reinforcement that may be set up in the terms of the period of time that has elapsed from the delivery of the last reinforcement generates 'interval schedules' & when a reinforcement is contingent on a no. of responses emitted by the subject since the last reinforced response is generated. ratio sche

Ratio & Interval schedule are of two types
(i) Fixed Interval schedule. (FI) (i) Fixed Ratio (FR)
(ii) & Variable Interval schedule. (VI) (ii) Variable Ratio (VR)

In FI schedule reinforcement follows the first response emitted after a fixed time period measured from last reinforcement has elapse
Usually fixed interval schedules are indicated in minutes, so that an FI 5 refer to a 5 min fixed-interval schedule. The feature of FI is that the rate of responding is inversely proportional to the interval between reinforcements. At the begining of fixed time interval the animal responds slowly or not at all. At the end of the time interval approaches the animal gradually increases his speed of responding, apparently anticipating the moment of reward.

SCHEDULES OF REINFORCEMENT

The contingencies that can be collectively designed to couple behavior & reinforcement are collectively known as 'Schedules of reinforcement'. The establishment & maintenance of virtually all acquired patterns of behavior may be viewed as the result of specific contingencies which hold between behavior & reinforcement, which is to say, the result of schedules of reinforcement. It is neither possible nor necessary to describe all the sched of reinforcement that have been devised over the last three decades, nor it is possible to describe the behavioral characteristics generated by all available schedules. We shall, however, present a wide range of behavioral situations that are describable in terms of technically defined schedules of reinforcement. There are basically two types of 'Reinforcement Schedules'

(i) Simple Schedules (ii) Complex Schedules

By 'Simple' schedules we refer to those in which a single type of reinforcement contingency, maintained with constant parameters, is in force throughout an experimental session. Compound schedules emerge as a result of the combination of two or more simple schedules. Compound schedules can be sequential, in which case only a single schedule is in effect at any one time or they can be simultaneous. If two reinforcement schedules operating simultaneously are

independent of each other, they are termed 'concurrent schedules.

Simple Schedules are of two types (i) Interval Schedule (ii) Ratio schedule. A reinforcement that may be set up in the terms of the period of time that has elapsed from the delivery of the last reinforcem generates 'interval schedules' & when a reinforcement is contingent on a no. of responses emitted by the ratio sche subject since the last reinforced response is generated.

Ratio & Interval schedule are of two types
(i) Fixed Interval schedule. (FI) (i) Fixed Ratio (FR)
(ii) & Variable Interval schedule. (VI) (ii) Variable Ratio (VR)

In FI schedule reinforcement follows the first response emitted after a fixed time period measured from last reinforcement has elapse Usually fixed interval schedules are indicated in minutes, so that an FI 5 refer to a 5 min fixed-interval schedule. The feature of FI is that the rate of responding is inversely proportional to the interval between reinforcements. At the begining of fixed time interval the animal responds slowly or not at all. At the end of the time interval approaches the animal gradually increases his speed of responding, apparently anticipating the moment of reward.

Fixed Ratio Schedule :- A fixed no. of responses must be made before the animal gets the reinforcement. FR 5, for example, means that the animal will be rewarded at every 5th response. Here an imp. factor in determining when a response is rewarded is the no. of responses made. It usually generates a rapid burst of activity to reach the desired target to accomplish the ratio. The FR schedule usually generates a steplike cumulative recording, indicating that the animal temporarily stops responding after a rewarded response & then, at some point, resumes responding at a rapid rate.

Variable Ratio Schedule - In this the reinforcement occurs after a fixed no. of responses, that varies from trial to trial but the ratio of responses to reinforcement varies around an average ratio. Unlike the FR schedule where the animal is rewarded after making a specific no of responses say five, with the VR schedule, the

In instrumental conditioning instead, we must wait for the response we want to condition to occur spontaneously.

(iii) The U.S. is the reinforcer in Classical conditioning because without it no conditioning will occur. It literally reinforces or strengthens conditioning In Instrumental conditioning reinforcement occurs only when & if the response occurs.

THEORETICAL DISTINCTIONS/-

(i) Classical Conditioning procedures are especially adaptable to visceral or glandular responses under the control of the autonomic system whereas Instrumental procedures are adaptable to skeletal responses under the control of somatic nervous system (MOWRER)

(ii) Classical conditioning is a mechanistic reflexive process of formation & strengthening of association between Stimulus & Response Instrumental conditioning is non mechanistic & voluntary process of formation & strengthening of association between Stimulus & Response.

CLASSICAL AND INSTRUMENTAL CONDITIONING
- THEORETICAL AND PROCEDURAL DISTINCTIONS -

PROCEDURAL DISTINCTIONS:-

(i) In Operant conditioning the organism is required to do something to produce or to withhold withhold a response before the experimenter provides the reinforcement. Thus the experimenter must pay close attention to what the organism is doing so as to be sure to provide reinforcement.

In Classical conditioning the organism has no control over the delivery of US. Thus the experimenter performs the necessary operations entirely independent of what the organism does. In other words in operant conditioning the ~~or~~ critical experimental contingency is between the response supplied by the organism & it's outcome or consequences supplied by the experimenter or the environment. In classical conditioning experiment the critical contingency is between one stimulus ie the CS & the other stimulus ie US both under direct & exclusive control of the experimenter.

(ii) In Clasical conditioning experiment, there is always a readily identifiable stimulus ie US which elicits the response we wish to condition. Whereas in operant conditioning a comparable stimulus cannot be identified.

In instrumental conditioning instead, we must wait for the response we want to condition to occur spontaneously.

(iii) The U.S. is the reinforcer in Classical conditioning because without it no conditioning will occur. It literally reinforces or strengthens conditioning. In Instrumental conditioning reinforcement occurs only when & if the response occurs.

THEORETICAL DISTINCTIONS/-

(i) Classical conditioning procedures are especially adaptable to visceral or glandular responses under the control of the autonomic system whereas Instrumental procedures are adaptable to skeletal responses under the control of somatic nervous system (HOWEVER)

(ii) Classical conditioning is a mechanistic reflexive process of formation & strengthening of association between Stimulus & Response. Instrumental conditioning is non mechanistic & voluntary process of formation & strengthening of association between Stimulus & Response.

(iii) Classical conditioning procedures are adaptable to diffuse emotional responses as opposed to highly precise & adaptive responses of instrumental conditioning procedures (SCHLOSBERG)

(iv) Readily Classical conditioning is readily seen in animal learning & it is the passive process. Instrumental conditioning is readily seen in human learning & it is an active process.

(v) Respondents, the kinds of behavior to be most typically conditionable with Classical conditioning procedures, are classes of responses that are directly elicited by the stimuli (eg) of respondents are salivation, knee jerk, eyeblink, heartbeat etc.

Operants, the kinds of behavior to be typically conditionable with instrumental conditioning procedures have no identifiable external stimulus that produces them. They are emitted by the organism & are voluntary responses such as pressing the lever, children searching for candy etc.

through semantic context.

Response generalization :- In Stimulus generalization response is fixed & we focus our attention on the extent to which stimuli other than CS that would evoke CR. In Response generalization this paradigm is reversed & we require into the range of responses other than CR that are excitable by CS.

for eg. if Bell & Shock are paired & dog is conditioned to flex ~~his~~ its right leg to the sound of the bell after the conditioning has taken place, then if he starts flexing his other legs as well to the sound of the same bell it is a case of response generalization

GENERALISATION

Generalization is reacting in a similar way to different, perhaps subtly different stimulus situations.

In Stimulus generalization a new neutral stimulus that resembles the C.S. evokes a response similar to one evoked by C.S. even though it has never been paired with U.S. In other words CR is evoked by the stimulus which have never been paired with specific U.S.

In mediated generalization the generalization occurs through some medium. for example Semantic generalization is a mediated through the meaning of the word.

Style ——— No saliva } Before conditioning
Food ——— Saliva

Style + Food → Saliva } During conditioning.

Style → Saliva } After conditioning.

Now if homophone Stile doesn't produce salivation but the synonym fashion does then we can say generalization is mediated,

EXTINCTION

Extinction can be defined as a process involving removal of reinforcement following the occurrence of some response that has been reinforced in past. Extinction is an important process. It helps to ensure that behavior does not persist when is no longer useful in producing reward, avoiding punishment & that is important if the behavior is not to become a disorganised, maladaptive mess.

When a response is reinforced learning takes place & when reinforcement is held back the process of extinction begins. It is apparent that previously learned behavior doesn't come to halt immediately. This tendency to continue responding even without reinforcement for some time is called as Resistance to extinction. Responses vary in resistance to extinction.

A no. of factors have been shown to measure the persistence of responses in the face of the removal of reinforcement. These are called extinction variables. Some of the salient extinction variables are discussed below:-

(i) No. of Reinforcements:- Resistance to extinction depends, to some extent, upon the no. of reinforcements given to the organism before extinction procedure is initiated. As the no. of reinforced responses increases, the no. of responses to extinction also increases.

(ii) Delay of Reinforcement:- If reinforcement is delayed during

or perhaps conditions of the testing discouraged discrimination - for eg. if subject were required to respond rapidly, he may not have taken a proper note of stimulus which was presented to him (failure of discrimination). There are several counterarguments which can be brought to bear against this position. First is it is difficult under the failure of discrimination interpretation to account for stimulus generalization gradients. Also failure of discrimination hypothesis seems to encounter difficulty with certain aspects of semantic generalization data.

EXTINCTION

Extinction can be defined as a process involving remov
of reinforcement following the occurrence of some resp
that has been reinforced in past. Extinction is an imp
proam. It helps to assure that behavior does
persist which is no longer useful in producing rewards
avoiding punishment & that is important if the behavio
is not to become a disorganised, maladaptive mem

When a response is reinforced learning
takes place & when reinforcement is held back
the process of extinction begins. It is apparent tha
previously learned behavior doesn't come to halt immed
This tendency to continue responding even without
reinforcement for some time is called as Resistance to
extinction. Responses vary in resistance to extinctio

A no. of factors have been shown to modula
the persistence of responses in the face of the remova
of reinforcement. These are called extinction variables.
Some of the salient extinction variables are discussed
below -

(i) No. of Reinforcements/- Resistance to extinction dep
to some extent, upon the no. of reinforcements giv
to the organism before extinction procedure is
initiated. As the no. of reinforced responses incr
the no. of responses to extinction also increases.

(ii) Delay of Reinforcement/- If reinforcement is delayed dur

acquisition trials, it is a relatively safe rule of thumb that subsequent resistance to extinction will be increased. A clue as to the reason why this is so comes from the observation that to delay the arrival of a food reward in the goal box of a runway, say, creates stimulus conditions in the goal box that are ~~not~~ like those to be encountered when extinction begins. The

(iv) Effort & Extinction/- Mowrer & Jones provides evidence suggesting that the effort in making a response during extinction affect the resistance to extinction. Resistance to extinction decreases with the increase in the effort to produce response.

(v) Patterns of Reinforcement/- The general rule is that a pattern which involves some change in the nature of reinforcement conditions from response to response will produce greater resistance to extinction than a condition where all responses are reinforced immediately, 100 percent of the time.

THEORIES

Competition Theory/- It attributes extinction of a reinforced response to the acquisition of other responses which compete or interfere with the reinforced response. Thus when an animal stops

(3) Response Inhibition theory:-

Inhibition theory, in a certain historical sense, is the major classic theory of extinction. Pavlov explained extinction in terms of inhibitory processes. However the most complete formal statement of an inhibition theory of extinction comes in form of Hull's theories of reactive & conditioned inhibition. Reactive inhibition was presumed to develop as a simple function of the amount of ~~time~~ work required to produce a response. Furthermore, reactive inhibition had the properties of drive - that leads the organism not to respond (ie -ve drive). Rest would allow reactive inhibition to dissipate, the amount of dissipation being a direct function of the amount of time elapsing between successive responses. This reduction of drive was the necessary & sufficient condition for reinforcement of a habit. In short, reduction of reactive inhibition supposedly reinforced the organism for doing nothing & the state of affairs which resulted & produced failure to respond was a learned habit called conditioned inhibition. Extinction is thus as a result of active inhibition of learned response.

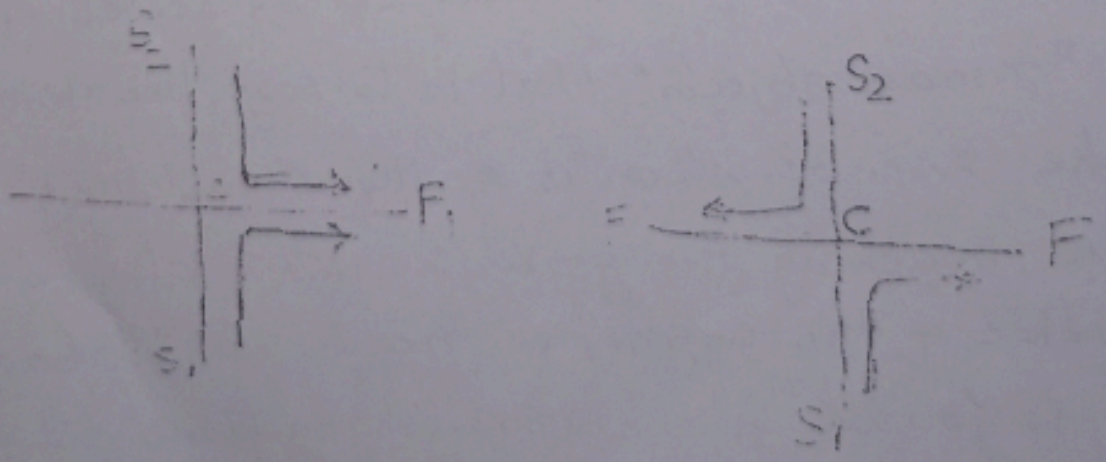
TOLMAN'S PURPOSIVE BEHAVIOR
A COGNITIVE THEORY

Tolman's explanation of learning draws upon both the Gestaltist & the ~~Bhe~~ Behavioristic schools of thought. Tolman is a behaviorist in the sense that he is strongly opposed to a psychology of consciousness or pure phenomenology. But despite his predilection for animal research & objective observation Tolman is not a Watsonian behaviorist. He makes it clear that behavior in his system will be treated as a molar rather than molecular phenomenon. A molar definition of behavior implies that the behavioral act is the unit for psychological study without regard to underlying molecular components in the nerves, muscles & glands. Moreover, the molar orientation envisages behavior as goal seeking & purposive. Tolman also insisted that the molar behavior is characterized by selectivity toward "mean objects" that is to say the animal will make use of shorter rather than longer routes in reaching the goals. Further Molar behavior is cognitive & the cognitive nature of purposive behavior is found in the animal's reactions to environmental means-objects in arriving at goals. Thus molar behavior involves is centred around

under three headings - (1) "place learning experiments 2' rel
exploratory activity. (3) "latent learning experiments.

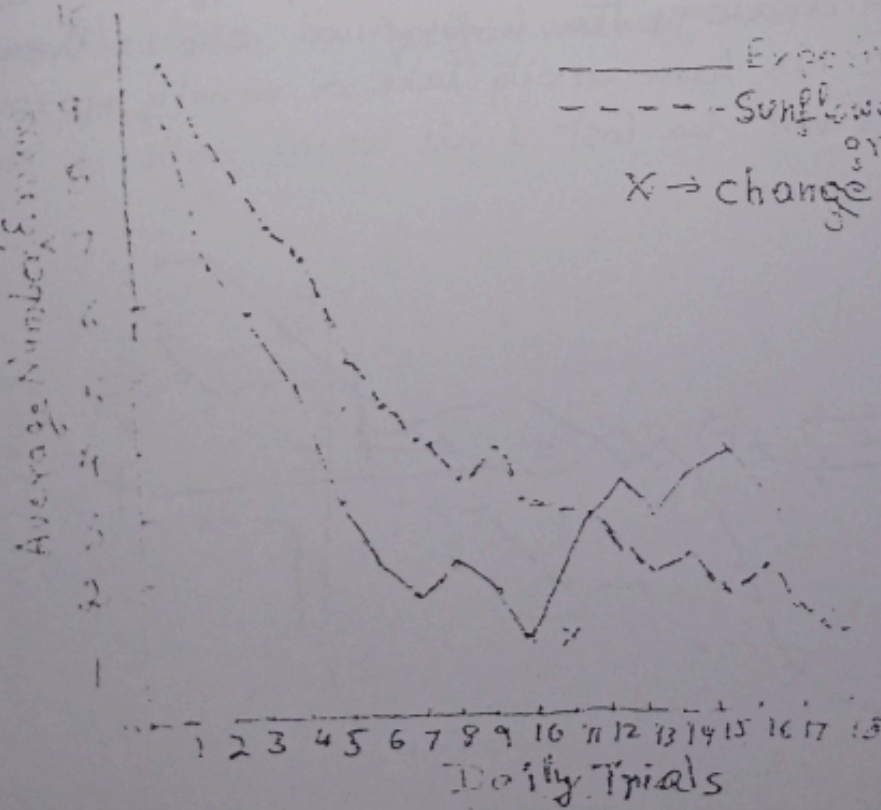
Place Learning :

If Tolman argues, we consider the question of what
animal learns in the maze, the alternatives appear to be
(1) some kind of motor habit, possibly a chain of conditi
responses to either kinesthetic or external cues or (2)
cognitive map made up of sign gestalts. Now a test of thes
alternatives was designed by Tolman & Honzik (1930) as
follows: A maze was constructed in the form of a cross
two possible starting points & two alternative goals. One
group of rats was trained so that its members always fo
food at the same place say F, (figure given below) irrespect
of whether they started at S_1 or S_2. Another group was required
make the same response. Turning right at the choice point C ir
pective of their starting point. The first group or the "place lear
were significantly better in their performance than the
'response learners'. The result supports the cognitive theory
the sense that learning a place presumably requires a cog
tive map of that place rather than a specific set of moto
responses. By analogy the individual who is thoroughly
familiar with his town or city take a variety of routes to
a given goal & not be lost if his usual path is blocked



REWARD EXPECTANCY

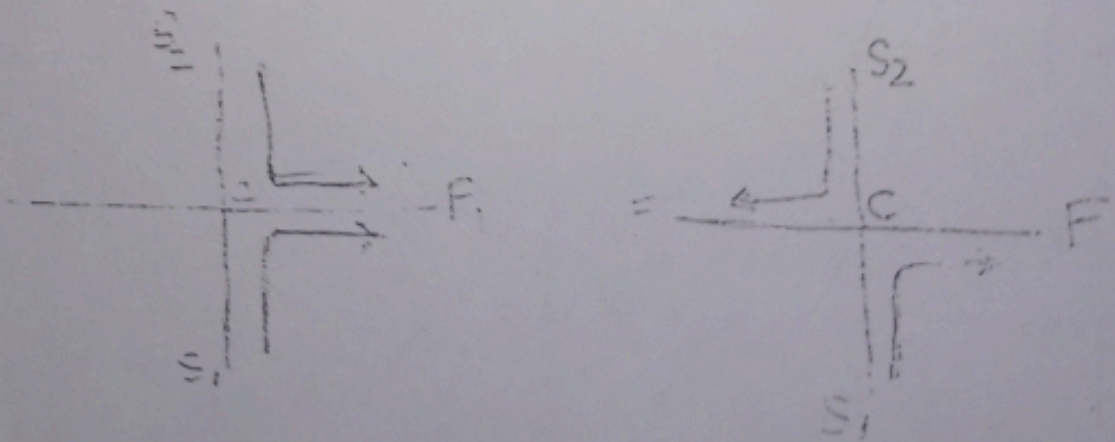
Reward expectancy in its simplest sense means that the learner comes to anticipate the presence of a reward (or in some cases a certain type of reward) & if that reward is absent or changed, behavior is disrupted. One of Tolman's associates M.H Elliott (1928) employed a T maze in which two equally hungry groups of rats were trained to find a reward of bran mash & sunflower seeds respectively. Elliott called the bran mash group the experimental group & the sunflower seed group the control group. When sunflower seed was substituted for bran mash on day 10 for experimental group, learning was disrupted as demonstrated by a marked increase in errors. The hypothesis is that the animals had come to expect the bran mash – a more desirable reward, as demonstrated by the more rapid learning of this group — and when their expectation was not confirmed, behavior was disrupted. This experiment among others, provides Tolman's operational definition of reward expectancy & at the same time serves as objective support for the importance of reward expectancy as a factor of learning.



under three headings - (1) "place learning experiments" "latent learning experiments".

Place Learning:

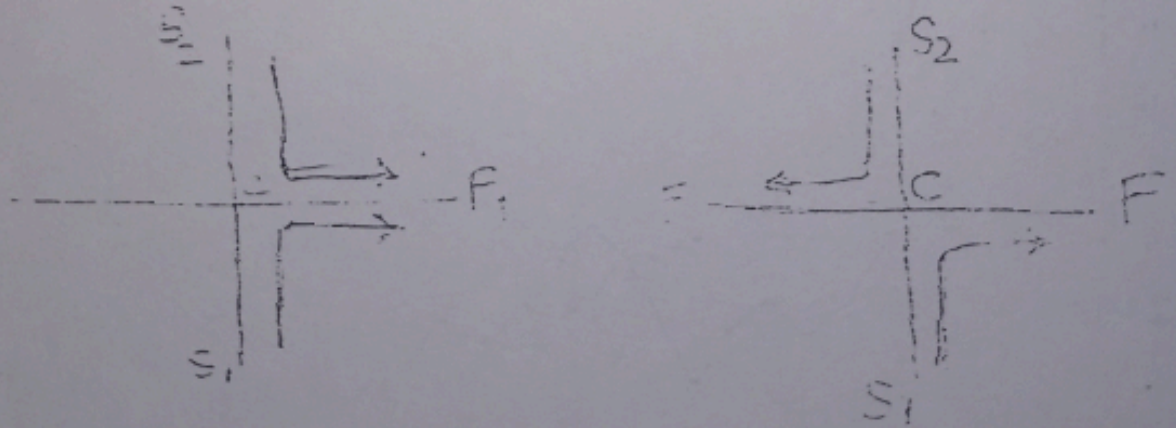
If Tolman argues, we consider the question of what an animal learns in the maze, the alternatives appear to be (1) some kind of motor habit, possibly a chain of conditioned responses to either kinesthetic or external cues or (2) a cognitive map made up of sign gestalts. Now a test of these alternatives was designed by Tolman & Honzik (1930) as follows: A maze was constructed in the form of a cross with two possible starting points & two alternative goals. One group of rats was trained so that its members always found food at the same place say F. (figure given below) irrespective of whether they started at S_1 or S_2. Another group was required to make the same response. Turning right at the choice point C irrespective of their starting point. The first group or the "place learners" were significantly better in their performance than the 'response learners'. The result supports the cognitive theory in the sense that learning a place presumably requires a cognitive map of that place rather than a specific set of motor responses. By analogy the individual who is thoroughly familiar with his town or city take a variety of routes to a given goal & not be lost if his usual path is blocked



under three headings - (1) "place learning experiments 2. response learning experiments. (3) "latent learning experiments.

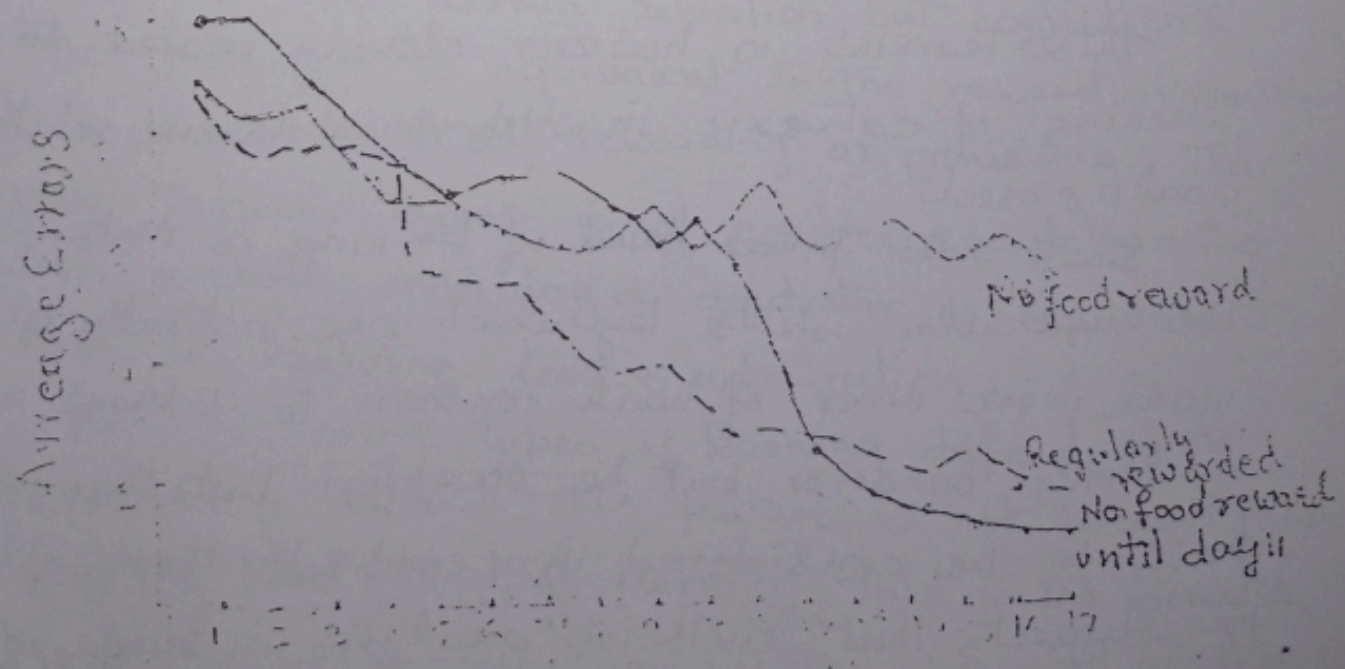
Place Learning :

If Tolman argues, we consider the question of what is animal learns in the maze, the alternatives appear to be (1) some kind of motor habit, possibly a chain of conditi responses to either kinesthetic or external cues or (2) cognitive map made up of sign gestalts. Now a test of the alternatives was designed by Tolman & Honzik (1950) as followed: A maze was constructed in the form of a cross two possible starting points & two alternative goals. One group of rats was trained so that its members always fo food at the same place say F, (figure given below) irrespec of whether they started at S_1 or S_2. Another group was require make the same response. Turning right at the choice point ir pective of their starting point. The first group or the "place lea were significantly better in their performance than the 'response learners'. The result supports the cognitive theory the sense that learning a place presumably requires a co tive map of that place rather than a specific set of mot responses. By analogy the individual who is thoroughly familiar with his town or city take a variety of routes a given goal & not be lost if his usual path is blocked



LATENT LEARNING :

Latent learning is a fundamental concept in Tolman's system & continues to be a controversial topic in contemporary learning theory. As the term implies 'latent learning' is hidden learning : it goes on unobserved but can be revealed under certain conditions in performance. One of the classics in the experimental literature is Tolman & Honzik's study (1930) of latent learning in rats. Three groups of rats were used : a no reward group that was allowed to wander around in the maze but found no food in the goal compartment ; a regularly rewarded group & a delayed-rewarded group that received no reward for the first ten days but from the eleventh day no found food in the goal compartment (figure below shows no reward results in little apparent learning). But as the curve for the delayed reward group demonstrates - learning was taking place, although it was not manifested in performance until the introduction of the reward.



to what. They are essentially the same as what Tolman ~~reff~~ referred as SIGN-GESTALT EXPECTATIONS. Nearly all of what we ordinarily call knowledge comes under this heading. When we learn the route from one place to another we are forming Field Expectances. Cognitive maps are made up mostly of Field Expectances. They develop through experience with objective World.

The fourth kind of learning consists of Field Cognition Modes. They are ways of learning or biases towards learning certain things more readily than others. To some extent these are innate & to some extent these are learned.

The fifth variety of learning in Tolman's system is drive discrimination. This is the ability to distinguish among the different drives, eg. There is some evidence that animals have to learn the difference between hunger & thirst.

This learning is however closely related to the learning of cathexis in which demands are related to goal objects.

Sixth & the final kind of learning is Motor Pattern. The muscular skills by which one actually gets goal were never of much concern to Tolman's study of Molar behavior but he accepted that they would have to be considered in a complete theory of learning. He suggests that Guthrie's analysis in terms of S-R Connections learned by contiguity may be appropriate for this kind of learning.

TOLMAN'S SIX DIFFERENT TYPES OF LEARNING

Tolman distinguished six different types of learning. The first kind of learning is the formation of Cathexis. This concept is taken from Freud's Psychoanalytic theory of motivation. A Cathexis in Tolman's interpretation is a tendency to seek certain goals rather than others when experiencing a certain drive. The drive resulting from food deprivation leads us to seek meat or candy but not to seek sawdust or ants. The difference is due to our previous experiences of satisfying the drive of hunger by eating meat & candy & not by eating sawdust or ants. In cultures where ants are eaten cathexis for ants are formed. Whenever a given goal satisfies a given drive cathexis of that demand on that goal tends to be formed.

The second kind of learning involves equivalence beliefs. These are similar to skinner's conditioned reinforcers. They are not merely beliefs that reward or punishment will be found in a certain situation, but cognitions that the situation is equivalent to the reward or punishment & hence in itself rewarding or punishing. The example Tolman gives is of complex social learning, as when a child receiving a gold star is equivalent for him to receiving love & admiration.

Both in above types of learning depend upon experiencing reward. This feature is not present however in the third kind of learning. This is the formation of Field-Expectancies. These are cognitions about the

to what. They are essentially the same as what Tolman ~~reff~~ referred as SIGN-GESTALT EXPECTATIONS. Nearly all of what we ordinarily call knowledge comes under this heading. When we learn the route from one place to another we are forming Field Expectances. Cognitive maps are made up mostly of ~~#~~ Field Expectances. They develop through experience with objective World.

The fourth kind of learning consists of Field Cognition Modes. They are ways of learning or biases towards learning certain things more readily than others. To some extent these are innate & to some extent these are learned.

The fifth variety of learning in Tolman's system is drive discrimination. This is the ability to distinguish among the different drives, eg. there is some evidence that animals have to learn the difference between hunger & thirst.

This learning is however closely related to the learning of cathexis in which demands are related to goal objects.

Sixth & the final kind of learning is Motor Patterns. The muscular skills by which one actually gets to goal, were never of much concern to Tolman's study of Molar behavior but he accepted that they would have to be considered in a complete theory of learning. He suggests that Guthrie's analysis in terms of S-R Connections learned by contiguity may be appropriate for this kind of learning.

INSIGHT

Insight learning occurs suddenly with the feeling that now one really understands. Such learning is likely to be especially resistant to forgetting & especially easy to transfer to new situations. This type of learning involves considerable perceptual reorganization which enables the learner to see whole situation in a new way. He comes to understand logical relationships on perception of the connections between means and ends.

Such insight is by no means restricted to humans. During W.W. I Köhler was interned in Canary Islands where he did his experiment on Apes, he presented the apes with the problems in which bananas were displayed out of reach & could be obtained only by using techniqus new in the apes experience E.g. banana weight be hung from the ~~roof~~ of the animal cage with boxes elsewhere in the cage which could be piled under banana so the ape could climb up and get banana. Köhler found that these problems were often not only solved suddenly but frequently were solved immediately after a period of time during which ape was not actively trying to reach the banana.

Some time it appeared that animal after having failed to obtained banana by familiar method sat & thought about the problem & then suddenly saw the solution. Such incidents were described by Kohler in terms of perceptual restructuring.

It is called CONTINUITY THEORY because excita
& inhibition are assumed to build continously from
trial to trial. Whether the individual will respond
not depends upon whether the net excitation is gre
than net inhibition or vice-a-vasa.

TRANSPOSITION OF RELATIONAL RESPONDING:-
When principle learned in one Problem-Solving situa
is applied to the solution of another problem, the pro
is referred as 'TRANSPOSITION'. Köhler's early work wa
done with chickens & apes. The typical experiment
involved training the animal to approach one the
shades of gray paper. for example chickens were fe
on a dark shade of gray paper but not on the lighte
shade. After such training when the animal was giv
a choice between two shades of gray he approa
the darker one. If this expt. was to end at thi
point behaviorists ... would have been delig
since that is exactly how an animal should react
to their point of view. It is the second part o
the experiment however that the Gestaltist felt
more revealing. After preliminary training the
animal was a given a choice between the darke
on which it was trained & still darker sheet of
gray paper. The question is how the animal would
respond to a new situation. The answer to that
question depends upon how one views the learn
process. The Gestaltist felt that behaviorists wo
have to predict that the animal would approach

THEORIES OF DISCRIMINATION LEARNING

There are two sets of discrimination learning theories.

— One set of theories lays emphasis on the development of the gradient of excitation & gradient of inhibition to the correct & incorrect stimuli.

— The second set of theories emphasizes on the problem solving character of discrimination & all or nothing properties of the hypothesis that the organism might use in learning to discriminate. This theory also places emphasis on attention & information processing.

The first set of theories are called CONTINUITY THEORIES & the second set as NONCONTINUITY THEORIES.

CONTINUITY THEORIES is the work of Spence who used many of the Hullian concepts to build his theory.

The fundamental assumptions of the continuity theory are (1) Pairing a stimulus with +ve reinforcement creates an excitatory tendency or state of affairs.

(2) Pairing a stimulus with -ve reinforcement creates an inhibitory state of affairs.

(3) Excitation & Inhibition both generalise along stimulus dimension with which they are associated such that they become weaker the farther along the stimulus dimension from the point at which conditioning originally occured.

(4) Generalized excitation & inhibition add algebraically to produce net amount of excitation or inhibition.

(5) If there is more generalised excitation to inhibition their will be tendency to respond & vice-a+versa.

It is called CONTINUITY THEORY because excita & inhibition are assumed to build continously from trial to trial. Whether the individual will respond not depends upon whether the net excitation is grea than net inhibition or vice-a-versa.

TRANSPOSITION OF RELATIONAL RESPONDING:-
When principle learned in one Problem-Solving situa is applied to the solution of another problem, the pro is referred as 'TRANSPOSITION'. Köhler's early work wa done with chickens & apes. The typical experiment involved training the animal to approach one the shades of gray paper. for example chickens were fe on a dark shade of gray paper but not on the lighte shade. After such training when the animal was giv a choice between two shades of gray he approac the darker one. If this expt. was to end at this point behaviorists ... would have been delig since that is exactly how an animal should react to their point of view. It is the second part o the experiment however that the Gestaltist felt w more revealing. After preliminary training the animal was a given a choice between the darkp on which it was trained & still darker sheet of gray paper. The question is how the animal would respond to a new situation. The answer to that question depends upon how one views the learn process. The Gestaltist felt that behaviorists wo have to predict that the animal would approach

light of the two shades of gray in the new situation since it is the exact one that had been rewarded in the first phase of the experiment. The Gestaltist however did not view learning as the development of specific habits or S-R connections. To them what is learned in this kind of situation was a relational principle ie they felt that the animal learned the principle of approaching the darker of two objects in the first phase of the experiment & that the same principle would be applied to the second phase of the experiment. The gestaltist would predict therefore that the animal would choose the darker of the two objects in the phase two although they had been rewarded for choosing the other object in phase I. Generally speaking the prediction made by the Gestalt Ψgist in this situation is a accurate one.

BEHAVIORIST EXPLANATION OF TRANSPOSITION/-

In the kind of learning situation described above the behaviorist tend to talk about the learning of specific S-R connections. As a result their views on learning have been referred as the Absolute theory. On the other hand the Gestalt view of learning which emphasizes the comparison between the two stimuli or has been referred as Relational theory. Köhler's research created some problem for the absolute position until Spence came up with his now famous explanation of the Transpasition phenomena based on

Whenever there is choice between two stimuli, the one eliciting the greatest net approach tendency will be chosen. In first phase of Spence's experiment the animal chose 160 sq cm box over the 100 sq cm box because the net +ve tendency was 51.7 for the former & 29.7 for the latter. In the phase two the 256 sq cm box was chosen over 160 sq cm box because the net +ve tendency was 72.1 for the former & still 51.7 for the latter. Spence's explanation has the advantage of making some unexpected predictions of transpositional phenomena. Eg. his theory would predict that transposition should break-down at some point and in the above example an animal would choose the smaller object in a pair of test stimuli This would happen if the animal were presented with a choice in 256 sq cm box & any box larger than 409 sq cm In all choices involving a 256 sq cm box & a box 409 sq cm or larger the animal would choose smaller of the two thereby reversing the principle the animal had supposed to have learned. Since Spence's theory could predict both the success & failures of transposition his viewpoint became more popular than Gestaltists point of view. Research on various aspects of transposition phenomena has demonstrated that both S-R & Gestalt prediction fails under certain situations as we will see in the expt's that involve reversing of the discrimination cues.

NON CONTINUITY THEORY

The theory of discriminative learning places great emphasis upon gradual accumulation of habit strength & upon algebraic summation of gradients of generalisation based on reinforcement & extinction. In general, this theory has been contrasted with one which emphasizes the problem solving behavior of organisms in discriminative learning. This is generally called a non continuity theory, because it implies that learning a discrimination is not a constant accumulation of positive & negative habit strength or the like. The essential idea is that organisms try out hypotheses about the discrimination problem they have to solve, now paying attention to one aspect of the problem, now to another, trying out this hunch, then that one, & so on. Eventually the problem is solved - perhaps all at once - as the result of a more or less strategic attack upon it. Obviously, the strategies that are available depend to a very large extent upon the inherent capabilities of the learning organism: people are going to be much better than rats in their problem solving ability. But facts can be found which suggest a non continuous process in rat learning.

Thus we find discrimination learning essentially involves hypothesis testing - organisms try out the hypotheses about the discrimination problem they have to solve

Comparasion of Continuity & Noncontinuity Theories

All theoritical approaches to discrimination learning egin by trying to specify either formally or intuitively at it is, that a subject has learned in his discrimination raining. How are we to characterize the subjects knowled- gained by this educative procedure.

Accordingly theories of discrimination learning fall to two broad classes - One of these places great uphasis upon the development & interaction of gradients excitation & inhibition to correct & incorrect stimuli. The ter stresses the importance of the active problem solving havior character of discrimination & all-or-nothing roperties of hypothesis, that organism might use in lear- ng to discriminate. The latter theory also places special uphasis on the principles of attention & information ocessing.

Historically at least the continuity theory depended pon formal treatment of deductions from postulates uch more than the non continuity theory. In particular pence's theory of discrimination learning was a much ore mathematically oriented, a formally rigorous heory than Krechevsky's outlive of discrimination earning. In the light of difference of approach it is ot easy to compare the two theories - because the ground rules that the two approaches adopted in theory onstruction have not always been the same.

Some of the evidence on the comparative adequacy

of the continuity + noncontinuity theories have has come from experiment in which a problem is alter pathway through the training programme. One way to do this is to reverse the discriminative cues ear in training while an animal is responding at a chance level. Suppose that we start to train a rat to discriminate between white + black cards We reinforce choices of the black card + extinguish choices of white one. Then after a few trials, we reverse the cues, so that the white card is now associated with reinforcement + black card with nonreinforcement. If the animal has been initial following a wrong hypotheses, during the ~~initial~~ ~~stage~~ of training we should expect no effect, if we re verse the cues, since the animal has not yet begun to associate black + white cues with the presence or absence of reinforcement. If however each trial adds a small increment both of habit strength to positive stimulus, + of inhibit to the negative stimulus as the continuity theory would suggest, then reversing the cues ought to lead to negative transfer or interference - and th to relatively slow learning. This reasoning holds only for early trials where the animal is responding a chance level, that is, during the precolution period w presumably, noncontinuity rats have not had a ch

to stumble upon & identify a hypothesis is correct. There are no. of experiments which have used the technique of reversing cues during presolution period, & the overwhelmin majority show that reversing cues does retard learning. (Ehrenfreund 1948; Sutherland & Mackintosh 1971). It is clear, then, that the results of discrimination experiments in which cues are reversed early in learning favor the continuity view.

The continuity theory does not fare well, however, if we reverse cues during a later stage of learning proce Suppose we train animal on a discrimination problem unti they have learned the problem well. Then suppose we give them a large no. of additional trials on the problem; tha is we overtrain or permit the animal to overlearn the problem. ~~Hite~~ While non continuity theory might not have any specific prediction to make about behavior if we now reverse cues, continuity theory would have very specific prediction to make - namely, that is ought to be progressively more difficult for the animals to reverse their behavior as the no. of overtraining trials increases. This would be true because overtraining should add additional habit strength to correct solution to the original problem. Consequ ntly, it ought to be more difficult for the animals to drop (extinguish) their original behavior & to respond to reversed cues.

But in a no. of experiments, this does not seem to.

in effect, beging begin all over again.

There are a no. of similar theories (eg Lovejoy 1966; Mackintosh 1974), & as Suter points out, most could account for his data with some relatively minor modifications in their assumption. All share in common however, the notion that the overlearning reversal effect depends upon attention like processes which are quite acutely & differentially tuned to the stimuli that are involved in discrimination-attention processes that do not arise from gradual buildup of excitation & inhibition & may totally ignore one or the other of an S^+ & S^- stimuli at various stages of the discrimination process. This is a type of data that would <u>not</u> sit well with the continuity theorist.