Edwin Ray Guthrie (1886-1959)

Chapter 8

1. Guthrie was born in Lincoln, Nebraska on Jan. 9, 1886.
2. He received his PhD in philosophy from the University of Pennsylvania (1912), and joined University of Washington (1918) as an assistant professor.
Edwin Ray Guthrie

6. received a gold medal from American Psychological Foundation (1958).

(1886-1959)

Aristotle’s Principle of Contiguity

Law of Association

1. A thought (or an idea) that was originally experienced along with other thoughts, will on their recurrence will lead to the recall of the associated thoughts.
2. Contiguity principle asserts that the basis for items to be associated are closeness in time and/or space.

Aristotle (384-322 BC)

Association of Ideas
Association of Ideas

Because the sensory experiences were spatially and temporally contiguous for the child, they formed associations. Later when one idea was triggered, other associated ideas were recalled.

Guthrie’s Principle of Contiguity

Learning Principle

1. A combination of stimuli which accompany a movement will on its recurrence, will be followed by that movement.
2. Contiguity principle says, when stimuli associate themselves with a movement -- their recurrence, is followed by the movement.

Pavlov & Watson

Learning

1. Pavlov and Watson believed that bell (S) and weak acid (S) were contiguous. Association between the two led to learning (conditioning).
2. Guthrie criticized Pavlov and Watson on their explanation of learning (conditioning) and suggested that, combination of stimuli (bell & weak acid) associated themselves with a response (salivation). Whenever the stimuli occurred, response followed.
Comparison

Pavlov & Watson

S → Bell → S → Weak Acid → R → Salivation
Contiguous Association

Guthrie

S → Bell → S → Weak Acid → R → Salivation
Contiguous Association

Stimulus Pattern

Stimuli combine to form a stimulus pattern. Stimuli can be external or internal or both when they form an association with a movement.

Probability of Response

Stimulus pattern cannot be predicted by absolute certainty, thus movements (responses) will always be probabilistic.

Initial Stimulus Pattern

Change in Pattern

Movements

Movements (probabilistic)
Signal

This stimulus pattern thus becomes the signal for a movement or behavior. “What is being noticed becomes the signal for what is being done (Guthrie, 1959).”

Aristotle’s Law of Frequency

Law of Frequency

1. Stimuli and their resulting responses have to be repeated frequently for a strong association to form between them.
2. Repetition of stimulus and a response strengthens the bond between them.

Guthrie’s One Trial Learning

Guthrie however proposed, that stimulus pattern gains its full associative strength on its first pairing with the movement (response).

<table>
<thead>
<tr>
<th>Aristotle (Repetitive Trials)</th>
<th>Guthrie (Single Trial)</th>
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<tbody>
<tr>
<td>$S \rightarrow R$</td>
<td>$S \rightarrow R$</td>
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<td>$S \rightarrow R$</td>
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<tr>
<td>Strong Association</td>
<td>Strong Association</td>
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Recency Principle

1. If associations between stimuli and movements (responses) are contiguous and require a single trial to learn, then a “Recency Principle” is necessary.

2. **Recency principle** states that recent stimuli will form associations with an action or movement than previous stimuli.

Recency Principle

A stimulus pattern consists of previous (older) and recent stimuli in temporal order. It is more recent stimuli that get associated with movement.

Movement-Produced Stimuli

1. At times the difference between an external stimulus and an overt response is delayed. How does Guthrie explains delayed response?

2. He says an external stimulus leads to a sequence of **movement-produced stimuli**, which are movements in the body serving as stimuli for a sequence of responses to culminate in a final delayed response.
Movement-Produced Stimuli

An external delayed stimulus triggers an internal movement in the individual which serves as a stimulus (M/S) for the next movement, till the final movement is made.

Older Stimuli

Recent Stimuli

Movement

Movement-Produced Stimuli

External Stimulus

“Ring”

Head and body turning response

Movement-produced stimulus

Head and body turning response

Moving out of chair response

Movement-Produced Stimuli

External Stimulus

“Ring”

Final Response

Picking up the phone response

Walking to the phone response

Causes movement produced stimuli

Walking to the phone response

Causes movement produced stimuli

Moving out of chair response

Causes movement produced stimuli

Movement-Produced Stimuli

External Stimulus

“Ring”

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Movements, Acts & Skills

1. **Movements** are minute responses made by the muscles that get associated with impinging stimuli. Movements are learnt responses.
2. **Acts** are a conglomerate of a number of learnt movements. Acts are learnt behaviors, like learning to press keys on a keyboard.
3. **Skills** are made up of many acts that are repeated (practice) to develop performance proficiency. Fast typing is a skill.
Thorndike & Animal Learning

Thorndike believed that cats learnt to escape the puzzle box through trial and error (practice) and reinforcement (food) when the animal made the correct response.

Guthrie-Horton Study (1946)

Guthrie and Horton used a puzzle box similar to Thorndike, and recorded 800 escapes in cats. Horton took photographs. Guthrie took notes.

1. Each cat learned its own peculiar stereotypical movement to escape the box. Thus Guthrie suggested it reflected one-trial learning, unlike Thorndike’s proposal that cats learnt through repetition.
2. Guthrie also proposed that cats did not need reinforcement to learn. This also opposed Thorndike’s idea that reinforcement was required. To Guthrie, reinforcement was a potent stimulus that prevented unlearning.
Forgetting

Like one-trial learning, forgetting also occurs in just one trial. In the presence of a stimulus pattern when an old movement is replaced by a new movement forgetting takes place.

![Diagram of old and new movements](image)

Breaking Habits

To break habits determine the cues (pattern of stimuli) that initiate the undesired habit. Replace the undesired habit with a desired habit in the presence of those cues.

1. Threshold/Tolerance Method
2. Fatigue/Exhaustion Method
3. Incompatible Response Method

Threshold/Tolerance Method

Introduce a stimulus, weak in strength so that it does initiate the bad habit. Increase the intensity of the stimulus slowly making sure that the animal tolerates the stimulus and does not engage in the undesired behavior before moving on to the next stronger stimulus.

Examples: 1. Spitting peas. 2. Horse breaking
Fatigue/Exhaustion Method

The undesired habit needs to repeated for long periods to cause fatigue or tiredness. Undesired habit will be removed by the negative consequences of fatigue or exhaustion. Similar to flooding (Pavlov).


Incompatible Response Method

Stimuli that cause undesired responses are presented with other stimuli that produce a desired response. Incompatibility of a desired response removes the undesired response. Similar to counter conditioning.

Example: Removal of fear from a toy panda with the introduction of mother’s warmth.

Sidetracking Habits

Guthrie suggested that breaking undesirable habits was difficult, so avoiding stimuli that cause undesirable habits was to sidetrack them.

Undesirable behavioral patterns (like smoking) in one environment can be sidetracked by going to a completely new environment (where cigarettes/tobacco is not available).
Punishment

1. Punishment needs to convey information, what the individual needs to do, e.g., dog chasing car. Pain during punishment is meaningless.
2. Punishment should produce an incompatible behavior to the unwanted behavior.
3. Punishment must be applied along with other stimuli, and it should be salient enough to change the undesired behavior.
4. If 2 or 3 are not met then punishment is ineffective, and in fact may strengthen the undesired behavior.

Drives & Intentions

1. For Guthrie, food (external stimulus) and hunger drive (internal stimulus) were parts of a stimulus pattern. Drives like hunger are maintaining stimuli that keep the individuals going till the goal is reached.
2. Though maintaining stimuli like hunger are internal, they can also be external like praise.
3. Intentions are conditioned responses (purposive behaviors), associated with maintaining stimuli leading the individual to reach goals.

Transfer of Training

1. Guthrie like Thorndike, did not believe in transfer of training as proposed by formal discipline.
2. Guthrie accepted Thorndike’s Identical Element Theory in explaining how contextual stimuli have similarity in producing the same response in a familiar and an unfamiliar situation. Adding 2+2 on the blackboard is different than adding 2+2 on the seat or at home. But one comes up with the same response (4) because important elements (2+2) remain the same.
Voeks' Postulates

Postulate I: Principle of Association
Any stimulus pattern which once accompanies a response, and/or immediately precedes it by one-half second or less, becomes a full-strength direct cue for that response.

Postulate II: Principle of Postremity
A stimulus which has accompanied or immediately preceded by two or more incompatible responses is a conditioned for only the last response made while that stimulus was still present.

Postulate III: Principle of Response Probability
The probability of any particular response occurring at some specified time is a function of the proportion of the stimuli present, which were present at the time when the response was originally made.
Voeks’ Postulates

Postulate IV: Principle of Dynamic Situations
The stimulus pattern is not static but dynamic, and changes from time to time. The pattern is modified, due to changes that result from the subject’s making a response, accumulation of fatigue products, visceral changes and other internal processes of the subject.

Evaluation

<table>
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<tr>
<th>Strengths</th>
<th>Weaknesses</th>
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<tr>
<td>Parsimonious – one law explains a lot.</td>
<td>Not falsifiable – one law explains too much. No observation can refute it.</td>
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<td>Practical – easily applied to fear and other behaviors.</td>
<td>Lack experimental control and internal consistency.</td>
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<tr>
<td>Understandable.</td>
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Questions

12. Summarize Guthrie's views on punishment.
13. Why do law of contiguity and one trial learning necessitates recency principle.
14. Describe Voeks’ postulates in formalizing Guthrie’s theory.