### Outline
This web page explores the **Learned Helplessness theory of depression** developed by Martin Seligman in the 1970s. It begins by outlining the symptoms that any theory of depression must account for. The phenomenon of learned helplessness is then introduced, and Seligman's novel idea of uncontrollability is explored. The central axiom of the theory - that helplessness is a cognitive state in humans and animals is emphasized, before comparing helplessness in animals with human depression.

The **Motor Activation Deficit hypothesis** represents a major challenge to Learned Helplessness theory. An experiment by Weiss that pits the two explanations against each other is described. The results suggest that helplessness may be the result of a temporary deficit in a neurochemical system involved in learning.

This topic is included in your course because it illustrates how a theory - not only serves to bring together a body of existing knowledge - but also acts as a catalyst for further research. After exploring

### Learning objectives
After studying the material on this page you should be able to:

- Recognize and list the symptoms of depression
- Describe the effects of prior inescapable shock on avoidance learning
- Explain the term response contingency space
- Locate continuous and partial reinforcement, extinction and uncontrollability within the response contingency space
- Define an uncontrollable situation
- List the psychological processes affected by learned helplessness
- Compare and contrast learned helplessness and depression
- Describe the motor activation deficit explanation of learned helplessness
- Explain the rationale for proposing a motor activation deficit explanation of learned helplessness
- Describe the temporal characteristics of the effect of stress on norepinephrine level
- Describe Weiss' experiment on the
this material - and studying the recommended reading - you should form your own opinion on the following questions:

- to what extent does helplessness overlap with human depression?
- to what extent is the helplessness phenomenon in animals due to cognitive factors?
- does the physiological explanation of helplessness rule out a cognitive explanation?
- does the physiological explanation of helplessness provide a biological basis for the cognitive deficit?

- effect of inescapable shock on avoidance learning
- Evaluate Weiss’ and Seligman’s account of the role of psychological and physiological factors in generating learned helplessness

Points to ponder:

There are a number of less straightforward issues that you may care to think about as you study this material.

- To what extent do you think the experimental procedures used to produce helplessness are truly uncontrollable in the way that uncontrollability is defined in the response contingency space?
- Do you think it was reasonable to proceed to construct a theory of learning in the light of early results that indicated that helplessness was a temporary impairment in the ability of dogs to acquire an active avoidance-escape response?
- To what extent does Learned Helplessness theory succeed as a theory of human depression, but fail as an explanation of the learned helplessness phenomenon?
- Is the pain and suffering endured by the animals in these experiments justified by the insight they provide into human depression?

The Nature of Depression

Many people experience sadness following major trauma such as death in the family, divorce or job loss. This is not depression. Depression resembles sadness, but it is more severe and intense. In addition, whereas there is usually a reason for sadness, it can be difficult to account for the severity and intensity of depression in the light of the life events experienced by the sufferer.

The following symptoms are associated with depression:

<table>
<thead>
<tr>
<th>depressed mood</th>
<th>lack of energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>lack of interest in, and pleasure from,</td>
<td>feelings of worthlessness and guilt</td>
</tr>
<tr>
<td>almost all activities</td>
<td>inability to think clearly or concentrate</td>
</tr>
</tbody>
</table>

http://salmon.psy.plym.ac.uk/year2/psy221depression/psy221depression.htm 8/28/2006
• decreased appetite leading to weight loss
• insomnia or hypersomnia
• psychomotor agitation or retardation
effectively, indecisiveness
• thoughts of death, suicidal thoughts

(From Lickey and Gordon, 1991)

Learned Helplessness Theory

Martin Seligman is responsible for the Learned Helplessness theory which had a major influence on psychological research into depression in the 1970s. Seligman discovered helplessness by accident whilst studying the effects of inescapable shock on active avoidance learning in dogs.

Seligman restrained dogs in a pavlovian harness and administered several shocks (UCS) paired with a conditioned stimulus (CS) - this is the conventional CS-UCS pairing procedure used to study classical conditioning. Then these dogs were placed in a shuttle-box where they could avoid shock by jumping over a barrier. The shuttle-box was used to study the role of operant conditioning in learning. Most of the dogs failed to learn to avoid shock.

From Swenson "Observational Learning Basics and history"

Seligman argued that prior exposure to inescapable shock interfered with the ability to learn in a situation where avoidance or escape was possible. Seligman used the term Learned Helplessness to describe this phenomenon.

It is important to emphasize that helplessness is not an all-or-none phenomenon. Seligman studied the behaviour of about 150 dogs between 1965 and 1969. About 100 (2/3rds) were helpless after the administration of unavoidable electric shock in the pavlovian situation. The remaining 1/3rd were completely normal and learned to avoid shock in the avoidance learning test. There was no intermediate outcome - dogs either learnt to avoid, or passively accepted shock in the shuttle-box. Furthermore, about 5% of naive dogs that had never received inescapable shock, exhibited helplessness when first exposed to shock in the operant learning situation.
The central idea in the Learned Helplessness theory is the notion that all animals (including humans) are able to learn that reinforcers are **uncontrollable**. This marks a sharp change in direction from previous studies of learning which had focussed on learning in controllable situations (Seligman, 1992).

**Response contingency space**

![Response contingency space diagram](image)

**Interactive exercise:** 'click and drag' your mouse on the 'hand' to move the:

- green horizontal line
- brown vertical line

To explore the probabilities associated with positions in response contingency space
Cognition and helplessness

It is important to appreciate that although cognition is at the heart of Seligman's theory, learned helplessness affects other psychological processes:

- **motivation** - reduced, no incentive to try new coping responses
- **cognition** - inability to learn new responses to overcome
prior learning that trauma is uncontrollable

- emotion - the helpless state resembles depression

**Learned Helplessness and Human Depression**

Seligman argues that there are similarities between the symptoms of depression in humans and helplessness.

<table>
<thead>
<tr>
<th>Symptoms of depression</th>
<th>Corresponding symptom in learned helplessness</th>
</tr>
</thead>
<tbody>
<tr>
<td>depressed mood</td>
<td>helplessness</td>
</tr>
<tr>
<td>lack of interest in, and pleasure from, almost all activities</td>
<td>cognitive representation of uncontrollability</td>
</tr>
<tr>
<td>decreased appetite leading to weight loss</td>
<td>helpless animals eat less &amp; loose weight</td>
</tr>
<tr>
<td>insomnia or hypersomnia</td>
<td>I know of no study on this point</td>
</tr>
<tr>
<td>psychomotor agitation or retardation</td>
<td>helpless animals are passive in face of shock</td>
</tr>
<tr>
<td>feeling without energy</td>
<td>lack of response initiation</td>
</tr>
<tr>
<td>feelings of worthlessness and guilt</td>
<td>perception that individual cannot control their environment</td>
</tr>
<tr>
<td>inability to think clearly or concentrate</td>
<td>cognitive representation of uncontrollability</td>
</tr>
<tr>
<td>effectively, indecisiveness</td>
<td>helpless animals may die in traumatic situations</td>
</tr>
<tr>
<td>thoughts of death, suicidal thoughts</td>
<td></td>
</tr>
</tbody>
</table>

This concludes my very brief introduction to Learned Helplessness. I have had to omit many important ramifications of the theory, in particular predictions from the theory about the causes of depression and how it could be treated. Seligman goes into these topics in his very readable book: Seligman, M.E.P., *Helplessness*, Freeman, New York, 1992.

**The Motor Activation Deficit Explanation of Learned Helplessness**

I want to focus on one aspect of helplessness and depression that has posed problems for Seligman's theory: the physiological basis of Learned Helplessness. Seligman points out similarities between the physiological basis of depression and helplessness:

<table>
<thead>
<tr>
<th>Physiology of depression</th>
<th>Physiology of learned helplessness</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Depression is associated with a deficiency of catecholamines (particularly norepinephrine) at central receptor sites. This is the catecholamine theory of mood</td>
<td>- Helpless rats have lowered levels of norepinephrine in the brain</td>
</tr>
</tbody>
</table>
Weiss believes that 'learned helplessness' is produced by "some form of stress-induced 'debilitation'". He called this the Motor Activation Deficit hypothesis (Weiss & Glazer, Psychosomatic Medicine, 37, p501, 1975). He highlights one important observation made by Overmier and Seligman in their original report of learned helplessness:

"They reported that poor avoidance-escape performance in the dogs was evident 24 hr after the session of inescapable shock but was totally absent if the dogs were first tested 48 hr after shock."

(Weiss & Glazer, Psychosomatic Medicine, 37, p501, 1975, emphasis added)

Weiss has studied the effects of exposure to uncontrollable situations on norepinephrine (NE) metabolism in the brain (e.g. Weiss, J.M. et al, Psychosomatic Medicine, 37, 522-533, 1975).

**Stress and norepinephrine**

![Effect of stress on hypothalamic norepinephrine levels](chart.png)

Weiss argues that rapid dissipation of the learned helplessness effect is not characteristic of learning, but instead indicates a short-term physiological imbalance that corrects itself with the passage of time from exposure to trauma.

In support of this argument the diagram shows that NE level in the brain is:

- reduced shortly after exposure to inescapable shock,
- but recovers over the next 48 hours
This suggests that the reason Seligman's dogs did not exhibit helplessness when tested 48 hr after uncontrollable shock was because brain NE had returned to normal by this time.

However, the effects of shock on brain chemistry depend upon prior experience.

**Previous research has revealed that NE levels are not depleted if animals are given repeated exposure to uncontrollable shock.**

Weiss used this information to design a clever experiment to test the two competing explanations of helplessness.

Rats were given **repeated** exposure to uncontrollable shock before being tested for their ability to learn an avoidance response in a shuttle-box.

- **Learned Helplessness** theory predicts that these rats should be **helpless** and should not be able to acquire the avoidance response.
- **The Motor Activation Deficit** hypothesis predicts these rats should have **normal NE levels** and should acquire the avoidance response.

This table is a simplified version of the treatments given to separate groups of rats in the experiment:

<table>
<thead>
<tr>
<th>Group</th>
<th>Days1 though 14</th>
<th>Day 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-S</td>
<td>Inescapable Shock (S)</td>
<td>Inescapable Shock (S) followed by 25 trials of avoidance learning in a shuttle-box</td>
</tr>
<tr>
<td>NS-S</td>
<td>No Shock (NS)</td>
<td>Inescapable Shock (S) followed by 25 trials of avoidance learning in a shuttle-box</td>
</tr>
<tr>
<td>NS-NS</td>
<td>No Shock (NS)</td>
<td>No Shock (NS) followed by 25 trials of avoidance learning in a shuttle-box</td>
</tr>
</tbody>
</table>

The results of Weiss & Glazers' experiment (Psychosomatic Medicine, 37, 523-534, 1975) together with the predictions made by the two theories are shown below in an interactive table that allows you to separately view the results of each experimental treatment. Click on the group names (S-S, NS-S, and NS-NS) to view the results for each independent group in the experiment. Compare each groups actual performance with the predictions made by the two theories.

http://salmon.psy.plym.ac.uk/year2/psy221depression/psy221depression.htm
theories.

Test of the two theories

<table>
<thead>
<tr>
<th>Group</th>
<th>Theoretical Prediction</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-S</td>
<td>NE levels recover with chronic shock. Rats should learn avoidance response.</td>
<td></td>
</tr>
<tr>
<td>NS-S</td>
<td>NE levels are reduced. Rats should not learn avoidance response.</td>
<td></td>
</tr>
<tr>
<td>NS-NS</td>
<td>Rats should learn avoidance response.</td>
<td></td>
</tr>
</tbody>
</table>

The crucial group is the one given chronic exposure to shock before being tested in the shuttle-box (Group S-S).

Results:

- Both theories predict that
1. a single exposure to shock (Group NS-S) should interfere with learning in the shuttle-box
2. rats with no prior experience with shock (Group NS-NS) should learn in the shuttle-box
   - Both these predictions are confirmed by the results, therefore these results do not distinguish between the two theories.

However, contrary to the prediction of Learned Helplessness theory,

- chronic exposure to inescapable shock (Group S-S) did not induce a state of helplessness that interfered with learning in the shuttle-box. This result supports the prediction made by Weiss' Motor Activation Deficit account of helplessness.

Afterword

In the late 1970s, Seligman's theory of depression was reformulated within the framework of attribution theory (Gilbert, 1984). Briefly depression will occur if:

- the individual is aware of uncontrollable factors in their environment
- the individual views the situation as unchangeable
- they blame themselves for their helplessness - internal attribution

References and Recommended Reading:

- Seligman, Helplessness, Freeman, New York, 1992
- Weiss, J.M. et al, Psychosomatic Medicine, 37, 522-533, 1975
- Weiss & Glazer, Psychosomatic Medicine, 37, p501, 1975,

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