

Second Order Conditioning

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October 7, 2025

RECOMMENDED CITATION

mohammad looti (2025). *Second Order Conditioning*. PSYCHOLOGICAL SCALES.
Retrieved from <https://scales.arabpsychology.com/?p=34900>

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Primary Disciplinary Field(s): Psychology, Behavioral Neuroscience, Learning Theory, Behaviorism

1. Core Definition

Second Order Conditioning (SOC), also frequently termed Higher Order Conditioning, represents a crucial extension of the principles established by classical conditioning, pioneered by Ivan Pavlov. It describes a learning process where a previously neutral stimulus (NS) becomes a conditioned stimulus (CS) not by being paired directly with an unconditioned stimulus (UCS)--the natural trigger--but rather by being paired with an already established and robustly conditioned stimulus (CS1). Essentially, the learning process is extended one level beyond the original association, demonstrating the hierarchical nature of associative learning. This mechanism is foundational to understanding how complex human emotions, preferences, and aversions are developed, often without direct experience of the original biologically relevant stimulus.

In the standard framework of first order conditioning, the learning relies on the inherent, often biological, connection between the UCS (e.g., food, shock, loud noise) and the unconditioned response (UCR, e.g., salivation, pain withdrawal, fear). When the NS is repeatedly presented immediately prior to the UCS, the NS transforms into the CS, capable of eliciting the conditioned response (CR). SOC departs from this direct biological linkage. The power of the established CS1 is leveraged to imbue a new, completely unrelated stimulus (NS2) with the same associative power. This means the individual or organism responds to the CS2 as if it were the CS1, even though CS2 has never been paired with the original UCS.

This phenomenon is critical because it explains the spread of learned associations in real-world environments. For example, if a tone (CS1) consistently predicts food (UCS), the animal salivates (CR). If a flashing light (NS2) is then consistently paired only with the tone (CS1), the animal will eventually begin to salivate upon seeing the light alone. The light becomes the CS2. This process showcases that the predictive value of a stimulus--its ability to signal an important event--is itself sufficient to drive new learning, allowing associations to chain together in complex networks that form the basis of sophisticated behavior.

2. Mechanism of Action and Contrast with First Order Conditioning

The mechanical difference between first order conditioning (FOC) and second order conditioning (SOC) lies entirely in the nature of the reinforcing stimulus used in the training phase. FOC requires the pairing of a neutral stimulus with an unconditioned stimulus that naturally and reliably elicits a response. The learning curve for FOC is typically steep and robust, producing long-lasting associations because the UCS has inherent motivational significance (e.g., survival or pleasure).

SOC, conversely, requires a minimum of two sequential learning stages. The initial stage establishes the foundation (CS1-UCS pairing). The second stage is the SOC phase, where the newly introduced neutral stimulus (NS2) is paired with the established conditioned stimulus (CS1). During this second stage, the CS1 effectively acts as a surrogate UCS, transmitting its associative power to the NS2. The crucial distinction is that no primary reinforcement (UCS) is necessary during the second stage of learning; the established predictive value of CS1 is the only required component for the conditioning to occur.

Furthermore, a primary contrast exists in the strength and durability of the resulting learned associations. Associations formed through FOC are generally strong and highly resistant to extinction. In contrast, SOC associations (CS2-CR) are typically weaker, more fragile, and are generally established more slowly. They are also highly vulnerable to decay. If the original CS1 is later subjected to extinction procedures (i.e., presenting CS1 without the UCS), the power of CS2 to elicit the CR rapidly diminishes, a phenomenon known as extinction of the higher order response.

While FOC forms direct, foundational links between external cues and innate biological responses, SOC allows for the generation of complex, symbolic meaning. It enables the organism to respond to cues that are only abstractly or indirectly linked to immediate biological needs. This cascading effect of conditioning is fundamental to human cognitive processes, where learned values and social signals (e.g., money, fashion brands) acquire powerful affective meaning despite their lack of intrinsic biological utility.

3. Etymology and Historical Development

The conceptual foundation of Second Order Conditioning is inextricably linked to the early experimental work of Russian physiologist Ivan Pavlov in the late 19th and early 20th centuries. While Pavlov's initial research focused predominantly on the core elements of FOC--demonstrating how arbitrary stimuli (tones, bells) could elicit salivary responses--his extensive documentation of conditioned reflexes provided the necessary empirical structure for later investigations into hierarchical learning. Pavlov and his collaborators observed instances where conditioning seemed to 'spread' or 'chain,' hinting at the potential for stimuli to gain reinforcing properties through learned associations alone.

Following Pavlov, behaviorists in the mid-20th century formalized the concept and structure of higher order conditioning. Researchers, particularly within the American psychological tradition, recognized SOC as a critical mechanism for explaining non-direct learning, which was difficult to account for purely through simple stimulus-response pairings. The formalization of SOC provided a crucial theoretical tool for reconciling basic conditioning models with the observed complexity of human and animal behavior, particularly in areas like language acquisition and the development of

emotional disorders such as phobias.

During this period of formalization, it became clear that SOC challenged strict reductionist views of conditioning, which posited that all learning must ultimately trace back to primary, biologically reinforcing events. The successful demonstration of SOC proved that the **conditioned stimulus (CS1)** itself acquires sufficient psychological significance--specifically, the power to predict the UCS--to serve as a functional reinforcer or eliciting stimulus in subsequent learning trials. This shifted the focus of research from simple physical pairing to the psychological representation of predictive relationships between stimuli.

4. Factors Affecting Conditioning Strength

The strength and reliability of Second Order Conditioning are contingent upon several factors, often making it a delicate and less stable form of learning compared to FOC. One of the most influential factors is the **strength of the initial association (CS1-UCS)**. If the first-order conditioning is weak, unstable, or already undergoing extinction, the subsequent second-order conditioning will be negligible or fail entirely. A highly salient, frequently reinforced CS1 is required to effectively transfer its associative value to the NS2.

Another critical determinant is **temporal contiguity**, specifically the time lag between the presentation of the CS2 and the CS1 during the second stage of learning. As with FOC, optimal learning occurs when the NS2 is presented immediately before the CS1. Excessive delays can severely inhibit the formation of the CS2-CR association. Furthermore, the number of pairings in the SOC phase is vital, though SOC typically requires significantly more pairings than FOC to reach a comparable level of response strength, and rarely achieves the same magnitude of response.

The phenomenon of **extinction and disinhibition** plays a major role in the stability of SOC. Since the CS2's power is entirely derivative of the CS1, any procedure that weakens CS1 will inevitably weaken or eliminate CS2's ability to elicit the response. This "chained" dependency means that even after the CS2-CR association is established, simply presenting CS1 alone repeatedly without the UCS will cause the entire learning chain to collapse. This fragility is a defining characteristic that differentiates higher-order conditioning from primary learning.

5. Applications and Examples

Second Order Conditioning provides powerful explanations for a wide range of human behaviors, particularly in the formation of symbolic values and emotional responses. A classic real-world example is the development of value associated with **money**. Money itself (the CS2) has no intrinsic biological worth; it cannot satisfy hunger or provide shelter directly. However, money is constantly paired with the ability to acquire primary reinforcements (UCS, such as food, security,

and pleasure), which are powerful first-order conditioned stimuli (CS1). Through repeated association, money acquires substantial reinforcing and motivating properties, eliciting strong emotional and behavioral responses.

In the realm of **marketing and advertising**, SOC is exploited extensively. Advertisers often pair a previously neutral product (NS2) with an already highly valued or desirable entity--such as a famous celebrity, an attractive model, or stirring patriotic music (all of which function as established CS1s). The goal is to transfer the positive affective response elicited by the CS1 to the product (CS2), thereby influencing consumer preference and purchasing behavior, even if the product itself offers no unique functional benefit.

Furthermore, SOC is central to understanding the propagation of **anxiety and phobias**. If an individual experiences a painful event (UCS) in a particular environment (CS1), they develop fear (CR) of that environment. If that environment (CS1) is consistently associated with a specific, previously innocuous sight, sound, or person (NS2), the fear response can generalize to the NS2, turning it into a CS2. This mechanism explains why fears often spread from the original traumatic cause to neutral cues that were merely present during the frightening event.

6. Theoretical Significance and Impact

The theoretical significance of Second Order Conditioning lies in its ability to demonstrate that learning is not always tethered to immediate biological needs. It offers a vital bridge between rudimentary classical reflexes and complex cognitive processes, confirming that psychological representations and expectations play a critical role in associative learning. By allowing a CS to function as a reinforcing stimulus, SOC fundamentally expands the scope of what can be learned.

SOC provided early behavioral theorists with a powerful tool for analyzing phenomena like **stimulus generalization** and the development of **abstract concepts**. If an organism can learn to respond to a stimulus that is only secondarily linked to a primary reinforcer, it implies that complex chains of associations can be formed, enabling organisms to navigate environments with nuanced and indirect cues. This helps explain behaviors that appear arbitrary or irrational but are rooted in a complex history of layered associations.

Crucially, the successful experimental demonstration of SOC solidified the understanding that the predictive value of a stimulus--its informativeness--is the core mechanism of classical conditioning, rather than merely temporal pairing. The CS1 signals the impending UCS, and it is this signaling power that is transferred to the CS2. This theoretical understanding laid groundwork for later cognitive theories of learning, such as the Rescorla-Wagner model, which mathematically describe how the informational value (or prediction error) of a stimulus drives associative change.

7. Limitations and Related Phenomena

While powerful, Second Order Conditioning faces significant theoretical and practical limitations. The most recognized limitation is the **ceiling effect**: conditioning rarely extends successfully beyond the second or, occasionally, the third order. Attempts to establish Fourth Order Conditioning typically fail, suggesting that the associative strength dissipates rapidly with each subsequent level of abstraction from the original UCS.

Another key limitation is the susceptibility of SOC to **blocking and overshadowing**. If, during the second conditioning stage, other highly salient stimuli are present alongside NS2 and CS1, those concurrent stimuli may 'block' the ability of NS2 to acquire associative strength, or 'overshadow' it, preventing the formation of a strong CS2-CR link. This highlights the competitive nature of associative learning.

A phenomenon closely related to SOC, yet distinct, is **Sensory Preconditioning**. In SOC, the CS1 is established first, and the NS2 is conditioned to it second. In Sensory Preconditioning, two neutral stimuli (NSa and NSb) are paired together first. Then, NSb is paired with the UCS to make it CSb. Finally, NSa is tested and found to elicit the CR, even though NSa was never paired with the UCS or the CSb. While both demonstrate indirect learning, SOC relies on the established reinforcing power of the CS1, whereas Sensory Preconditioning relies on the prior association of two neutral stimuli before any primary reinforcement is introduced.

Further Reading

[Second-order conditioning \(Wikipedia\)](#)

[Classical Conditioning \(Wikipedia\)](#)

[Simply Psychology: Classical Conditioning and Pavlov](#)