

CRESPI EFFECT

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Primary Disciplinary Field(s): Psychology (Learning Theory, Motivation, Behavioral Conditioning)

1. Core Definition and Classification

The **Crespi Effect**, often categorized under the broader umbrella of the **Reward Contrast Effect**, describes a pronounced and temporary behavioral shift observed in an organism following an abrupt, unexpected change in the magnitude or quality of the reinforcement (reward). This effect is characterized by an acceleration or deceleration in the conditioned response--such as running speed or response vigor--that is disproportionate, or incommensurate, to the objective physical change in the support provided.

This phenomenon is critical because it demonstrates that the motivational value of a reward is not absolute but is intensely subjective and relative to prior experience. The effect is typically observed in experimental procedures involving instrumental conditioning, such as rats running a straight alley maze or lever-pressing tasks, where performance is measured immediately after the shift in reinforcement level. The subsequent performance level significantly undershoots or overshoots the expected performance of control subjects who have consistently received the new reward level.

The Crespi Effect is bifunctional, encompassing two distinct forms of motivational contrast: the **Positive Contrast Effect (PCE)**, resulting from an increase in reward, and the **Negative Contrast Effect (NCE)**, resulting from a decrease in reward. Both components highlight the influence of expectation and emotional state on observable performance, moving the field of learning theory beyond purely mechanistic input-output models.

2. Historical Context and Crespi's Original Study (1942)

The effect is named after American psychologist Leo P. Crespi, who first systematically documented this phenomenon in his seminal 1942 doctoral dissertation conducted at Stanford University. Crespi designed a classic experiment using three groups of rats trained to run a straight alley maze to receive food rewards. Initially, each group received a different fixed amount of reinforcement: small (1 unit), medium (4 units), or large (16 units). This initial training phase established stable baselines of performance corresponding directly to the magnitude of the reward, consistent with established laws of reinforcement.

The critical manipulation occurred in the subsequent phase when Crespi abruptly shifted the reward levels for the experimental groups. For instance, rats accustomed to the large reward (16 units) were suddenly switched to the medium reward (4 units), and rats accustomed to the small reward (1 unit) were simultaneously switched to the medium reward (4 units). Crucially, the control group continued receiving the medium reward (4 units) throughout the entire experiment, providing

a stable baseline for comparison.

The results of this shift phase were dramatic and unexpected by contemporary behavioral models. Performance was not simply adjusted to the new 4-unit reward level. Instead, the rats whose reward was decreased (16 → 4) immediately ran significantly slower than the control rats who had always received 4 units (NCE), while the rats whose reward was increased (1 → 4) immediately ran significantly faster than the control rats (PCE). This momentary, intense deviation from the control baseline became known as the **Crespi Effect**, demonstrating the powerful role of previous reward history in determining current motivational drive.

3. The Positive Contrast Effect (PCE)

The **Positive Contrast Effect (PCE)**, often termed "elation effect" or "euphoria," manifests when an organism receives a sudden, unexpected increase in the quality or quantity of reinforcement. This abrupt shift causes the organism's performance to accelerate markedly, temporarily exceeding the performance level of organisms that have consistently received that higher level of reward.

This behavioral boost suggests that the subjective value of the new, larger reward is enhanced due to the favorable comparison with the previously expected, smaller reward. The organism responds with heightened enthusiasm and vigor, suggesting a powerful motivational surge driven by the discrepancy between low anticipation and high actual outcome. For example, if a worker suddenly receives a bonus triple the size of their standard annual raise, their immediate productivity surge may overshoot that of a colleague whose raise has always been that high.

While the PCE is intense immediately following the shift, it is typically transient. Over subsequent trials, the performance of the PCE group gradually declines toward the stable level demonstrated by the control group that consistently receives the large reward. However, the initial overshooting of performance provides strong evidence against models that posit reward magnitude as the sole, fixed determinant of incentive motivation.

4. The Negative Contrast Effect (NCE)

Conversely, the **Negative Contrast Effect (NCE)**, often referred to as the "depression effect" or, more formally, the Successive Negative Contrast (SNC), occurs when the reward magnitude is suddenly reduced. This decrease triggers an immediate and precipitous drop in the organism's performance, sinking far below the level exhibited by control subjects who have always received the new, smaller reward amount.

The NCE is interpreted as a manifestation of emotional suppression resulting from disappointment or anticipatory frustration. The organism's failure to receive the accustomed large reward

generates an inhibitory emotional state that actively interferes with the conditioned behavior. The rats in Crespi's study receiving the 16 → 4 unit shift essentially refused to run, performing worse than the rats who never had reason to expect anything more than 4 units.

The NCE is generally considered more robust and enduring than the PCE in experimental settings. Its intensity and persistence provided a crucial foundation for subsequent theories of motivational conflict and frustration developed by behaviorists like Abram Amsel. The NCE underscores that the reduction of an expected reward creates a powerful negative drive state that can temporarily override the standard reinforcing effects of the smaller reward that is still being provided.

5. Theoretical Explanations and Underlying Mechanisms

The Crespi Effect forced significant revisions in classical learning theories, particularly those based on the Hull-Spence framework. According to the original Hull-Spence theory, the magnitude of the reward primarily affects the incentive motivation component (K), which was thought to be a fixed parameter determined by the current reward size. Crespi's findings mandated that K must be viewed as a variable, dynamic factor influenced heavily by the immediate history of reinforcement.

The most influential theoretical explanation for the NCE is **Abram Amsel's Frustration Theory**. Amsel posited that unexpected non-reinforcement (or reduction in reinforcement) elicits an innate, unconditioned emotional response: **frustration**. This frustration (RF) is an aversive internal state that motivates avoidance or suppression of the behavior associated with it. When the animal anticipates frustration, it develops a fractional anticipatory frustration reaction (rf), which acts as an inhibitory drive, actively suppressing the running response in the alley, thus explaining the under-performance observed during NCE.

Conversely, PCE is often explained by the concept of elation or contrastive expectancy. The low reward history establishes a low baseline expectation. When the large reward is suddenly delivered, the positive affective reaction (elation) is amplified by the contrast, producing a momentary increase in incentive motivation that overshoots the stable baseline. Modern cognitive accounts typically frame both PCE and NCE through the lens of prediction error, where performance vigor is modulated by the magnitude and valence of the mismatch between expected and actual reward outcome.

6. Significance in Learning Theory and Applications

The demonstration of the Crespi Effect provided compelling evidence that learning and performance are not solely governed by the current schedule of reinforcement but are inextricably linked to internal, cognitive, and emotional processes. It substantiated the idea that motivation is relational and comparative, dependent on the contrast between successive environmental states.

In experimental psychology, the Crespi Effect is crucial for understanding the nature of incentives and the complexity of reinforcement schedules. It led to a greater appreciation for how expectations are formed and how rapidly behavior can be modulated when those expectations are violated. The effect serves as a powerful tool for analyzing motivational states, particularly those related to disappointment and elation.

In human applications, the principles underlying the Crespi Effect are observable in organizational behavior and economics. For instance, an unexpected bonus that far exceeds expectations (PCE) may lead to a temporary surge in employee enthusiasm and productivity that is greater than what would be achieved if that high bonus were standard practice. Conversely, the abrupt removal of an expected perk or benefit (NCE) can lead to rapid decreases in morale and performance, sometimes even resulting in output lower than if the perk had never existed, illustrating the negative power of relative deprivation.

Further Reading

[Reward Contrast and Motivation \(Wikipedia\)](#)

[Crespi, L. P. \(1942\). Quantitative variation of incentive and performance in the white rat. The American Journal of Psychology.](#)

[Amsel, A. \(1992\). Frustration Theory: An Analysis of the Crespi Effect.](#)