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# Extrinsic motivation and Intrinsic Motivation, which one is more long lasting?

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# Abstract

This research paper delves into the functions and impacts of intrinsic and extrinsic motivations through an exploration of various experiments. It begins by providing clear definitions of these two types of motivations, distinguishing between drives and incentives. Additionally, the paper elucidates the processes by which motivation is generated. The primary focus is on intrinsic and extrinsic motivations, elucidating their nature and origins.

In the experimental phase, the paper delves into existing theories and experiments, including the Overjustification Effect, Goal Setting Theory, and Self-Determination Theory by Deci & Ryan. Experiments are categorized into two sections: those within the realm of social psychology and those within the domain of neuroscience. Social perspective experiments investigate the social implications of extrinsic motivations, specifically whether rewards possess the potential to significantly boost motivation. Neuroscientific perspective experiments delve into the release levels of dopamine and related neurons, shedding light on which type of motivation provides a heightened sense of "happiness" or "enjoyment" that may serve as a stronger motivator.

Prior to conducting the research, the hypothesis posits marked differences among all four types of motivations, with the prediction suggesting that intrinsic motivation will prove more enduring than extrinsic motivation.

Every day, individuals encounter a myriad of motivations, incentives, and drives, some of which are essential for sustaining human life. Basic drives guide human to drink when they thirsty, while others aspire to engage in demanding activities driven by strong incentives. However, what are the similarities or differences of drives and incentives, comparing to the two kind of motivations— —intrinsic and extrinsic motivation? Examining from the wealth of existing studies and theories exploring these motivations, a central question remains: which of these motivational forces proves to be more enduring over time?

To initiate the following discussion, the definitions of the four fundamental concepts need to be elucidate. As outlined in David Belin's lecture, drives and incentives can be differentiated: drives constitute motivations propelling behaviors, while incentives signify motivations attracting behaviors (Belin, 2023). Broadly, motivation's definition encompasses desires or needs directing actions (Ch.1 Key Terms - Psychology). Though sometimes it’s hard to specifically define or categorize the motivations, intrinsic motivation, a subset thereof, originates from internal rationale, like emotions or sentiments, rather than external rewards (Ch. 1 Key Terms - Psychology). Conversely, extrinsic motivation rests solely on external elements, including rewards or punishments. As vital stimuli, diverse motivations are indispensable for organismal survival, influencing three pivotal levels: endocrine, autonomic, and behavioral (Belin, 2023).

Both intrinsic and extrinsic motivations are valid driving forces that activate hormonal pathways and draw upon knowledge stored in the hippocampus. However, significant distinctions exist between these two forms of motivation. Intrinsic motivation revolves around an internal sense of reward, often stemming from activities that offer enjoyment or satisfaction. Conversely, extrinsic motivation hinges on external rewards, emphasizing outcomes rather than fulfilling psychological needs (Barr, 2022). Within the extrinsic motivational framework, the interplay of reinforcement and punishment assumes a considerable role in shaping behaviors (Kendra, 2023). In contrast, intrinsic motivation finds its essence in the intrinsic value of the behavior itself, serving as a form of its own reward (Barr, 2022).

Theoretical concepts suggest a close correlation between intrinsic motivation and one's innate drive, while extrinsic motivation finds its connection with external incentives. However, instances where these two motivational facets remain distinctly separated are exceedingly uncommon (Belin-Rauscent).

To illustrate the four concepts with a straightforward example: after a protracted and strenuous exercise, one experiences profound fatigue and an intense desire to quench their thirst. The "thirsty" sensation epitomizes a "drive," yet if the preference shifts from water to another beverage, this process becomes an "incentive." Opting to engage in the arduous exercise solely for health reasons exemplifies intrinsic motivation; on the contrary, doing so to indulge in high-calorie foods denotes extrinsic motivation.

While the previous paragraphs highlighted the influence of sentiments on internal motivation, it is important to acknowledge the presence of a distinct reward system that propels human actions in all sort of motivation. Notably, the release of the neurotransmitter "dopamine" by the Ventral Tegmental area assumes a pivotal role in this mechanism. Functioning as the "happy hormone" that governs the reward system and instigates motivation, dopamine serves as the neural conduit for information exchange across different regions of the brain (Better Up). This communication is particularly pronounced when favorable events transpire, marking the occurrence of rewarding stimuli.

Complementing dopamine's effects is serotonin, produced by the Raphe Nuclei, which aids in the dissemination of motivational signals throughout various brain segments. The bedrock principle underpinning human action is rooted in memory experiences (Center on the Developing Child, 2023). Upon the emergence of a rewarding target, dopamine orchestrates the activation of neural pathways, fostering an augmented inclination towards reinforcing the associated rewards. The amygdala, often dubbed the "emotion trigger" (Center on the Developing Child, 2023), undertakes the task of processing environmental cues, evaluating stimuli, and subsequently determining whether pursuing the reward is warranted.

Integral to the motivation-forming process is the role of memories, which rely on past experiences and sensations to inform the body's judgment of the appeal or desirability

of a given action. The Hippocampus, acting as the "memory center," collaborates with the dopamine pathway to bolster motivation by leveraging relevant memories. Concurrently, the prefrontal cortex engages in self-regulation, steering behavioral responses towards pleasurable stimuli (Better Up). Ultimately, the Nucleus Accumbens assimilates behavioral feedback, thereby culminating the reinforcement cycle.

Built upon the foundations of intrinsic and extrinsic motivation, a multitude of existing theories have emerged to explore their impacts and intricate interplays that shape human behavior. Notable among these are the Self-Determination Theory, the goal setting theory, and the phenomenon of over-justification effect.

The Self-Determination Theory (SDT), originally formulated by Edward Deci and Richard Ryan, elucidates the intricate dynamics of intrinsic and extrinsic motivations. Within the framework of SDT, the two primary forms of motivation are categorized as "autonomous motivation" and "controlled motivation" (Gagné & Deci). Autonomous motivation encompasses choices driven by personal experiences, with intrinsic motivation serving as a subset of this category (Gagné & Deci). In contrast, controlled motivation encompasses decisions influenced by external pressures or obligations (Gagné & Deci). An integral tenet of SDT is the recognition that regardless of the specific motivation at play, the interplay between the individual and their environment remains pivotal (Deci, Ryan). In essence, the Self-Determination Theory unveils the multidimensional nature of motivations, underscoring the distinction between

autonomous and controlled motivations while emphasizing the essential role of the environment-individual interaction.

In practice, the Goal Setting Theory places significant emphasis on harnessing intrinsic motivation. A case in point is the American Pulpwood Association, where the implementation of specific and ambitious goals aimed at elevating workers' productivity relied heavily on intrinsic motivation strategies. The outcomes revealed a notable improvement in efficiency, likely attributed to heightened satisfaction with their work outputs among the employees (Latham). Operationalizing the Goal Setting Theory entails several essential concepts. Foremost, goals should be meticulously defined and in high reach. Furthermore, embedding individual passions within these goals serves as a catalyst for invoking intrinsic motivation. Lastly, a degree of challenge, encapsulated within the concept of venturing, impels individuals to stretch their capabilities and fuels their determination to succeed (Locke & Latham). In addressing the question of why goal setting proves effective, Latham dissected the process into four distinct steps (Latham). Firstly, by dedicating oneself to the established goals, focused attention is naturally drawn to goal-relevant tasks. Secondly, goals serve as a motivational force, infusing individuals with energy and enthusiasm. Thirdly, the introduction of deadlines contributes to heightened efficiency during work periods. Lastly, in the fourth step, goals act as catalysts, propelling individuals to leverage their existing knowledge and contextual understanding.

The Over-justification Effect, also referred to as the over-justification hypothesis, suggests that when an individual possesses intrinsic motivation for an activity and is subsequently introduced to extrinsic rewards, these rewards can actually undermine the individual's initial motivation, leading to a decrease in their engagement with the activity (Lepper). This phenomenon is exemplified through various scenarios, such as the motivations of school-going children (Bates). Many U.S. students exhibit an innate drive when initially entering school, and it is widely believed that the enduring force behind their continued attendance and active learning is primarily intrinsic motivation (Bruner). However, it is worth noting that in numerous scientific experiments, the differentiation between reinforcement and rewards has not been effectively delineated, thus complicating the task of substantiating this theory (Akin-Little & Little).

To examine the duration of intrinsic and extrinsic motivation, a practical approach is to conduct social experiments. Consider the "Soma Puzzle" Study conducted by Deci, Koestner, and Ryan, which sought to determine the impact of different motivations on people's engagement within the same conditions. It was predicted that offering a reward, specifically one dollar for each completed puzzle piece, might negatively affect participants' efficiency (Ryan, 1983). The study involved twenty participants in the testing group and fifteen in the control group, with outliers removed and no age restrictions considered. The resulting data yielded a confidence interval (CI) of -0.59 to 0.30 for the control group and a CI of 0.33 to 0.00 for the testing group, which confirmed the prediction (Deci, 2001).

Another experiment, representative of a different context in social psychology, was conducted by Panagopoulos in 2007. This study aimed to investigate the impact of extrinsic rewards on federal voting behavior. The economist Dean S. Karlan had previously proposed that offering public privileges to voters would incentivize greater voter turnout in 1994. In response to this hypothesis, Panagopoulos pointed to several existing strategies that had been implemented by that time. For instance, the California Democracy party had offered free dinners to voters in 1999, and Michigan Republicans distributed supplies in 2004.

Subsequently, Panagopoulos designed and conducted his own experiment in 2007, which took place in Gilroy, California, with a substantial sample size of 7,392 registered single-voters, representing approximately 38.6% of the population (Panagopoulos, 2012). The participants were divided into three groups: a control group that received no incentives, a control group of 993 individuals who received a blank notecard with a voting reminder, and 496 individuals who received a voting reminder card with the option to exchange it for a reward valued at two dollars, five dollars, or twenty-five dollars after voting (Panagopoulos, 2012). However, at the conclusion of the experiment, only five individuals requested the reward, which suggested that the majority of people who voted were not primarily motivated by direct incentive rewards (Panagopoulos, 2012).

Due to the potential for significant biases in human motivation experiments, researchers often turn to animal models to study the release of dopamine during behavioral responses.

The study titled "Increased Extracellular Dopamine in the Nucleus Accumbens of Rats Elicited by a Conditioned Stimulus for Food: An Electrochemical Investigation," conducted by Phillips, Atkinson, Blackburn, and Blaha, provides significant insights into the influence of anticipation on individuals, often surpassing the actual rewards. For the experiment, each rat was prepared under pentobarbital anesthesia with a dialysis probe assembly containing stearate-modified graphite paste electrodes (SGEs). Additionally, an AgCl-reference electrode and auxiliary electrode were securely anchored to the rat's skull to monitor their reactions (Phillips, Atkinson, Blackburn, & Blaha, 1993). In this experimental setup, rats were subjected to unpredictable food delivery times, consistently preceded by a light conditioned stimulus (CS+) (Phillips, Atkinson, Blackburn, & Blaha, 1993). The recorded data, represented in four chronoamperometric records, distinctly demonstrates that the significant signal detected by the SGEs initiated when the light conditioned stimulus was activated (Phillips, Atkinson, Blackburn, & Blaha, 1993).

Of particular interest is model C, derived from two SGEs placed in the caudate nucleus, where the oxidation of dopamine (DA) prior to the CS+ registered at approximately 3.1. Following the CS+ but before the meal's delivery, this level surged to approximately 3.7 (Phillips, Atkinson, Blackburn, & Blaha, 1993). These findings shed

light on the powerful role of expectation in shaping behavior and neurochemical responses.

In another experiment conducted by Wolfram Schultz, monkeys were chosen as subjects due to their closer genetic relation to humans. In this experiment, the monkeys were trained to press a lever in response to specific visual cues, which served as indicators of potential rewards. During the experiment, the research team employed microelectrodes to monitor the electrical activity of dopamine neurons within the monkeys' brains.

From the data presented in the report, it was observed that when there were no specific predictions, and the reward was received, there was a significant and abrupt increase in the electrical activity of the dopamine neurons. Conversely, in the second condition where expectations were established, the activity surged at the moment the monkey pressed the lever but remained relatively stable when the reward was eventually obtained (Schultz, 1998).

These findings were highly significant as they led to the discovery of what Schultz termed "reward prediction error" within dopamine neurons. This phenomenon suggests that dopamine neurons are not only activated upon receiving a reward but also when there is a deviation between anticipated and actual outcomes, whether these outcomes surpass expectations or fall short (Schultz, 1998).

With these conclusions being made, it prompts to a question whether it's indeed external rewards that trigger a significant surge in dopamine production and the accompanying feeling of happiness, or if it's the anticipatory value of the outcome that serves as the primary motivating factor for individuals.

To begin by emphasizing the ultimate point, both intrinsic motivations and drives are inherent aspects of human functioning. "Drives" are essential signals that prompt people to consume life-sustaining substances such as thirst or hunger. Conversely, “incentives " enhance human being’s quality of life, which is what sets human beings apart from animals is their pursuit. Human being not only quest for survival but also seek for an enhanced quality of life.

As previously discussed, distinguishing between intrinsic motivation and extrinsic motivation can be challenging. However, research indicates that when embarking on a new project, employing intrinsic motivation tends to yield superior results compared to relying on extrinsic motivation for support. This is not only due to factors like a higher level of dopamine oxidation, enhanced reasoning, and increased motivation, but also aligns with the "two-pronged hypothesis" coined by Amabile in 1983, which posits that intrinsic motivation fosters greater creativity while extrinsic motivation may hinder it (Zhang & Xie, 2008).

With these findings validated, this paper asserts that intrinsic motivation tends to be more enduring than extrinsic motivation.

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Hongxia Zhang, Yi XIe. “动机过程对青少年网络行为意向的影响模型“ Acta Psychology Sinica. 2008, 40(12):1275-1286.