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Evolving Perspectives on Conditioning: From Biology to Cognition

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ABSTRACT

The study of conditioning has undergone significant transformations in recent decades, driven by new research and evolving theoretical perspectives. This section explores two major paradigm shifts that have reshaped our understanding of learning. First, we examine the role of biological constraints in conditioning, highlighting how an organism's evolutionary history influences its ability to form associations. Phenomena such as conditioned taste aversion and preparedness illustrate how natural selection has shaped learning mechanisms. Second, we discuss the increasing recognition of cognitive processes in conditioning, demonstrating that learning is not merely a mechanical stimulus-response process but involves complex mental representations. Contingencies underscore the role of cognition in both classical and operant conditioning. Together, these insights challenge traditional behaviorist views and pave the way for a more integrative approach that acknowledges the interplay between biology, cognition, and environmental influences in shaping learning and behavior

Keywords: Conditioning, Learning, Biological Constraints, Preparedness, Cognitive Processes, Classical Conditioning, Operant Conditioning

Introduction

Behavior modification has been a fundamental component of psychology from its inception, and behaviorists such as Pavlov and Skinner thought it was just a straightforward correlation between stimuli and responses, which are learned uniformly across different species. More recently, however, this view has been heavily debated as conditioning is now believed to have biological and cognitive processes embedded into it (Rescorla et al 1988).

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One major shift in perspective is the recognition of biological constraints on learning. The learning of such associations such as conditioned taste aversion also explains how organisms are evolutionarily forced to quickly and easily form certain associations to ensure their survival. Moreover, cognitive research such as predictions, expectations, and reasoning has established that learning is not a purely automatic function. Concepts like latent learning, signal relations, and response-outcome contingencies aggrandize the importance of cognition in shaping conditioned behaviors (Dodd et al 1994). These advancements have transformed our understanding of conditioning, moving beyond rigid stimulus-response models toward a more integrative approach.

Recognizing Biological Constraints on Conditioning

Learning theorists have long held that the fundamentals of conditioning are quite universal, meaning that they hold true for a wide range of species. Up until the 1960s, the majority of psychologists held the view that associations could be conditioned between every reaction an organism could make and any input it could record, even though no one ever suggested that hamsters could learn physics (Revusky et al 1977). However, recent studies have shown that the biological inheritance of an organism imposes constraints on the generality of conditioning principles.

Conditioned Taste Aversion

Renowned psychologist Martin Seligman ate a steak with béarnaise sauce at a restaurant with his wife a few years ago. He suffered from acute nausea and a horrible case of the stomach flu around six hours later (Farage et al 2011). He was so disgusted by the scent that he almost puked when he later ordered béarnaise sauce. There are many more stories like Seligman's. Combination of an unconditioned stimulus (the illness) and a neutral stimulus (the sauce) resulted in an unconditioned reaction (nausea). As a result, the béarnaise sauce turned into a conditioned stimulus that made people sick.

However, Seligman acknowledged that his dislike of béarnaise sauce appeared to go against some fundamental conditioning concepts. First, because of the long 6-hour lag between the US (the sickness) and the CS (the sauce), conditioning should have been avoided. Although this conditioning only occurred in

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one pair, it is difficult to produce a conditioned response in laboratory studies.

Second, why did solely béarnaise sauce turn into a CS that made people sick? There were other stimuli in the restaurant; why not use them? For instance, shouldn't Seligman feel queasy around his wife, plates, forks, and tablecloths?

They studied conditioned taste aversion in a number of researches. In these investigations, they used radiation to artificially create nausea in rats and changed the kinds of cues that come before nausea and other unpleasant experiences (Freeman et al 2009). They discovered that rats rapidly developed conditioned taste aversions when taste stimuli were followed by nausea.

However, the rats did not establish conditioned taste aversions when taste cues were followed by other unpleasant stimuli (like shock) (Bures et al 1998). Moreover, conditioned aversions were not elicited by visual and auditory stimuli followed by sickness. To put it briefly, García and his colleagues discovered that while it was nearly difficult to avoid taste-nausea (and smell-nausea) linkages, it was nearly impossible to establish certain associations. What theoretical importance does this unusual inclination to link nausea and flavor have? According to García, it is a consequence of the evolution of mammals. Animals that survive by consuming toxic foods must learn to avoid making the same mistakes twice (Rozin et al 1971). Organisms that rapidly learn what not to consume will be favored by natural selection. Thus, it's possible that evolution has physiologically preprogrammed some species to pick up specific associations more readily than others.

Preparedness and Phobias

Through a process known as priming, nature has also predisposed animals to develop some anxieties more readily than others, according to Martin Seligman (1971).

According to Seligman, some phobias are far more prevalent than others, which could be explained by preparation. It is not difficult for people to become afraid of snakes, spiders, heights, and darkness (Saul et al 2001). However, phobic dread of hammers, knives, hot stoves, and electrical outlets are uncommon, even after traumatic experiences. What traits are shared by common phobic objects? Most used to pose real dangers to our prehistoric ancestors. Therefore, our species may benefit from a terror response to such objects.

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Seligman claimed that the human brain was gradually wired by evolutionary factors to swiftly and readily develop conditioned anxieties in response to these inputs. The priming theory has received a lot of support from phobic conditioning simulations conducted in the lab. Priming theory has been expanded upon by Arne Öh-man and Susan Mineka (2001), who also delineated the essential components of what they refer to as an evolved module for fear learning.

The widespread anxiety that followed the corona virus epidemic may also be influenced by our evolutionary wiring. According to Troisi (2020), "the fear of infection is deeply embedded in our emotional brain" since infectious diseases have posed a serious threat throughout human history. Troisi contends that the frequency and intensity of COVID-19 worry also reflect our natural fear of infection, despite the fact that the widespread media coverage has made the condition worse (Nesse et al 2023).It will be intriguing to observe if this preparation results in the development of long-lasting anxiety reactions to previously innocuous behaviors (handshakes) and environments (crowds).

Recognizing Cognitive Processes in Conditioning

According to learning theorists, if animals such as snails can be conditioned, then higher mental functions cannot be involved in the conditioning process (Alkon et al 1983). Although there were some arguments against this viewpoint, cognitive processes were not given any weight in the main theories of conditioning. Theorists have, however, shifted towards stronger cognitive theories of conditioning in recent decades as a result of study findings. A few of these studies should be reviewed.

Latent Learning and Cognitive Maps

Edward C. Tolman (1932, 1938), was the first significant "renegade" to shatter the traditional understanding of learning. A number of experiments undertaken by Tolman and his associates posed some challenging queries for the dominant theories of conditioning. Three groups of food-deprived rats were put through a series of tests once a day in a groundbreaking study that taught them how to navigate a complex maze.

Every day, rats in group A were rewarded with food when they made it to the end of the maze. Over the course of 17 days, their ability to navigate the maze (as indicated by the number of "wrong turns" they made) steadily improved as a result

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of this reinforcement (Garcia et al 1973).

There was no food reward given to the rats in group B. This group committed a lot of "mistakes" and only slightly improved their performance because they were not given reinforcements meant to get them to the goal area quickly. Group C was the crucial group; they were awarded beginning with the eleventh trial in the maze, but they received no reward for the first ten trials. Similar to group B, the rats in this group performed poorly on the first ten trials, but after discovering food in the target box on the eleventh trial, they significantly improved on the following trials. Although the rats in group C had been learning about the maze as much as the rats in group A, Tolman came to the conclusion that they lacked the incentive to show this learning until a reward was offered (Tolman et al 1948). Learning that is not immediately apparent from behavior is what Tolman dubbed latent learning. Why did these results contradict the prevailing theory of learning? At a time when learnt responses were believed to be sealed by reinforcement, they first proposed that learning may occur without reinforcement.

Second, at a time when cognitive processes were believed to be unimportant for comprehending training, even in humans, they proposed that rats exhibiting latent learning had created a cognitive map of the maze a mental picture of the spatial layout. Other research by Tolman (1948) indicated that conditioning is influenced by cognitive processes. However, Tolman's theories were ahead of his time and mostly drew criticism and denials from the prominent learning theorists of his era. Ultimately, though, Tolman's theories won out, and conditioning models were compelled to take cognitive variables into account.

Signal Relations

Robert Rescorla was one thinker who had a particularly significant impact on highlighting the significance of cognitive elements in classical conditioning (1978, 1980). According to Rescorla, environmental cues function as signals, and certain cues are superior or more trustworthy than others. A "good" signal is one that makes it possible to predict the US with accuracy. Thus, by altering the percentage of trials in which the CS and United State are matched, you have altered the predictive value of a conditioned stimulus (Lapedes et al 1987). In one study, for instance, rats in one group were matched with a CS (tone) and a US (shock) 100% of

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the time, while rats in another group were associated with these stimuli only 50% of the time.

When Rescorla studied conditioned fear in two groups of rats, what did he discover? He discovered that the CS caused a significantly greater terror response. Numerous other studies on cue relationships have also demonstrated that a CS's predictive value plays a significant role in regulating classical conditioning. According to these findings, information processing rather than reflective response may be a part of classical conditioning.

Response-Outcome Relations and Reinforcement

Research on reinforcement and response-outcome linkages also emphasizes how cognitive processes play a part in conditioning. Imagine putting Cold-play music on repeat while you diligently study the night before a big test. You receive an A on your exam the next morning (Milai et al 2017). Does this outcome support your inclination to listen to Coldplay songs prior to tests? Most likely not. You will probably understand the rational connection between the reinforcement of a good grade and the response of studying hard, and only the response of studying will be reinforced.

You could, however, form the practice of playing Cold-play prior to significant tests. B. F. Skinner made the case many years ago that noncontingent reinforcement which happens when a response is unintentionally rewarded by a reinforced that follows it could prove "superstitious behavior" even when the reinforcer's delivery was not prompted by the response. In a seminal study, Skinner (1948) put eight pigeons in operant chambers with reinforcement delivered every 15 seconds, independent of the pigeons' replies. Six of the eight pigeons, according to Skinner, started to react in ostentatious and superstitious ways, including turning anticlockwise or moving their heads (ANDERSEN et al 1942).

After many years of dominance, Skinner's notion that superstition stems from noncontingent reinforcement gave way to more cognitive theories of superstitious behavior. Nevertheless, superstitious behavior is very prevalent, and many forms of incorrect reasoning, as well as unintentional reinforcements, can occasionally fuel superstitious behavior. In one study, for instance, players were required to utilize three putters for a lab activity designed to examine the potential effects of

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performance without visual feedback.

With the exception of minor variations, the three putters were identical. Participants were given verbal input regarding the accuracy of their putts, but they were unable to view the data on a screen (Frost et al 2013). When they used one putter, the verbal feedback was manipulated to be honest; when they used a second putter, it was manipulated to be very negative; and when they used a third putter, it was controlled to be exceedingly positive. 22 out of 28 participants selected the positive or "lucky" putter that had been mixed with a fake booster when asked subsequently which putter they would want to use in a competition. It is possible that superstitions are prevalent in sporting contexts since research indicates that people are particularly prone to superstitious behavior when they are in situations where their performance will be judged.

Numerous anecdotal accounts exist of players, like Wade Boggs, displaying superstitious reactions to improve their chances of success, such as wearing a particular pair of socks, eating the same lunch, doing certain rituals, etc (Asimov et al 2013). Superstition seems to be more prevalent among athletes when the task is more difficult and the result is less clear. Naturally, athletes are not the only ones with these peculiarities. For instance, most people feel compelled to "knock on wood" after expressing how fortunate they are in a certain area.

According to a study, a lot of people think that "tempting fate" will bring bad luck.

His chances of being accepted would be higher (Asimov et al 2013). Instead than attributing superstitious behavior to the capricious whims of operant training, current research tends to blame it on common cognitive biases and errors that encourage irrational reasoning. In a seminal theoretical analysis, Risen (2016) describes how, even in intelligent, well-educated, and rational individuals, a variety of typical cognitive tendencies encourage superstitious thinking. He also highlights an intriguing paradox: People occasionally let their irrational beliefs affect their emotions and actions even when they know that a superstition is illogical.

In any event, when a reaction is followed by positive outcomes, it is evident that reinforcement is not automatic. People actively consider the connections between their answers and the results they get (Bindra et al 1978). To put it briefly, contemporary and revised theories of conditioning view it as a process of identifying

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relationships between environmental occurrences.

Conclusion

The study of conditioning has evolved significantly, moving beyond traditional behaviorist models to incorporate biological and cognitive influences. Research on conditioned taste aversion and preparedness has demonstrated that an organism's evolutionary history constrains the associations it can readily form, challenging the assumption that all stimuli and responses are equally condition able. Additionally, cognitive research has shown that learning is not purely a mechanical process but involves mental representations, expectations, and reasoning. Concepts such as latent learning, signal relations, and response-outcome contingencies illustrate that organisms actively interpret and process information when learning new behaviors. These advancements highlight the complexity of conditioning and emphasize the need for a more integrative approach that considers the dynamic interactions between biological predispositions, cognitive processes, and environmental stimuli. By embracing this broader perspective, future research can continue to refine our understanding of how learning occurs across different species and contexts.

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