

ELICITING MOTOR RESPONSES THROUGH PAVLOVIAN CONDITIONING

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Abstract

Classical conditioning theory involves learning a new behaviour through the process of association. In simple terms, two stimuli are linked together to produce a newly learned response in a person or animal. It is the process of associating, and consequently, providing meaning to a neutral stimulus with another meaningful stimulus, in order to elicit similar response and the basic processes that occur in classical conditioning include acquisition, stimulus generalisation, stimulus discrimination, and extinction. It is, in fact, no doubt that Pavlovian theory is also known as the theory of classical conditioning has an impeccable illustration of associative learning, this paper attempts to depict its application to learning motor skills as well as to critically evaluate its influence in sports.

Keywords: Learning, memory, classical conditioning, motor learning, motor skill acquisition, motor adaptation

Introduction

We may find it interesting that “learning” and “memory” makeup two different chapters in almost every text and are usually taught as a fairly distinct discipline within psychology classes, even though the two terms seem very much related. One way to understand the difference between them is to consider B.F. Skinner’s definition of learning, “a relatively permanent change in behaviour as the result of experience (Hall, 1998)”. A basic difference between memory and learning is that memory is not necessarily relatively permanent. Also there is need to note that the term “behaviour” is an important part of Skinner’s definition, with the clear implication that learning is something that is empirical - which can be observed, whereas, on the other end, most cognitive psychologists consider memory to be an abstract construct, which can only be studied indirectly through empirical

measures (Hall, 2000). Learning grew from the behaviorist school, while the area of memory/cognition was the direct result of the cognitive school of thought.

Behaviorism is essentially the study of how we learn. Life is a process of continual change; from infancy to adolescence to adulthood to death, we are changing (Trickey, 2010). Many factors work together to produce those changes, but one of the most important is the process of learning. Through our experiences, we learn new information, new attitudes, new fears, and new skills; we also learn to understand new concepts, to solve problems in new ways, and even to develop a personality over a lifetime (Trickey, 2010). The product of such experiences is converted into memories stored in our brain. Moreover, as such, there is basically no learning without memories. It was the Greek philosopher, Aristotle who came to a conclusion, over 2000 years ago that we learn by association (Trickey, 2010). Learning by association is connecting events that occur in sequences. Psychologists have determined that there are two basic types of learning by association: Classical Conditioning and Operant Conditioning. Both types modify brain structure and brain chemistry, but they do so with varying degree of awareness or self-control.

Classical conditioning differs from operant or instrumental conditioning: in classical conditioning, behaviours are modified through the association of stimuli, whereas in operant conditioning behaviours are modified by the effect they produce (i.e., reward or punishment) (Bouton, 2016). Classical conditioning pertains to situations in which we tend to respond automatically, based on the severity or repetition of a stimulus (Schoolworkhelper, 2016). The amygdala is involved in regulating many of our autonomic, fight or flight type responses. The process by which we learn new behaviours is also largely influenced by specific neurotransmitters, especially dopamine which is known to reinforce or reward specific behaviors by making us feel good about it (Morin, 2013).

Classical Conditioning was first developed by a Russian physiologist named Ivan Pavlov during the late 1920's. Pavlov was originally trying to study the saliva's role in the digestive system of dogs. During the course of his experiments, he made the connection between reflex and a conditioned response. Essentially, what Pavlov discovered was the model of learning that works on both animals and humans. To understand classical conditioning, it is best to describe Pavlov's experiments.

Literature review

According to Maheshwari (2012), conditioning is a behavioural process whereby a response becomes more frequent or more predictable in a given environment as a result of reinforcement, with reinforcement typically being a stimulus or reward for the desired response. Classical conditioning is also known as *Pavlovian* or *Respondent* conditioning is a reflexive or automatic type of learning in which a stimulus acquires the capacity to evoke a response that was originally evoked by another stimulus. According to Trickey (2010), classical conditioning is a form of learning in which a previously neutral stimulus (CS) is paired with a stimulus (UCS) that elicits an unlearned response (UCR). As a result of these pairings of the CS and the UCS, the CS comes to elicit a response (CR) that is

identical or very similar to the UCR. Classical conditioning is a form of learning whereby a conditioned stimulus (CS) becomes associated with an unrelated unconditioned stimulus (US) in order to produce a behavioural response known as a conditioned response (CR). According to Mackintosh (1983), it refers to learning procedure in which a biologically potent stimulus (e.g., food) is paired with a previously neutral stimulus (e.g., a bell). It also refers to the learning process that results from this pairing, through which the neutral stimulus comes to elicit a response (e.g., salivation) that is usually similar to the one elicited by the potent stimulus. The critical element in classical conditioning is that the CS and the UCS be closely associated in time. This is because of the length of time different individuals take to learn to associate both the CS and UCS.

Motor learning has been defined as a “set of internal processes associated with practice or experience leading to relatively permanent changes in the capability for skilled behavior (Starfish Therapies, 2012).” In other words, motor learning is when complex processes in the brain occur in response to practice or experience of a certain skill resulting in changes in the central nervous system that allow for the production of a new motor skill (Starfish Therapies, 2012). It often involves improving the smoothness and accuracy of movements and is obviously necessary for complicated movements such as speaking, playing the piano, and climbing trees; but it is also important for calibrating simple movements like reflexes, as parameters of the body and environment change over time (Adams, 1971). Motor learning research often considers variables that contribute to motor program formation (i.e., underlying skilled motor behaviour), sensitivity of error-detection processes, and strength of movement schemas (Schmidt, 1975). Motor learning is “relatively permanent”, as the capability to respond appropriately is acquired and retained. As a result, the temporary processes that affect behaviour during practice or experience should not be considered learning, but rather transient performance effects. As such, the main components underlying the behavioural approach to motor learning are the structure of practice and feedback given. The former pertains to the manipulation of timing and organisation of practice (potentially for different subtasks or variations of the task) for optimal information retention, while the latter pertains to the influence of feedback on the preparation, anticipation, and guidance of movement (Moxley, 1979; Salmoni, Schmidt, & Walter, 1984; Adams, 1968).

The learning process can take different lengths of time for every individual and progression can be dependent on a variety of factors such as motivation of the learner, feedback received, environmental stimuli, organisation of practice, and the presence of musculoskeletal or neuromuscular impairments. There are basically three stages in which motor learning occurs; these are the cognitive stage, associative stage and the autonomous stage (Starfish Therapies, 2012; Fitts & Posner, 1967; Taylor & Ivry, 2012). *Cognitive Stage* is the initial stage of motor learning, and the goal is to develop an overall understanding of the skill. Here, the learner must determine what the objective of the skill is and begin to process environmental factors that will affect their ability to produce the skill while the teacher must do his/her best to provide an optimal environment for learning, which may mean removing large distractors. During this stage, the learner mostly relies on visual input and trial and error to guide learning. In the *Associative Stage*, the learner begins to demonstrate a more refined movement through practice. Since learner has had some practice and has identified various stimuli that may occur, they begin to focus on

“how to do” moving on from the “what to do” in the first stage. Here, visual cues become less important and proprioceptive cues become very important. Proprioceptive cues refer to the learner focusing more on how their body is moving in space and what input is being felt from their joints and muscles. The more practice, the more proprioceptive input the learner receives to aid learning. Therefore, the more practice, the better! *Autonomous Stage* is the final stage of learning where the motor skill becomes mostly automatic. Progression to this level of learning allows the learner to perform the skill in any environment with very little cognitive involvement compared to the first stage.

Methodology

Pavlov's Experiment

The best-known of Pavlov's experiments involves the study of the salivation of dogs. The “classic” classical conditioning experiment conducted by Pavlov goes as follows:

A dog is hooked to a mechanism that measures the amount that the dog salivates. A tone is sounded just before a dog is given meat powder. This occurs several times. Eventually, conditioning occurs in that the dog salivates just to the bell alone. Of course, the dog salivates instinctively in response to the food, but “learns” to salivate to the sound of the bell, much as you might find your mouth watering at the site, smell, or even memory of your favorite food. Pavlov used this relatively simple experiment as a model for describing much of the automatic/non-conscious learning that occurs in everyday life.

Pavlov identified four basic components in this classical conditioning model. The unconditioned stimulus (UCS) is the stimulus that naturally and instinctively elicits the target response, which, in the case of his classic experiment is the meat powder. The conditioned stimulus (CS) is the stimulus that comes to elicit the target response, which was the tone in Pavlov's experiment. The unconditioned and conditioned responses (UCR & CR) are a little trickier to identify in that they are often the exact same behavior. The fundamental difference is that the unconditioned response occurs as a result of the unconditioned stimulus, and the conditioned response occurs in response to the conditioned stimulus. In the Pavlov experiment, the unconditioned response is salivation in response to the meat powder, and the conditioned response is salivation in response to the tone. The basic components of this classical conditioning model are explained below;

- Unconditioned Stimulus – This can be any stimulus that can elicit the response without any learning. In other words, the UCS is one that unconditionally, naturally and automatically triggers a response (Maheshwari, 2012); the response to an unconditioned stimulus is natural and inborn. The meat which was given to the dogs in Pavlov's experiments was the unconditioned stimulus (UCS).
- Unconditioned Response – It is an unlearned, inborn reaction to the unconditioned stimulus. Maheshwari (2012) describes the UCR as the unlearned response that occurs naturally in response to the unconditioned stimulus. The dogs' salivation to the meat powder was the unconditioned response (UCR).

- **Conditioned Stimulus** – The conditioned stimulus is previously neutral stimulus that, after becoming associated with the unconditioned stimulus, eventually comes to trigger a conditioned response (Maheshwari, 2012). The bell used in Pavlov’s experiments was the conditioned stimulus (CS) and was originally unable to elicit the response of salivation, but it acquired the ability to elicit the response through the process of classical conditioning.
- **Conditioned Response** – The conditioned response is the learned response to the previously neutral stimulus (Maheshwari, 2012). When a response that is similar or identical to the unconditioned response is elicited by the conditioned stimulus, it is referred to as the conditioned response. When the dog began salivating to the conditioned stimulus, salivation became the conditioned response (CR).

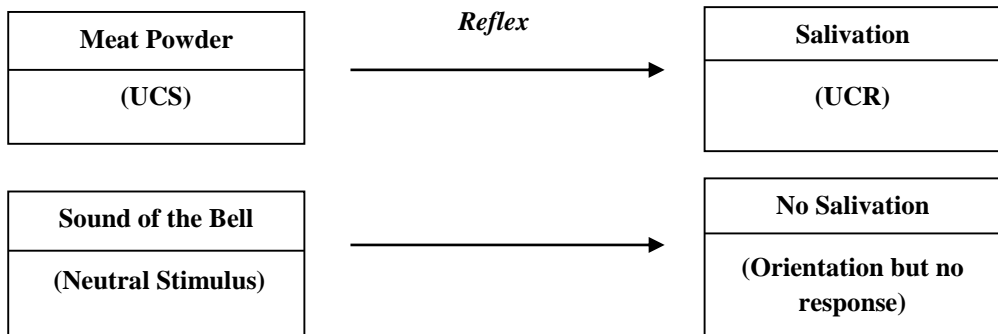


Figure 1: The Stage 1 of classical conditioning (before conditioning)

In this stage, the unconditioned stimulus (UCS) produces an unconditioned response (UCR) in an organism. In basic terms, this means that a stimulus in the environment has produced a behaviour/ response which is unlearned (i.e., unconditioned) and therefore is a natural response which has not been taught. In this respect, no new behaviour has been learned yet (McLeod, 2014). This stage also involves another stimulus which has no effect on a person and is called the neutral stimulus (NS). The neutral stimulus in classical conditioning does not produce a response until it is paired with the unconditioned stimulus.

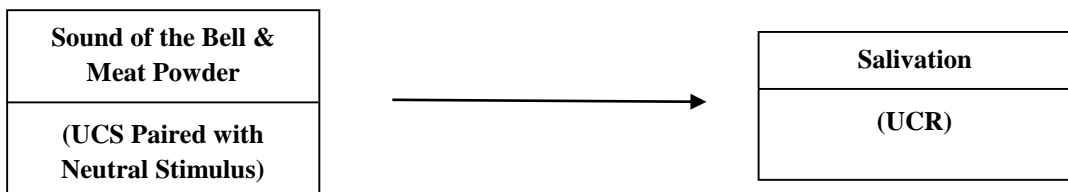


Figure 2: The Stage 2 of classical conditioning (during conditioning)

During this stage, a stimulus which produces no response (i.e., neutral) is associated with the unconditioned stimulus at which point it now becomes known as the conditioned stimulus (CS). Often during this stage, the UCS must be associated with the CS on a number of occasions, or trials, for learning to take place (McLeod, 2014).

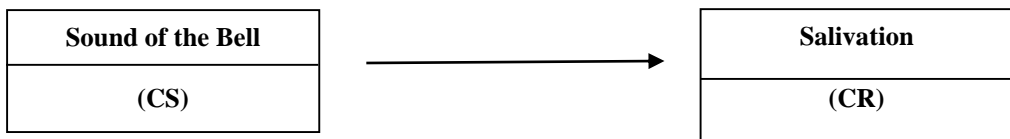


Figure 3: The Stage 3 of classical conditioning (after conditioning)

After conditioning, Neutral Stimulus is now the conditioned stimulus. It produces CR, Salivation, which is similar to the UCR produced by the dog during conditioning.

Neurological Response to Conditioning

It is important to analyse how the conditioned response occurs in the brain. When a dog sees food, the visual and olfactory stimuli send information to the brain through their respective neural pathways, ultimately activating the salivation glands to secrete saliva. This reaction is a natural biological process as saliva aids in the digestion of food. When a dog hears the sound of a bell and at the same time sees food, the auditory stimulus activates the associated neural pathways. However, because these pathways are being activated at the same time as the other neural pathways, there are weak synapse reactions that occur between the auditory stimulus and the behavioural response. Over time, these synapses are strengthened so that it only takes the sound of a bell to activate the pathway leading to salivation.

Conditioning Procedures

- **Forward conditioning:** Learning is fastest in forward conditioning. During forward conditioning, the onset of the CS precedes the onset of the US in order to signal that the US will follow (Chang, Stout, & Miller, 2004). Two common forms of forward conditioning are delay and trace conditioning. In delay conditioning, the CS is presented and is overlapped by the presentation of the US. During trace conditioning, the CS and UCS do not overlap. Instead, the CS begins and ends before the UCS is presented. The stimulus-free period is called the trace interval or the conditioning interval.
- **Simultaneous Conditioning:** During simultaneous conditioning, the CS and UCS are presented and terminated at the same time. For example: If a person hears a bell and has air puffed into their eye at the same time, and repeated pairings like this lead to the person blinking when they hear the bell despite the puff of air being absent, this demonstrates that simultaneous conditioning has occurred.
- **Second-order or higher-order conditioning:** Second-order or higher-order conditioning follows a two-step procedure. First, a neutral stimulus (CS1) comes to signal a UCS through forward conditioning. Then a second neutral stimulus (CS2) is paired with the first (CS1) and comes to yield its own conditioned response (Chance, 2008). For example: A bell might be paired with food until the bell elicits salivation. If light is then paired with the bell, then the light may come to elicit salivation as well.
- **Backward conditioning:** Backward conditioning occurs when a CS immediately follows a UCS (Chang, Stout, & Miller, 2004). Unlike the usual conditioning procedure, in which the CS precedes the UCS, the conditioned response given to the

CS tends to be inhibitory. This presumably happens because the CS serves as a signal that the UCS has ended, rather than as a signal that the UCS is about to appear (Chance, 2008).

- **Temporal conditioning:** In temporal conditioning, a UCS is presented at regular intervals, for instance, every 10 minutes. Conditioning is said to have occurred when the CR tends to occur shortly before each US. This suggests that animals have a biological clock that can serve as a CS.
- **Zero contingency procedure:** In this procedure, the CS is paired with the UCS, but the UCS also occurs at other times. If this occurs, it is predicted that the UCS is likely to happen in the absence of the CS. In other words, the CS does not "predict" the UCS. In this case, conditioning fails, and the CS does not come to elicit a CR (Rescorla, 1967). This finding – that prediction rather than CS-UCS pairing is the key to conditioning – greatly influenced subsequent conditioning research and theory.

Basic Principles of Conditioning

1. **Acquisition:** Acquisition is the initial learning of the stimulus-response link. It refers to the first stage of learning when a response is established (Maheshwari, 2012). It is determined by how much time elapses between presenting the neutral stimuli (NS) and the unconditioned stimuli (UCS). The speed of conditioning depends on a number of factors, such as the nature and strength of both the CS and the UCS, previous experience and the animal's motivational state (Bouton, 2016; Shettleworth, 2010). The process slows down as it nears completion (Schacter, 2009). Two important aspects of acquisition are contiguity and contingency. Contiguity is the time interval between the occurrence of the meaningful stimulus and the neutral stimulus. The optimal time interval between the two stimuli is 0.25 second. Contingency, on the other hand, is the predictability between the two stimuli (Roscoria, 1966 & 1988). Ideally, the two stimuli should always be paired together until acquisition occurs.
2. **Stimulus Generalisation:** In conditioning, the stimulus generalisation is the tendency for the conditioned stimulus to evoke similar responses after the response has been conditioned (Maheshwari, 2012). In other words, it is the tendency to respond to stimuli that are similar to the conditioned stimuli (CS). Stimulus generalisation is said to occur if, after a particular CS has come to elicit a CR, another similar stimulus will elicit the same CR. Usually, the more similar the CS and the test stimulus are, the stronger the CR to the test stimulus (Shettleworth, 2010). The more the test stimulus differs from the CS, the weaker the CR will be, or the more it will differ from that previously observed.
3. **Stimulus Discrimination:** In conditioning, discrimination is the ability to differentiate between a conditioned stimulus and other stimuli that have not been paired with an unconditioned stimulus (Maheshwari, 2012). It is the learned ability to differentiate between similar stimuli and is also described as the learned tendency to respond to a restricted range of stimuli. One observes stimulus discrimination when one stimulus (CS1) elicits one CR, and another stimulus (CS2) elicits either another CR or no CR at all (Shettleworth, 2010).
4. **Extinction:** Extinction is the process of unlearning the conditioned stimulus. In psychology, extinction refers to the gradual weakening of a conditioned response that results in the behaviour decreasing or disappearing (Maheshwari, 2012). Extinction

according to Egbochukwu (2015) refers to the process of weakening or disappearance of a conditioned response (CR), when the conditioned stimulus is repeatedly presented without the unconditioned stimulus (UCS). The philosophy behind acquisition and extinction is this: "If it can be learned, it can also be unlearned." Extinction occurs with the absence of the unconditioned or originally meaningful stimulus. It is how long it takes to forget or eliminate the conditioned response (CR). If the CS is presented without the UCS, and this process is repeated continuously, the CS will eventually stop eliciting a CR. This means that the CR has been "extinguished" (Shettleworth, 2010).

Recovery from extinction

Several procedures lead to the recovery of a CR that had been first conditioned and then extinguished illustrating that the extinction procedure does not completely eliminate the effect of conditioning (Bouton, 2016). These procedures are;

- **Reacquisition:** If the CS is again paired with the US, a CR is again acquired, but this second acquisition usually happens much faster than the first one.
- **Spontaneous recovery:** Spontaneous recovery is defined as the reappearance of a previously extinguished conditioned response after a rest period. Unlike acquisition, unlearning a conditioned stimulus takes time. To demonstrate our difficulty to unlearn, spontaneous recovery is the recurrence or reappearance of the conditioned response despite the continued absence of the conditioned stimulus after a period of rest (Maheshwari, 2012).
- **Disinhibition:** occurs when the CS is tested just after extinction, and an intense but associatively neutral stimulus occurs, which may be a temporary recovery of the conditioned response to the CS.
- **Reinstatement:** If the UCS used in conditioning is presented to a subject in the same place where conditioning and extinction occurred, but without the CS being present, the CS often elicits a response when it is tested later.
- **Renewal:** Renewal is a re-emergence of a conditioned response following extinction when an animal is returned to the environment in which the conditioned response was acquired.

Other principles of Classical conditioning include;

1. **Inhibition:** Inhibition is a process by which a stimulus obstructs a response that would have occurred (Egbochukwu, 2015). Inhibition may be external or internal. External inhibition is the process of blocking conditioned response by external factors in the environment and may be observed if a strong or unfamiliar stimulus is presented just before, or at the same time as, the CS. This causes a reduction in the conditioned response to the CS. Internal inhibition is the process of blocking or obstructing conditioned response by internal factors within the organism such as mood, sickness, etc.
2. **Latency:** Latency is the time interval between the initiation of stimulation and the beginning of the response. In other words, there is a delay between stimulation and

responses. The intensity of the stimulus determines the magnitude or extent of the response.

Application of Classical Conditioning to Learning Motor Skills

Conditioning is a form of learning in which either a given stimulus (or signal) becomes increasingly effective in evoking a response, or a response occurs with increasing regularity in a well-specified and stable environment (Maheshwari, 2012). The type of reinforcement used will determine the outcome. Classical conditioning is a process of behaviour modification by which a subject comes to respond in a desired manner to a previously neutral stimulus that has been repeatedly presented along with an unconditioned stimulus that elicits the desired response (Maheshwari, 2012). Motor 'learning' on the other hand is used to mean the formation of a new motor pattern that occurs through long-term practice (i.e., days, weeks, years). Motor learning involves motor skill acquisition and motor adaptation (Beers, 2015). Before motor skill is acquired – which is the first stage in learning a motor skill - occurs in individuals, there is what is termed *perception* of stimuli which are presented to these individuals in order to elicit a desired response that can lead to a skill being learned (or adapted to).

“Perception is the process through which the information from outside environment is selected, received, organised and interpreted to make it meaningful to the perceiver. This input of meaningful information results in decisions and actions (Kashyap, 2016). He further defined perception as a process by which individuals organise and interpret their sensory impressions in order to give meaning to their environment.” According to Joseph Reitz in Kashyap (2016), “Perception includes all those processes by which an individual receives information about his environment—seeing, hearing, feeling, tasting and smelling. The study of these perpetual processes shows that it is determined by both physiological and psychological characteristics of the human being and their functioning is affected by three classes of variables—the objects or events being perceived, the environment in which perception occurs and the individual doing the perceiving. In learning motor skills, there is need to consider these variables in order to influence an individuals' perception of the skill and consequently learning of that skill. Since perception is a subjective process - different people may perceive the same environment differently based on what particular aspects of the situation they choose to selectively absorb, how they organise this information and the manner in which they interpret it to obtain a grasp of the situation - it is very important to understand their perception, that is, how they perceive the different situations in order to understand their behaviour. This will help to condition their perception by knowing the right stimulus to present to an individual, when to present such stimulus to the individual (i.e., presenting a stimulus to individuals when they are psychologically ready) and the perfect environment to present this stimulus. Conditioning the individuals' perception is similar to the first stage of Pavlov's experiment (before conditioning) where the stimulus to be conditioned is introduced to the animal. In motor learning, if the perception of an individual can be conditioned accurately to make a stimulus (in this case movement skill) meaningful to such individual, it will result to efficient motor skill acquisition in such an individual.

Motor skill acquisition is the initial practice or performance of a new skill (or new control aspect of a previously learned motor skill). Motor skill acquisition is the science that underpins movement learning and execution and is usually termed motor learning and control (Williams & Ford, 2009). In motor skill acquisition, there are basically two stages which are *the initial stage of learning* – where the objectives of the learner is to learn the basic movement pattern needed to achieve the goal and to identify components of the environment important to the task (which could be aspects in the environment which are necessary for successful performance of the task or those which are not integral to performance and may be distracting) – and *the later stage of learning* – which is the phase of refinement and the learners' focus switching from "what to do" to "how to do" the movement better. Each stage embodies unique characteristics relative to an athlete's level of performance of a skill or activity which can include factors such as level of instruction, quality and frequency of feedback, opportunity to make decisions, type and frequency of practice, exposure to other sports, organismic factors and socio-economic or cultural limitations (Ericsson & Lehman, 1996; Fairbrother, 2010; Newell, 1986). These characteristics are responsible for conditioning motor skill acquisition in individuals. Motor skill acquisition in motor learning is similar to the second stage in Pavlov's experiment (during conditioning) where the unconditioned stimulus is paired with a neutral stimulus to produce a response. *Acquisition* as in Pavlov's principles of conditioning occurs when the stimulus is presented to individuals repeatedly in order to teach that individual to respond to such stimulus when next it is presented to bring about the creation of the stimulus-response link. There is need to identify the different stimuli that will elicit the desired movement skills when presented repeatedly in order to bring about motor proficiency otherwise known as motor adaptation.

Adaptation is the trial-and-error process of adjusting movement to new demands and is thought to be more than a simple error cancellation process. Instead, it may calibrate the brain's prediction of how the body will move and takes into account costs associated with the new task demand. Motor adaptation is a form of motor learning, described as a process of acquiring and restoring movement skills through the central nervous system adapting to environmental forces, in order to eliminate kinematic errors. This is similar to stage three of Pavlov's experiment (after conditioning) where the neutral stimulus can elicit the desired response even in the absence of the unconditioned stimulus. Acquiring motor patterns is the most primal learning process in human development – in evolution and maturation. The primacy of the learning process led to the development of instincts. The primary instinct in any encounter with a new environment of forces is to overcome and adjust in order to achieve results. In the process of adjustment – learning of new motor patterns is gradually achieved. Adaptation is sometimes viewed as a process in which the nervous system learns to predict and cancel effects of a novel environment, returning movements to near baseline (unperturbed) conditions (Izawa, Rane, Donchin, & Shadmehr, 2008). It is seen as a stage of motor proficiency as movement is mostly automatic since the individual has attained mastery of movement through repeated practice. During motor adaptation, the nervous system constantly uses error information to improve future movements (Wei & Kording, 2008) resulting to a better execution of such movement patterns.

A simple neurological illustration of the three processes in motor learning – Perception, Acquisition, and Adaptation – and how they are related to Pavlov’s Classical Conditioning is shown below.

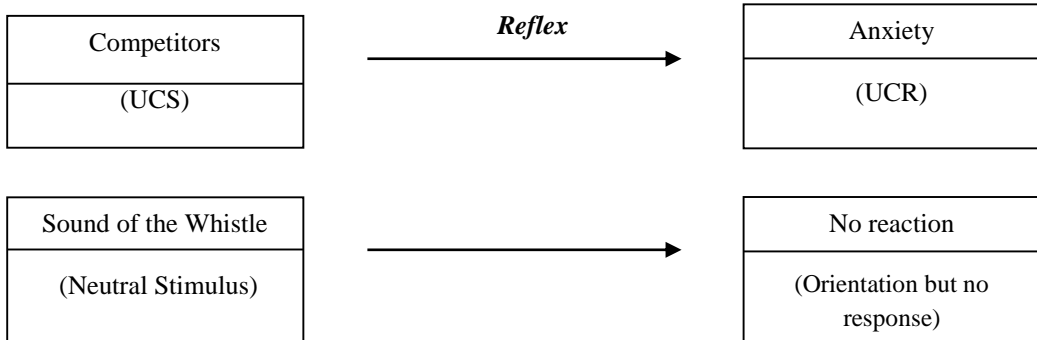


Figure 4: The Stage 1 of conditioning perception (before conditioning)

In this stage, the unconditioned stimulus produces an unconditioned response, i.e. a stimulus which is represented by his opposing competitors in the environment has produced a response which is unlearned and therefore is a natural response which has not been taught. This stage also involves neutral stimulus (sound of the whistle) which has no effect on the individual does not produce a response because he is not yet accustomed to it, but it gives him a clue.

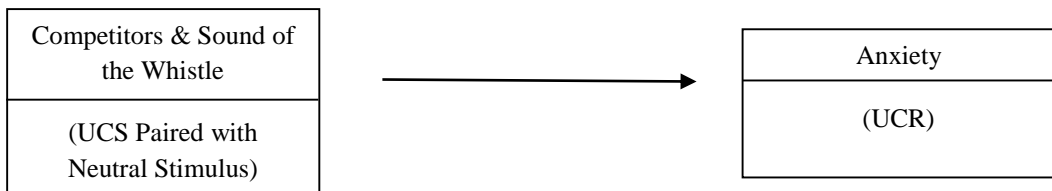


Figure 5: The Stage 2 of conditioning acquisition (during conditioning)

During this stage, the neutral stimulus is associated with the unconditioned stimulus at which point it now becomes known as the conditioned stimulus (CS). Often during this stage, the UCS must be associated with the CS on a number of occasions, or trials, for learning to take place.

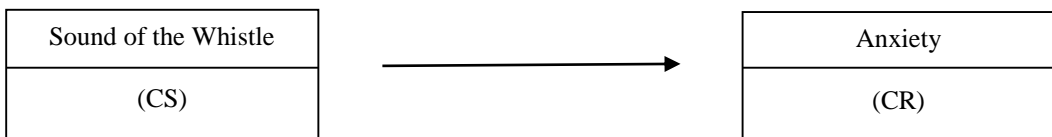


Figure 6: The Stage 3 of conditioning adaptation (after conditioning)

After conditioning, Neutral Stimulus is now the conditioned stimulus. It produces CR which is similar to the UCR produced by the individual during conditioning.

Results and discussion

Advantages of Classical Conditioning in Sports

- a. Being an adaptive mechanism, classical conditioning helps protect an individual from injuries that result from executing movement skills. Since the individual is conditioned to executing same movement patterns in response to conditioned stimuli, he tends to do so proficiently without the risk of being exposed to injuries.
- b. It can be used in everyday life. Not only that classical conditioning is employed in therapeutic interventions or on the field of play, but it can also be applied in everyday life of individual athletes. This is because conditioned responses can always be elicited in similar situations when these stimuli are presented to the individual athlete as a result, positive transfer of learning is bound to occur.
- c. Although the behavioural consequence of conditioning may appear to be merely the development of an anticipatory reflex, the underlying process is fundamental to learning about the relationship among environmental events. Sensory preconditioning tells us that when neutral stimuli co-occur, an association forms between them. Presumably, the informal equivalent of sensory preconditioning will be occurring all the time as a person goes about his normal everyday business. Simply moving through the environment will expose him to sequences of events that go together, and the associations that form among them will constitute an important piece of knowledge – a ‘map’ of his world. In learning motor skills, this is relevant as it helps the individual athlete develop knowledge or a map about his environment, the different skills and how these fit together to constitute a perfect whole.
- d. As a laboratory procedure, classical conditioning is important because it allows exploration of the nature of associative learning. The observed CR (salivation, anxiety, etc) may not be of much interest in itself, but it provides a useful index of the otherwise unobservable formation of an association. Researchers have made extensive use of simple classical conditioning procedures as a sort of ‘test bed’ for developing theories of associative learning. In learning motor skills, this associative learning is useful in eliciting desired movements from athletes.

Disadvantages of Classical Conditioning in Sports

- a. While this learning method helps an individual athlete learn new behaviours, it does not create new behaviours. Basically, it only connects a naturally occurring response to a stimulus and deals with visceral responses. This is highly disadvantageous to the individual athlete because it makes his pattern of play highly predictable by his opponent.
- b. Research on classical conditioning can become a bit complex as it comes with numerous variables, making it difficult to understand and apply by sports individuals and coaches. There are lots of variables that can affect the degree to which this method would occur or not, in different situations, and considering these variables require that they to be assessed with utmost attention.
- c. It can trigger the development of phobias in humans. Pavlovian conditioning by John B. Watson conducted on an infant child found that the child became afraid of a white rat by pairing the animal with a jarring and loud noise, though the child was not afraid

when introduced to the rat alone the first time. This implies that classical conditioning can cause phobias in humans.

Critical Evaluation

A strength of this theory is that it is based on empirical evidence carried out by controlled experiments; classical conditioning emphasises the importance of learning from the environment, and supports nurture over nature. However, it is limiting to describe behaviour solely in terms of either nature or nurture, and attempts to do this underestimate the complexity of human behaviour. It is most likely that behaviour is due to an interaction between nature (biology) and nurture (environment). Classical conditioning is also a reductionist explanation of behaviour because the complex behaviour is broken down into smaller stimulus-response units of behaviour. Although, breaking complicated behaviours down into small parts means that they can be scientifically tested, this reductionist view lacks validity. Thus, whilst reductionism is useful, it can lead to incomplete explanations. Another strength of classical conditioning theory is that, learning through classical conditioning does not take much time as this can be seen from the number of times we exhibit the same response to the neutral stimulus as the pairing goes meaning we learn quite easily with classical conditioning. A final criticism of classical conditioning theory is that it is deterministic (i.e., it does not allow for any degree of free will in the individual). Accordingly, a person has no control over the reactions they have learned from classical conditioning, such as a phobia or fear. Although this can be used to predict events, deterministic psychology underestimates the uniqueness of human beings and their freedom to choose their own destiny.

Conclusion

The stages an athlete passes through in order to achieve the level of skill acquisition and adaptation required for expert performance is an arduous one influenced by an abundance of factors which must be purposefully planned for in order to generate the foundation upon which skilled performance can be displayed. Therefore, in an attempt to elicit conditioned movement skills in an athlete, it is important to have him do it at the same time he does something he likes. This is to help keep the athlete interested in executing such movement skills as he is doing exactly what he likes to do and as such can lead to eliciting a conditioned and desired motor response in such athlete.

Recommendations

Of course, the concept of classical conditioning is complex, but by understanding its advantages and disadvantages, one can build a good opinion about it. As a coach or instructor, to best apply this theory, it is important to have the following points in mind.

- The theory believed that one must be able to practice and master a task effectively before embarking on another one. This means that an athlete needs to be able to respond to a particular stimulus (information) before he/she can be associated with

a new one. Therefore, coaches should ensure mastery of a skill before progressing to a new skill.

- Coaches should know how to motivate their athletes to learn. They should be versatile with various strategies that can enhance effective participation of the athletes in the teaching-learning activities for successful (efficient) sports performance.
- Coaches should emphasise drill and practice in order to condition athletes for desired performance outcomes. Drills and practice are very important as the repetition of stimulus-response habits can strengthen the performance of skills since muscle memory is important in accomplishing any athletic task. To execute movement skills successfully, the athlete must be able to react without having to carefully tell each muscle group what to do. This is because his reactions are seemingly automatic. Muscle memory is the result of teaching the muscles how to perform a specific activity and repeating that activity until it can be done freely without methodical thought.
- Most of the emotional responses can be learned through classical conditioning. A negative or positive response comes through the stimulus being paired with. As such, in order to elicit positive outcomes, coaches or instructors should endeavour to pair desired behaviours with pleasant stimuli.
- In the case of an athlete who is returning into the field from rehabilitation, one of the recovery procedures for re-awakening extinct skills – spontaneous recovery, re-acquisition, reinstatement, disinhibition, renewal – should be adopted in order to quicken recovery of that athlete.

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