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Reviewing the Comparator Hypothesis: A Distinctive Process of Performance

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Traditional learning theorists, such as British empiricist philosophers believed learning involved the creation of mental links called association between internal depictions of stimulus and response occurrences. These associations are apt to formulate when occurrences have similar stimulus characteristics that occur in temporal and/or spatial relationships to each other (contiguous). British empiricist philosophers were interested in thoughts not behavior. Therefore, they gave little reflection to observable responses that represented thoughts prior to becoming subject to scientific investigation. Therefore, traditional learning theorist's main focus was acquisition processes (Miller R. R., & Matzel., 1988).

Today, the majority of learning theories are built on traditional learning theorist's beliefs on associations that discriminate contiguity and conditions that are crucial for learning to occur. This continued process in emphasizing acquisition and memory storage has resulted in bias to other response processes that occur between learning and change in behavior, for instance retrieval from latent memories, response selection, and response generation. These particular biases have formed the basis for researchers to explain absences in responses as a failure in acquisition. For example, if the CR (conditioned response) is not present during training. Retention failure was the explanation if the CR was observed during training depending on the experiment studied, such as cue blocking, overshadowing, and pre-exposure effect (Miller R. R., & Matzel., 1988).

Three basic problems arose from learning theories assumptions: animals encode only summary statistics which are memories that build upon each occurrence (i.e., Prados, José, 1999). Secondly, regarding prior experiences that include evidence of episodic memory (specific instances), for instance behavior is a perfect reflection of

what is encoded disregarding learning-performance. Lastly, requirement to explain interactions between stimuli presented individually during training (i.e., stimulus interference) and between stimuli presented concurrently (i.e., stimulus competition) (Miller, R. R., 2006). Consequently, performance focused models emerged to meet these challenges and express behavior is not a faultless indication that learning has occurred like learning theorist originally believed.

In contrast, performance focused models are occasionally referred to as contingency, rule-based, and statistical models. The performance model of learning assumes episodic and latent memory. Memories contribute to strength of responding in presence of a cue by inhibiting or exciting an organism's ability to learn performance as an outcome produced by a stimulus response (Allen, M. T., Padilla, Y., & Gluck, M. A., 2002). It predicts wide-ranging information processes on each session (e.g., training and testing). However, abrupt behavior applies only to session-by-session procedures that regulate responses because the only effect of processing in consequent session is the formation of episodic memory that occurs within each particular session. Therefore, comparator hypothesis initiated a performance theory for learning that differed from the learning theory.

R. Miller and associates (1988), inspired by Rescorla's (1968) contingency theory, created the comparator hypothesis in attempt to resolve two untested major assumptions of Rescorla's model. The first assumption related predictive power (associated strength) of the CS in relationship to predictive power during the training environment as opposed to the testing environment; however, the same environment was used in both situations leaving error in the assumption. Second, theory assumed that

association took place at the time of training not testing. Yet, the P (US/environment) was never distorted between training and testing.

The comparator hypothesis makes three major assumptions in attempting to solve problems in Rescorla's (1968) contingency theory. First, it assumes the CR depends not only on associations between a target CS (conditioned stimulus) and US (unconditioned stimulus) but also on possible associations that may be learned between contextual cues and US with emphasis on associated strengths of additional cues present during training with the target CS. However, a constraint for the comparator hypothesis is it only allows for development of excitatory associations with the US regardless of CR expressing an excitatory or inhibition. Second, the theory assumes established comparative strength in the excitation condition of the target CS during training. Third, it assumes associative strength of other cues with the goal CS permitting development of excitatory links with the US. Consequently, the comparator hypothesis arose through efforts to fill an insufficiency in explaining behavior as a faultless expression in what has been learned.

Failure of acquisition and/or retention can be explained by the comparator hypothesis as an insufficiency in performance in comparator processes that occur within an experiment. Phenomenon studied commonly for stimulus choice is overshadowing because how an organism behaves depends on the influence in stimulus totality present that a stimuli will gain control over. Overshadowing illustrates competition of stimuli for control on a response. Michael Domjan (2006) indicated that the first person to observe this phenomenon was Ivan Pavlov (1927). However, he tested it individually instead of in multiple compounds. Nevertheless, L. D. Matzel, T. R. Schachtman, & R. R. Miller (1985) studied multiple compounds by observing that overshadowing was indicative of

the CS acquiring associations with the US but unsuccessfully motivated performance. Their unsuccessful attempt occurred because the overshadowed stimuli were equal to the greatest stimuli present in the organism. This observation suggests an agreement with the comparator hypothesis.

The overshadowing and blocking similarities in stimulus selection contributes to studies in blocking experiments. Peter C. Holland (1999) studied the effects of the extinction that occurred in relation to overshadowing and blocking of comparator stimulus in seven experiments with 32, 90-100 day old, naive Sprague-Dawley rats. Each experiment was conducted differently, for instance design, stimuli, extinction and training amounts, and level of CR constructed. The CR to the blocked and overshadowed cues were either unaltered or decrease. As a result, Holland was skeptical about contributing the influence to performance because there was no evidence in compound conditioning that extinction of one cue affected the rat's ability to respond to the other present in each condition.

The US pre-exposure effect is an example that the training environment is the comparator stimulus. L. D. Matzel, A. M. Brown, & R. R. Miller (1987) tested it in a conditioned lick suppression experiment. Therefore, context extinction after the CS-US pairing was specific to the CS (noise) the rat was trained with. For example, the lick response rate increased in the testing in relation to the rat's pre-exposure to the CS.

Performance models developed as a result of preconceptions that originated from traditional learning theorist's narrow focus on acquisition processes as an explanation of associations between a stimulus and response. The comparator hypothesis indicated three specific assumptions unaccounted for in Rescorla's contingency theory then researchers

attempted to resolve the missing elements. Performance was indicated over learning as an

expression to explain behavior. As a result, differences between learning and behaviors

have been defined over time by researchers indicating a distinctive process of

performance. Basically, this is the divergence between learning theorist and behaviorists.

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