Bulletin of the Psychonomic Society
1976, Vol. 7 (3), 263-266

Conflict defined by approach/active avoidance procedures

DONALD R. YELEN
Washburn University, Topeka, Kansas 66621

Conflict produced by the simultaneous arousal of approach and active avoidance tendencies was investigated. The results of two replications indicated that subjects moved progressively closer to the ambivalent goal area as a function of the number of conflict trials administered. These results, when compared with those of previous studies where conflict was produced by passive avoidance training, led to the recognition of two different types of approach-avoidance conflict and to a re-examination of two theories used to account for conflict behavior.

Mowrer (1960) has drawn a distinction between passive and active forms of avoidance learning. In the passive form, a subject learns to avoid a noxious event by not doing something, e.g., an animal first learns to approach an area for food and then learns to stop approaching when shock is administered in the food area. In the active form, a subject learns to do something as a means of avoiding a noxious event, e.g., an animal learns to run out of a one-way shuttlebox before the onset of shock.

In previous studies of approach-avoidance conflict, the procedures used to define the conflict were often the same as the procedure used by Mowrer to define passive avoidance learning. For example, Conger (1951), Kaufman and Miller (1949), and Trapold, Miller, and Coons (1960) all investigated approach-avoidance conflict, and all used the technique of first training animals to approach a foodcup and then introducing avoidance training by means of shock delivered at the foodcup. The usual findings have been that the animals approach part way toward the goal and then stop, and that the point of stopping moves progressively farther away from the goal as either the number of shocks or the intensity of shock is increased.

The present study also investigated approach-avoidance conflict, but in this case the conflict resulted from approach and active avoidance training procedures. That is, animals were first trained to run toward a foodcup located at the end of an approach alley. The animals were then trained in a simple one-way avoidance alley. The avoidance alley was attached to the approach alley in such a way that making an avoidance response resulted in the animals' running away from the foodcup. A conflict was produced, then, because the incompatible tendencies of running toward and running away from the foodcup were simultaneously aroused. The purpose of this experiment was to determine the usefulness of applying Mowrer's distinction between passive and active forms of avoidance learning to the area of conflict.

METHOD

Subjects

The essential features of the experiment were replicated twice. In Replication I, the subjects were 14 experimentally naive male rats, 90-110 days old at the start of the habituation period, obtained from the Holtzman Company. Ten animals were assigned to a conflict condition that involved both approach and active avoidance training. The remaining animals were assigned to a nonconflict condition and received only active avoidance training. In Replication II, the nonconflict condition was omitted and a different response measure was used. The subjects in this replication were 12 male rats, 90 days old at the start of the habituation period, obtained from the Holtzman Company. All 12 animals were assigned to a conflict condition and received both approach and active avoidance training. These animals had been handled when 30 days old and observed in an open field when 60 days old, but otherwise were experimentally naive.

Apparatus

A straight alley covered with Plexiglas and divided into four sections was used. The two sections on the left side were, first, a 25-cm approach startbox, and second, a 100-cm section used both as an approach alley and as a conflict compartment. When starting from the right end the sections were, first, a 25-cm avoidance startbox, and second, a 50-cm avoidance alley. A transparent guillotine door separated the approach alley-conflict compartment from the avoidance alley. When this door was raised, an animal could run directly from the avoidance alley into the approach alley-conflict compartment. Side opening start doors were used. The walls as well as the startdoors were painted a medium gray. The inside dimensions of all sections of the apparatus were 9 cm high and 7 cm wide.

The floor of the approach alley-conflict compartment was divided into four 25-cm segments. The segment farthest away from the approach startdoor served as an approach goalbox. A 5-cm-diam opening, the center of which was 96 cm away from the approach startdoor, was cut in this segment in order to allow access to a foodcup mounted below the floor. A side-opening door was used to prevent retracing once the animal entered the goalbox. Each of the four segments was hinged on one side, supported by springs on the other side, and had a microswitch mounted below it. During conflict test trials these switches were used, in the first replication, to control clocks recording the time that a subject spent on each segment, and in the second replication, to operate event marking pens recording a subject's movements in the approach alley-conflict compartment.

Parallel strips of sheet metal were fixed to the floor of the entire apparatus. Each strip was 3 cm wide and was laid along one side of the floor. The metal strips covering the floor in the avoidance

startbox and the avoidance alley were connected across the output of a Lafayette constant-current ac shock source set at 2 mA.

Procedure

Seven days prior to the start of experimental training, individually housed subjects were placed on a restricted diet of Purina Lab Chow until their weight had dropped to 85% of the prehabituation ad-lib weight and then fed the daily amount necessary to maintain them at this level.

On approach trials, subjects were trained to run toward the foodcup. Each trial started by placing the subject in the approach startbox, waiting for the subject to orient to the startdoor for 1 sec, and then opening the startdoor. As soon as the subject entered the approach goalbox, the retrace door was closed. All trials were rewarded with 10 .045-g Noyes pellets. During all approach trials, the transparent guillotine door separating the approach alley conflict compartment from the avoidance alley was down and thus prevented the subject from entering the avoidance alley. A total of 36 approach trials were administered: on Experimental Day 1, one trial was given; on Days 2-8, five trials per day were given. The daily intertrial interval was approximately 12 min.

Nonconflict subjects in the first replication did not receive approach trials. During Experimental Days 1-8, subjects in the nonconflict condition were placed in a holding cage for 30 sec instead of being placed in the apparatus. In all other respects, the nonconflict subjects received the same treatment as the conflict subjects.

On active avoidance trials, subjects were trained to run out of the avoidance alley and away from the foodcup. Each trial started by placing the subject in the avoidance startbox, waiting until the subject oriented toward the startdoor, and then opening the startdoor. The only distinctive event preceding the onset of shock was the opening of the door. On all avoidance trials, the transparent guillotine door separating the avoidance alley from the approach alley-conflict compartment was up and thus allowed the subject to run past the foodcup and into the approach alley-conflict compartment. On Experimental Day 9, one escape trial was administered. During this trial, and only on this trial, the onset of shock to the floor of the avoidance startbox and the avoidance alley occurred simultaneously with the opening of the startdoor. On Experimental Days 10-17, four avoidance trials per day were given. On these trials, the onset of shock occurred 1.5 sec after the opening of the startdoor. The daily intertrial interval was approximately 15 min.

The subject's entry into the approach alley-conflict compartment following each of the avoidance trials initiated a 20-sec conflict test trial. During this time, the incompatible tendencies of moving toward the foodcup, because of the approach training, and moving away from the foodcup, because of its proximity to the avoidance alley, were simultaneously aroused. At the end of the 20-sec trial, the subject was immediately removed. In order to confine a subject to the approach alley-conflict compartment during the test trial, the approach startdoor was always closed and the transparent guillotine door was lowered as soon as the subject entered the compartment. To prevent the extinction of the approach response, 10 .045-g Noyes pellets were available to conflict subjects during these trials. In order to prevent any incidental approach training during the conflict test trials, Noyes pellets were not available to nonconflict subjects.

Two response measures for each conflict test trial were used in Replication I. The first was a mean distance score equal to:

$$\sum_{i=1}^{4} P_i D_i,$$

where P_i was the proportion of the total recorded time that a subject spent on segment i, and where D_i was the distance between the midpoint of segment i and the foodcup-shock area. The second response measure used was the number of pellets consumed by conflict subjects during the test trial. In the second replication, the distance between the subject and the foodcup-shock area as a function of the time elapsed during a conflict test trial was the dependent measure. A transparent template laid over the recordings made during a test trial was used in determining the subject's position in the approach alley-conflict compartment after 1, 4, 7, 10, 13, 16, and 19 sec of the trial had elapsed.

RESULTS

Replication I

A summary of the two response measures taken during the conflict test trials is presented in Figure 1. In this figure, the mean distance scores for subjects in both the conflict and nonconflict groups during Experimental Days 10-17 are plotted against the left ordinate, while the proportion of pellets consumed by conflict subjects is plotted against the right ordinate. Inspection of the mean distance scores indicates that subjects in the conflict group moved progressively closer to the foodcup-shock area as a function of days, and that subjects in the nonconflict group did not show any systematic movement during this same period. Statistical analysis supports these observations. That is, a group by days analysis of variance yielded a significant interaction ($F = 3.80$, $df = 7/84$, $p < .01$). Subsequent analyses indicated that the days effect was significant ($F = 11.68$, $df = 7/63$, $p < .01$) in the conflict group, but did not approach significance ($F < 1$) in the nonconflict group. Inspection of Figure 1 also shows that the proportion of pellets consumed by conflict subjects was consistent with their mean distance scores. That is, there was a reliable ($p < .01$) increase in the proportion of pellets consumed as a function of days.

Replication II

Figure 2 shows the mean distance between subjects and the foodcup-shock area as a function of the time elapsed during conflict test trials given on

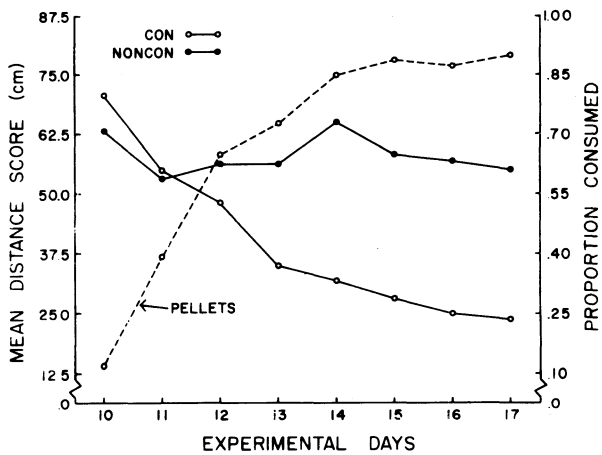

Figure 1. Mean distance scores for conflict and nonconflict subjects and proportion of pellets consumed by conflict subjects as a function of experimental days. Each point is the group average of four daily trials.

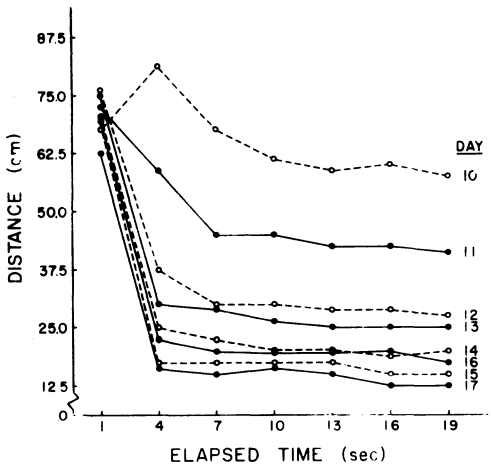

Figure 2. Distance away from the foodcup-shock area as a function of elapsed time during Experimental Days 10-17. Each point is the group average of four daily trials.

Experimental Days 10-17. The curves shown indicate that the following sequence of events occurred during conflict test trials. Subjects first ran past the foodcup to the far end of the approach alley-conflict compartment, turned around, moved part of the way back toward the foodcup-shock area, and then effectively stopped for the remainder of the trial. Movement back toward the foodcup-shock area increased progressively over days so that on the last experimental day virtually all subjects ran to the far end of the compartment, turned around, and then ran all the way back to the foodcup-shock area. These observations were supported by the results of a days by elapsed time by subjects analysis of variance. That is, this analysis indicated that the interaction of Days by Elapsed Time ($F = 7.15$, $df = 42/462$, $p < .01$), as well as the main effects of days ($F = 25.19$, $df = 7/77$, $p < .01$) and elapsed time ($F = 67.70$, $df = 6/66$, $p < .01$) were significant.

DISCUSSION

Mowrer's (1960) distinction between passive and active forms of avoidance learning appears to make a difference in the way subjects behave in a conflict situation. That is, in previous studies, where conflict was produced by passive avoidance procedures, e.g., Kaufman and Miller (1949), increasing the amount of avoidance training resulted in subjects stopping farther and farther away from the goal. In contrast, the results of the present study, where approach and active avoidance procedures were used to produce conflict, showed that an increase in avoidance trials was accompanied by subjects moving closer and closer to the goal during conflict trials.

Mowrer's distinction, then, is a useful one because it leads to the identification of two different types of approach-avoidance conflict. One type, passive avoidance, indicating that the avoidance tendencies are dependent on the punishment of the approach response, and a second type, approach-active avoidance, characterized by the competition between simultaneously aroused but independent approach and avoidance tendencies.

The recognition of two types of approach-avoidance conflict forces a re-examination of alternative theories. Mowrer (1960) and Miller (1959), to determine if the theories, which were originally introduced to explain the behavior observed in passive avoidance conflicts, could be expanded so that they would also be able to account for the behavior observed in conflicts produced by approach and active avoidance procedures. Re-examination indicated that the theories taken individually cannot account for both sets of data unless a number of questionable assumptions are introduced. The re-examination did indicate, however, that the theories could be integrated along lines suggested by Mowrer (1960), and that the combination of theories could account for the data from both types of conflict situations.

The integration of the Mowrer and Miller theories of conflict is based on Mowrer's (1960) idea that passive and active avoidance learning are similar in that both involve the acquisition of fear and that the two forms of avoidance learning differ because of the kinds of stimuli that elicit the fear. In passive avoidance, fear is assumed to be elicited by response-produced cues, while the fear in active avoidance situations is assumed to be associated with environmental stimuli. Because the Mowrer and Miller theories make different assumptions about the stimuli associated with fear each theory can be applied to a different type of conflict situation.

Mowrer's (1960) theory of passive avoidance learning assumes that fear comes to be associated with the cues produced by the subject's approach response to the goal. A subject is expected to stop short of the goal because fear acts by its onset to inhibit the approach response and by its offset to strengthen stopping. The stronger the fear, as produced by an increase in the number of reinforced trials or by an increase in the intensity of shock, the sooner a subject would be expected to stop. Thus, this theory can readily account for the behavior observed in experiments, e.g., Kaufman and Miller (1949), using passive avoidance procedures to define conflict.

Miller's (1959) theory has also been applied to conflicts defined by passive avoidance procedures; however, because this theory assumes that fear is associated with environmental stimuli, it should be applied, according to the present integration scheme, to conflicts that involve active avoidance. In addition, a review indicates that the empirical base of Miller's theory would be more consistent with conflicts defined by approach and active avoidance procedures. That is, Miller postulates a gradient of approach, an independent gradient of avoidance that is steeper than the gradient of approach, and then uses these postulates to deduce that during conflict a subject will stop at the point where the two gradients intersect. Empirical verification of the gradient of approach, a tendency to move toward a goal that gets stronger the nearer the subject is to the goal, is provided by Brown (1948). The empirical base for the gradient of avoidance, a tendency to move away from a noxious object that gets stronger the nearer the subject is to the object, is provided by Bugelski and Miller (1938) and by Brown (1948). Both of the latter experiments, it is important to note, used active and not passive avoidance procedures. In order to be consistent with the experiments that provide its empirical foundation, then, Miller's conflict theory should be applied to conflicts defined by approach and active avoidance procedures.

Before Miller's theory can be satisfactorily applied to the results of the present experiment, however, some way has to be found to move the intersection of the approach and avoidance gradients closer and closer to the goal. Because the number of approach training trials was large enough to allow subjects to reach a performance asymptote, and because food was available during conflict trials to maintain this level of performance, it was assumed that the approach gradient remained constant during the conflict test trials. Therefore, if the intersection of the competing gradients is to move closer and closer to the goal, the avoidance gradient must change in some way during the conflict test trials. One way to produce this change is to assume that fear, which motivates the avoidance tendencies, is extinguished in the conflict situation.

In the present experiment, fear is associated with the cues present in the avoidance alley, the point of reinforcement. Following Miller, it is assumed that fear can be aroused even when these cues are viewed from a distance, as for example, when the subject is in the approach alley-conflict compartment. When the cues are viewed

from a distance, however, the fear aroused at that point is never reinforced with shock and therefore should extinguish. The effect of the extinction of fear at one point in the approach alley-conflict compartment would be to reduce the avoidance tendencies at that point and thus, because fear would still be maintained in the avoidance alley, increase the steepness of the avoidance gradient. This change in the slope of the avoidance gradient would move the intersection of the competing gradients closer to the goal. If on subsequent trials, the fear evoked by the cues viewed from the new point of intersection was not reinforced, additional extinction would occur with the result that the intersection of the gradients would move still closer to the goal, and so on, until the subject finally reached the goal. In this, way, then, Miller's conflict theory, expanded by providing for the extinction of fear aroused at a distance from the point of reinforcement, can readily account for the progressive movement toward the goal observed in the present experiment where conflict was defined by approach and active avoidance procedures.

REFERENCES

BROWN, J. S. Gradients of approach and avoidance responses and their relation of level of motivation. *Journal of Comparative and Physiological Psychology*, 1948, **41**, 450-465.

BUGELSKI, R., & MILLER, N. E. A spatial gradient in the strength of avoidance responses. *Journal of Experimental Psychology*, 1938, **23**, 494-505.

CONGER, J. J. The effects of alcohol on conflict behavior in the albino rat. *Quarterly Journal of Studies on Alcohol*, 1951, **12**, 1-29.

KAUFMAN, E. L., & MILLER, N. E. Effect of number of reinforcements on strength of approach in an approach-avoidance conflict. *Journal of Comparative and Physiological Psychology*, 1949, **42**, 65-74.

MILLER, N. E. Liberalization of basic S-R concepts: Extentions to conflict behavior, motivation and social learning. In S. Koch (Ed.), *Psychology: A study of a science* (Vol. 2). New York: McGraw-Hill, 1959.

MOWRER, O. H. *Learning theory and behavior*. New York: Wiley, 1960.

TRAPOLD, M. A., MILLER, N. E., & COONS, E. E. All-or-none versus progressive approach in an approach-avoidance conflict. *Journal of Comparative and Physiological Psychology*, 1960, **53**, 293-296.

(Received for publication November 10, 1975.)