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NOTE

1. For acallosal S3, the test field was the now-stationary stimulus field.
2. Dixon, N. F. Simultaneous storage of contrary movement aftereffects. In preparation.

Aggression as a function of vulnerability to attack

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Thirty high-need achievers and thirty low-need achievers competed in a task involving reaction time with opponents who attempted to give them increasing shocks. It was observed that counteraggression varied as a function of the degree to which S was vulnerable to the opponent's attack. All conditions of vulnerability evidenced an increase in counteraggression. However, as predicted, the equal-vulnerability condition evidenced the greatest increase in aggression. Achievement motivation had little effect on aggression.

Epstein & Taylor (1967) recently reported results that suggest that the intensity of counteraggression is a multiplicative function of the victim's vulnerability to attack and the intensity of attack. In this experiment, Ss were told they were competing with an "opponent" on a task involving reaction time and that

the S with the slower reaction time on a trial was to receive a shock of an intensity set by his opponent before the trial. The authors allowed Ss to encounter two types of opponents: those who set the lowest shock settings and those who set the highest shock settings. The Ss were divided equally among three conditions: (1) high

vulnerability to the potential attack because of relatively "inferior" performance on the task, (2) low vulnerability because of relatively "superior" performance, and (3) equal vulnerability because of performance equal to the opponent's.

According to the results of this experiment, Ss behaved in a nonaggressive manner toward nonaggressive opponents under all conditions of vulnerability. Given the traditional assumption that the inhibition of aggression is a function of anticipation of punishment, it was predicted that the most intense expression of aggression would have occurred in the low-vulnerability condition. Although Ss were moderately aggressive toward all aggressive opponents, surprisingly, they expressed the most intense aggressiveness toward the aggressive opponent whose vulnerability was equal to that of their own.

The primary purpose of this experiment was to determine the reliability of the above results and to gather further information concerning the effects of attack and vulnerability on physical aggression. Ss were placed in the three conditions of vulnerability employed by Epstein and Taylor, but rather than competing with either aggressive or nonaggressive opponents, these Ss encountered opponents who became increasingly aggressive. In view of the results obtained by Epstein and Taylor, the following hypotheses were made: (1) differences in aggressiveness among conditions of vulnerability would increase as a function of attack, and (2) the equal-vulnerability condition would evidence the greatest increase in aggression as a function of attack.

The secondary purpose of this experiment was to determine the relationship between achievement motivation and aggressive behavior. While the possibility of a relationship between these variables has never been empirically explored, it has been suggested by much of the work done in this area (Murray, 1938; McClelland, 1961; Reisman, Glazer, & Denny, 1950; Rotter, 1954).

SUBJECTS

Ss were male undergraduates enrolled in an introductory psychology course at Kent State University. The extreme groups of Ss were selected from a total of 400 males given the EPPS (Edwards, 1959). The final selection of Ss consisted of 30 Ss with the highest score on the achievement scale and 30 Ss with the lowest score on the achievement scale. The mean achievement scores for the high- and low-achievement groups were 20.29 and 9.51, respectively.

Fig. 1. Mean aggression as a function of physical attack and vulnerability.

PROCEDURE

The S was seated at the task board (described in Taylor, 1967), and the shock electrode was attached to his left wrist. After the S's "unpleasantness" threshold for shock was determined, he heard a tape recording of the task instructions.

Each S was told he was competing with another S in an adjoining room on a task involving reaction time that would test his "general ability to handle a challenging situation." At the beginning of each trial, he was instructed to select (by pressing one of five buttons) any one of five intensities of shock he wished his opponent to receive. He was informed that the shock would be administered to his opponent at the end of a trial if he was faster than his opponent and that he would receive the shock his opponent set for him if his opponent was faster. Thus, he realized that either he or his opponent would receive a shock, depending upon the outcome of the competition, and that both could select the intensity of the shock the other would receive.

Actually, there was no opponent. The frequency of wins and losses and the amount of shock received were programmed by the E.

The task was then begun. All Ss received 25 trials. These consisted of four blocks of increasing attack trials, plus an extra trial that was required to measure S's aggressive reaction to the feedback of the 24th trial. The first block (low attack) consisted of six trials in which the feedback settings averaged 1.5. In three of these trials, the shock setting was "1" and in the other three trials, "2." In the second block of six trials, the average shock setting was 2.5, in the third block, 3.5, and in the fourth and last block of trials (high attack), 4.5. Each trial consisted of four specific events: (1) a signal to set the degree of shock the S wished his opponent to receive, (2) a ready signal, where the S pressed his finger down on a telegraph key, (3) the trial itself,

where the S released the key as quickly as possible, and (4) a feedback signal, which consisted of a light that indicated the amount of shock that had been set for the S by his opponent and, if the opponent was faster, the shock as well.

Vulnerability was manipulated by the number of shocks the Ss experienced per block of six trials: In the vulnerable condition, the Ss received five shocks per block of six trials; in the equal-vulnerability condition, the Ss received three shocks per block of trials; in the invulnerable condition, Ss received only one shock in six trials.

In establishing the actual intensities of shock to be administered to the S, the intensity judged "definitely unpleasant" by S in the initial part of the procedure was designated Number 5; Number 4 was set at 90% of that value, Number 3 at 80%, Number 2 at 70%, and Number 1 at 60%.

RESULTS

Aggression, measured by the magnitude of shock S set for his opponent to receive, was found to increase significantly as a function of increasing attack ($F = 72.8$, $df = 3/162$, $p < .001$). Mean shock settings for each of the four blocks, averaged over conditions of vulnerability and achievement motivation, were 1.82, 2.00, 2.48, and 3.03.

As predicted, the interaction of Blocks (attack) by Vulnerability was significant ($F = 4.20$, $df = 6/162$, $p < .01$). As can be seen in Fig. 1, while mean aggression increased in all conditions, the greatest increase in counteraggression occurred in the equal vulnerability condition. The overall mean shock settings for the invulnerable, equally vulnerable, and vulnerable conditions were 2.04, 2.65, and 2.31, respectively. This effect was significant at the .10 level ($F = 2.53$, $df = 2/54$).

Need achievement had little apparent effect on aggression ($F = .77$, $df = 1/54$). Mean shock settings for high- and low-need achievers were, respectively, 2.24 and 2.43. Interactions of need achievement with vulnerability and with attack were nonsignificant. An analysis of variance of reaction times in the competitive situation revealed no significant differences between high- and low-need achievers ($F = .35$, $df = 1/54$) and no differences between the three conditions of vulnerability. While all Ss improved their reaction times over blocks of trials ($F = 31.19$, $df = 3/162$), blocks interacted neither with vulnerability nor with need achievement.

DISCUSSION

It is obvious that the expression of aggression in these experiments was neither a direct function of the delivery of noxious

stimulation nor an inverse function of the anticipation of punishment. How then can we explain these results? One possibility is that Ss inhibited their aggressive tendencies in the highly vulnerable and invulnerable conditions. Vulnerable Ss may have inhibited their aggressive responses for fear of receiving more intense shocks from a more provoked opponent. Ss in the invulnerable condition, on the other hand, may have felt more pity than anger towards an opponent so foolish as to provoke an obviously superior performer.

Ss in the highly vulnerable and invulnerable conditions were fairly certain of their relative reaction-time prowess and, hence, their ability to attack their opponents. Ss in the equal-vulnerability condition were highly uncertain regarding the outcome of any given trial; the probability of receiving a shock was .50. It is possible that this uncertainty generated considerable anxiety that either "energized" the aggressive responses elicited by the attack stimuli or mediated aggressive responses instrumental in reducing uncertainty (Jones, 1966).

A third possibility is that the uncertainty inherent in the equal-vulnerability condition generated intense competitiveness. This competitiveness may have been responsible for the high aggressiveness (Deutsch, 1949). Given the fact that the Ss in the vulnerable and invulnerable conditions were certain of their reaction-time prowess, they may have become apathetic or fatalistic and relaxed their competitive strivings.

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