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Communal housing and shock-induced aggression*

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The effect of communal housing on shock-induced aggression was investigated. Testing, which began after 18 rats had been evenly divided and confined to one of three communal cages for 30 days, indicated that only one pair from each of the three cages exhibited high rates of fighting. The other two pairs in each cage, on the other hand, displayed low and variable rates of aggression. In a second experiment, the animals in each communal cage were paired in round-robin fashion with all cagemates. The results showed that Ss displaying higher rates of aggression in Experiment I again exhibited high frequencies of fighting. Rates displayed by other Ss on the other hand, were a function of the particular pairing. Thus, some rats fought when confronted with a more aggressive protagonist. Others, however, did not fight, regardless of the composition of the match.

Recent studies (Hutchison, Ulrich, & Azrin, 1965; Creer & Powell, 1971) have demonstrated that the conditions under which rats are housed affect the rate of shock-induced aggression exhibited by these animals. For example, Hutchinson and his colleagues (1965) reported that rats housed in a group showed higher rates of shock-elicited fighting during a single test session than did rats housed individually. However, when tested over a number of sessions, the frequency of such aggression stabilized more rapidly for pairs of Ss housed in separate cages and brought together only in the experimental chamber than for animals both caged and tested together (Creer & Powell, 1971). Several other investigations have demonstrated that mice housed individually show higher attack frequencies towards conspecifics in a no-shock test situation than do nonisolated mice (e.g., Welch & Welch, 1969).

Another line of research has shown the existence of two subpopulations of rats with regard to shock-induced aggression (Powell, Francis, Braman, & Schneiderman, 1969; Creer, 1973). Most paired rats fight at near maximum levels to shock. Other rats, however, show little or no shock-elicited fighting. These individual differences have previously been related to differential training histories (Powell, Francis, Francis, &

Schneiderman, 1972). In a more natural situation, such differences may be related to social conditions existing during crucial periods of development. For example, animals housed together for a period of time may develop dominance hierarchies which later influence rates of shock-induced fighting.

The purpose of the present study was twofold: In Experiment I, rats that had lived together in group cages for 30 days were randomly paired and tested in the shock chamber for several sessions. A second experiment was conducted to determine if the relationships noted in the initial experiment would be observed when Ss were paired in a round-robin manner.

GENERAL METHOD

Apparatus

A Grason-Stadler sound attenuated rat chamber, in which the inner enclosure measured 11½ by 9¼ by 7-5/8 in., with two sides constructed of metal and the other two of clear plastic, was used. Shock from a Grason-Stadler No. 1964 GS shock source, equipped with a shock scrambler, was delivered to a grid floor consisting of stainless steel rods, spaced ½ in. apart. The door to the insulated test cubicle containing the test chamber was removed to permit an unobstructed view of the animals through the Plexiglas door of the inner chamber. The various stimulus conditions were programmed remotely by a modular programming system. The shock parameters were monitored regularly by attaching a meter to the grid floor and measuring the electrical current. The grid floor was wiped clean after each

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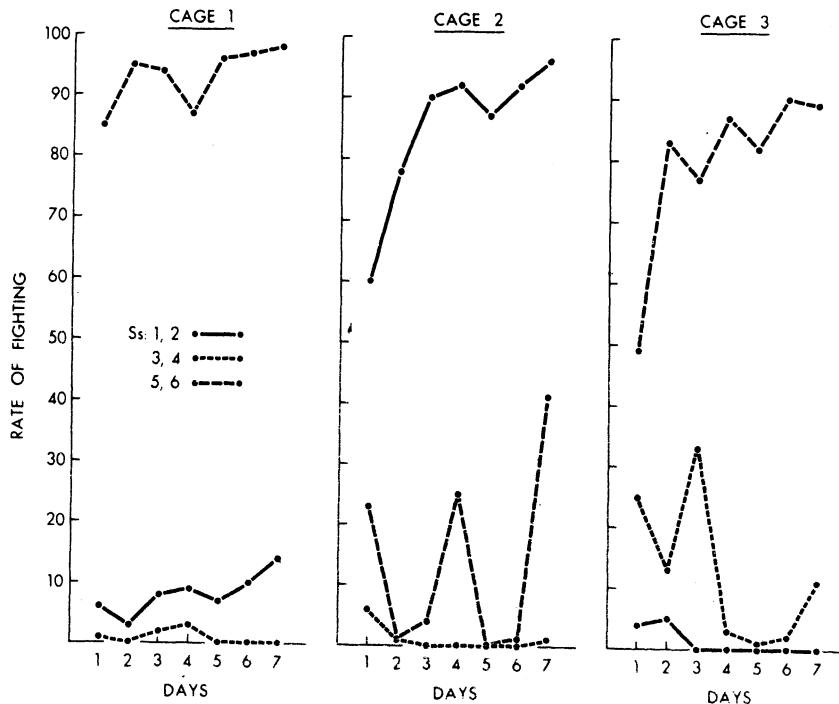


Fig. 1. The rates of fighting observed with the three pairs of rats in each of three communal cages.

session in order to remove feces and other foreign matter.

Procedure

Fighting responses were defined in a manner described by Ulrich and Azrin (1962). Two Es independently marked separate sheets of paper to record the striking movements that occurred between rats, standing upright and facing one another, with each shock presentation. To further preserve the independence of the two Es and to prevent either from responding to his partner's behavior, a different notation was placed opposite each trial when no fighting occurred to the shock. This method of recording permitted a comparison to be made of whether either E observed aggression during any given trial. Greater than 95% agreement was obtained between the two Es in registering shock-elicited fighting. Azrin, Ulrich, Hutchinson, and Norman (1964) reported that shocks of 2 mA intensity and a duration of 0.5 sec were optimal for inducing fighting in paired animals. These parameters were used in the present study. The shock was presented at a frequency of 20 shocks per minute; 100 shocks were administered daily to each pair. Experimental sessions were separated by 24 h. During the initial session, the animals were observed for a period before shock was presented to determine if any spontaneous fighting took place between any of the animals. None of the pairs exhibited this behavior.

EXPERIMENT I

The purpose of this experiment was to determine whether communal housing for 30 days both prior to and during a 7-day test period would affect the rates of shock-elicited fighting observed in pairs of rats.

Method

Subjects. Eighteen male experimentally naive Sprague-Dawley rats, approximately 60 days of age, were distributed evenly among three cages. The same six animals remained in each cage until the end of Experiment II.

Procedure. Ss in each cage were randomly paired at the end of 30 days and tested in the experimental chamber for seven sessions.

Results

The results of the first experiment are shown in Fig. 1. As noted, only one pair of Ss in each cage displayed a high rate of shock-elicited fighting. The frequencies exhibited by these animals increased over sessions. The remaining two pairs in each cage, on the other hand, fought at lower and more variable rates across sessions. For example, Pair 3 in Cage 2 displayed daily frequencies of fighting ranging from 0 to 41 across the seven sessions.

EXPERIMENT II

The disparity in the rates of fighting between pairs from each of the three group cages raises a question: If this variability was a function of housing conditions, does it reflect the existence of a behavioral pattern where a few animals in each cage are more aggressive than their cagemates? In an attempt to clarify this finding, an experiment in which each animal was paired with all cagemates was conducted.

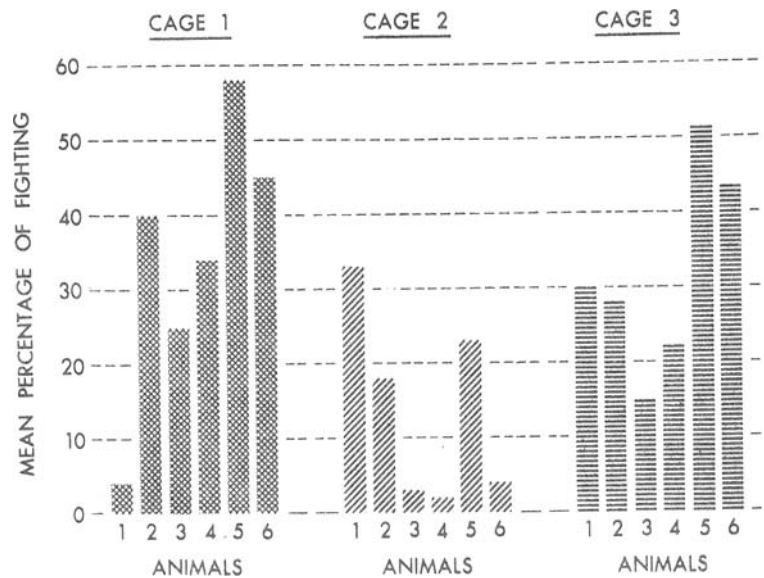
Method

At the conclusion of Experiment I, all animals were paired in round-robin fashion with each of the other five rats in their home cages and tested in the experimental chamber for one session.

Results

The mean percentage of fighting displayed by each S when paired in round-robin manner with cagemates is shown in Fig. 2. This indicates that Ss who fought at high rates during the first experiment, e.g., Ss 5 and 6 in Cage 1, continued to exhibit elevated frequencies of fighting when paired with the other animals in their

Fig. 2. The mean percentage of fighting observed by each S when paired in round-robin fashion with all cagemates.



respective home cages. By the same token, some animals who were members of pairs exhibiting low rates of fighting in Experiment I, e.g., Ss 3 and 4 in Cage 2, continued to display lower rates of fighting in response to the footshock. Several Ss exhibited higher rates of fighting when matched with other rats than occurred with the original pairings of Experiment I. For example, while S 1 in Cage 1 continued to display a low mean percentage of fighting when paired with the other rats in that cage, the other member of that original pairing, S 2, exhibited a high mean of fighting. Similar responding was displayed by Ss 1 and 2 in Cage 3.

GENERAL DISCUSSION

This study demonstrated that housing rats six to a cage for 60 days seemingly influenced the shock-induced aggression observed when the animals were later paired and tested within the shock chamber. More precisely, only one pair of animals from each of the three home cages displayed a high rate of aggression over seven sessions. The remaining Ss, on the other hand, exhibited low and more variable rates of shock-induced fighting. These results are consistent with the result reported by Creer and Powell (1971) in at least two respects: First, fighting rates over sessions were again shown to be a function of how the Ss were housed outside the experimental chamber. Secondly, housing animals in groups resulted in a greater inconsistency in fighting over sessions than was the case when rats were housed individually in separate cages.

When each rat was paired in a round-robin fashion with every other cagemate, the Ss displaying higher rates of aggression in the initial experiment again exhibited high frequencies of fighting. One member of each pair (S 5 in Cage 1, S 1 in Cage 2, and S 5 in Cage 3) clearly fought at higher rates than did their cagemates. Other animals (Ss 2, 3, and 4 in Cage 1, S 5 in Cage 2, and Ss 1, 2, 3, and 4 in Cage 3), who with a partner had shown lower rates of fighting in the first experiment, displayed higher rates of aggression when matched with other rats. This finding is consistent with a report by Panksepp (1971), who noted that some rats described as passive frequently fought more when confronted by more aggressive protagonists. Four Ss (S 1 in

Cage 1, and Ss 3, 4, and 6 in Cage 2), on the other hand, showed low rates of fighting no matter with which cagemate they were paired. Similar results were reported by Powell and his colleagues (1969) in demonstrating that certain rats exhibit low rates of fighting, regardless of whether their partners fought at high rates with other animals.

The current findings, along with the data previously reported by Powell et al (1969) and Panksepp (1971), suggest two general types of behavioral patterns: First, some animals display high rates of shock-induced fighting when paired with most other animals. If these Ss do not exhibit aggression with one particular partner, fighting is observed when, as pointed out by Panksepp (1971), the rat is paired with a more aggressive protagonist. The exception to this occurs when the animals are paired with a rat who exhibits a second type of behavioral pattern: Described both by Powell et al (1969) and in the present study, it is characterized by rats fighting at low rates, regardless of pairing.

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