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Gregariousness and aggression in wild and domestic rats*†

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Pairs of wild and pairs of domestic rats (*Rattus norvegicus*) were observed in an open field. Domestic pairs engaged in more gregarious contact ($p < .01$) and were less variable in their contact scores than wild rats ($p < .01$). Domestics were more active ($p < .01$) and produced fewer boluses than wild rats ($p < .01$). Unlike the wild pairs, domestic rats did not engage in aggressive behaviors.

Gregariousness has been demonstrated to exist in the domestic rat, and various mediators of this process have been explored (Latané, 1969). However, no analogous studies in the open arena have been reported on wild *Rattus norvegicus*. Most studies utilizing wild rats or making comparisons between wild and domestic rats have tended to emphasize aggression and have manipulated variables which would be expected to influence aggressive behaviors. For example, Barnett (1963) reported a study using wild rats as Ss in which he found that males added to established colonies were attacked and usually died. Barnett, Evans, and Stoddart (1968) reported a study in which pairs of wild caught male *Rattus norvegicus* engaged in more attacks when females were present. Barnett and Stoddart (1969) also used the interloper paradigm and compared wild caught and 6th- to 9th-generation laboratory bred wild rats. Wild caught animals engaged in more aggression and aggressive signaling. Boice (1972) observed groups consisting of wilds alone, domestics alone, and wild and domestic rats which were both water deprived and exposed to a cold stressor. Interest centered on the resulting dominance rankings based on water competition and spontaneous bouts. In these studies, the situations were structured such that aggression was likely to result. No quantitative measures of nonaggressive behavior were reported. In the present study, the social behaviors of wild and domestic rat pairs were compared, utilizing quantitative measures of both "gregarious" social contact and aggression.

METHOD

Subjects

The wild *Rattus norvegicus* were captured at a public landfill (Boice, 1971). Ten wild adult males were housed in individual cages for 2 weeks prior to the beginning of the study. Purina Rat Chow and water were available on an ad lib basis. Ten 90-day-old male domestic *Rattus norvegicus* (Holtzman, Madison, Wisconsin) were also individually housed with Rat Chow and water available ad lib.

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Apparatus

Ss were run in a circular arena 4 ft in diam and 30 in. high (Latané, 1969). The floor of the arena was marked off into 49 segments of approximately equal areas. The testing arena was illuminated by two 25-W red lights hung approximately 4 ft above the center of the arena. Handswitch-activated counters and stopclocks were controlled with standard relay apparatus by three Os who sat around the edge of the arena.

Procedure

Within wild and domestic groups, Ss were randomly assigned partners. These pairs remained the same throughout testing. For each of the 17 days of testing, the order of introduction of the pairs into the arena was also randomly determined. Both wild and domestic pairs were removed from their home cages with handling boxes. The boxes were placed in the center of the arena. The two rats were then simultaneously released and were allowed to roam freely for 300 sec. The amount of time spent in direct physical contact, both gregarious and aggressive, was recorded. Aggressive contact was characterized by fighting, biting, and contact while chasing. Direct physical contact that lacked these characteristics was scored as gregarious contact. Gregarious contact included such behaviors as huddling, crawling under, walking over, and grooming. The amount of time spent in threat and submissive postures was also recorded. Threat postures were defined by piloerection, teeth chattering, flank presentation, and back arching. Lying on the side or back was defined as a submissive posture. General mobility or activity level was measured as the number of lines crossed during the 300-sec session. Finally, the number of fecal boluses present at the end of the test session was recorded. At the end of the testing period, each member of the pair was removed from the arena and placed back in home cages with the handling boxes. The floor of the arena was then cleaned with a damp sponge and the next pair run.

RESULTS

On Test Day 1, the wild animals displayed frantic leaping and escape behaviors. Since it was impossible to obtain reliable activity and contact scores on Day 1, it was considered an adaptation day for all animals and was omitted from the following analyses. The data for the remaining 16 days were grouped into four blocks of 4 days each. Scores were analyzed in a 2 by 4 ANOVA with strain (wild vs domestic) and days (four blocks of 4 days each) as factors. A posteriori comparisons were made according to Tukey (b) (Winer, 1962).

Contact Times

The domestic pairs spend more time in gregarious

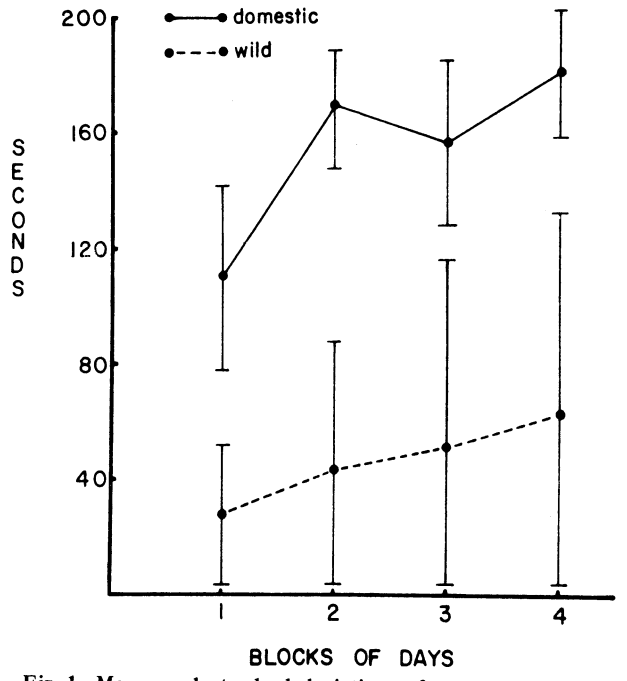

Fig. 1. Means and standard deviations of gregarious contact time for wild and domestic rats.

contact (M = 155 sec/day) than the wild pairs (M = 47 sec/day, F = 22.5, df = 1/8, $p < .01$). There was also a significant effect for days (F = 7.43, df = 3/24, $p < .01$). Inspection of the means in Fig. 1 indicates that gregarious contact generally increased across blocks of days. The mean time spent in gregarious contact by all animals was greater in the last block of days than in the first ($p < .01$).

Aggressive contact was observed only in wild pairs. The wild rats spent about six times more time in gregarious contact (M = 47 sec/day) than in aggressive contact (M = 8 sec/day), but this difference did not reach significance ($p > .05$) due to the great variability in scores. Aggressive contact means for the wild animals are shown in Fig. 2. The aggressive and gregarious contact times for wild rat pairs were correlated across blocks of days. The correlation was not significant (r = −.28, $p > .05$).

As can be seen in Fig. 1, wild rats exhibited much more variability in gregarious contact times than domestics. As a measure of the differences, an F ratio was computed with the means square errors for wild pairs and domestic pairs across blocks of days. Wild rats were significantly more variable than domestics (F = 9.5, df = 12/12, $p < .01$). Within the wild rats, the gregarious contact scores of the two most gregarious pairs were compared to the three other pairs in a 2 by 4 design with gregariousness (high vs low) and blocks of days (four blocks of 4 days) as factors. This post hoc analysis revealed a Days by Gregariousness interaction (F = 16.14, df = 3/9, $p < .01$). There were no differences in contact over the first block of days ($p > .05$), but thereafter the high gregarious pairs spent significantly more time in contact ($p < .05$). The main effects for gregariousness (F = 15.29, df = 1/3, $p < .05$) and days (F = 8.1, df = 3/9, $p < .05$) must be interpreted in light of the Gregariousness by Days interaction just described. However, even if aggressive and gregarious contact times are combined for the wilds and compared to the domestics' gregarious contact scores, domestics still spent significantly more time in contact than the wilds ($p < .01$).

Social Postures

There were no recorded instances of threat or submissive postures for the domestics. The wilds show session means of 7.6 sec in threat postures and 3.9 sec in submissive postures. There were no significant days effects for the aggression indices. Correlations were computed for pairs of wild rats across blocks of days. Threat postures were correlated with submissive postures (r = .46, $p < .05$) and with aggressive contact (r = .73, $p < .05$). Gregarious contact was correlated with threat postures (r = −.50, $p < .05$), but a nonsignificant correlation obtained between submissive postures and gregarious contact (r = −.35, $p > .05$). Submissive postures were correlated with aggressive contact (r = .55, $p < .05$). This pattern of correlations suggests that for wild pairs, threat and submissive postures were associated with overt aggression.

Activity and Boluses

The domestic rats were more active (M = 298 lines crossed) than the wild rats (M = 73 lines crossed, F = 230.1, df = 1/18, $p < .01$). There was a significant effect for days (F = 6.1, df = 3/54, $p < .01$). Activity was generally less on Days 10-17 than on Days 2-9 ($p < .01$). The combined means across days are presented in Table 1. Correlations were computed by adding the activity scores for each member of a pair and utilizing the combined activity score across blocks of days. Activity was not significantly correlated with any other variable. More boluses were present after wild rats were run (M = 3.6) than after domestics were run (M = 0.7, F = 12.0, df = 1/8, $p < .01$). The mean number of boluses present decreased across test sessions (F = 8.4, df = 3/24, $p < .01$). These data are also presented in Table 1. Correlations were computed for pairs of rats across

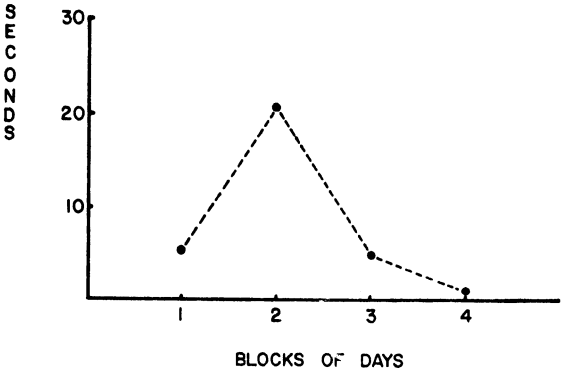

Fig. 2. Mean duration of aggressive contact for wild rats.

Table 1
Mean Activity and Bolus Production Across Days

	Blocks of Days			
	2-5	6-9	10-13	14-17
	Activity (Lines Crossed/Day)			
Domestics	308.5	316.2	267.5	298.6
Wilds	79.0	93.2	67.0	52.6
	Boluses (Number/Day)			
Domestics	2.0	0.4	0.4	0.0
Wilds	5.4	3.6	3.4	2.0

blocks of days. Boluses were correlated with gregarious contact time for the domestics ($r = -.70$, $p < .05$), but a nonsignificant correlation obtained for the wilds ($r = -.19$, $p > .05$).

Informal Findings

It was noted that domestic rats, when in contact, attended closely to each other; however, when apart exploring the arena, it was as though the other member of the pair was not present. The wild pairs, when apart, attended to each other much more than did the domestics. That is, if one member of the pair moved, the other rat reoriented so as to be able to follow the movements. One explanation for this might be differences in visual acuity between pigmented and albino rats. Nevertheless, if this attentional factor were measured and incorporated with contact scores into a "social awareness" index, perhaps the large differences observed between strains would be attenuated.

One behavior which Barnett notes as missing from domestic's repertoire, but which was observed many times in this study, was "crawling under," an amicable behavior (Barnett, 1963, p. 93).

DISCUSSION

These data indicate that large behavioral differences exist between wild and domestic rat pairs in the present test situation. The finding that domestics spend more than half the testing period in gregarious contact replicates earlier studies using domestic rats, as does the finding that gregarious contact increases over time (Latané, 1969). The present study found that the pattern of increasing contact times across days also holds for wild rat pairs, but that the general level of contact time for wild rat pairs was about one-third that of domestic rat pairs. These findings can serve as a baseline for future research. Some unanswered questions of interest include: Do situational variables such as social deprivation, housing, and environmental stress interact with the type of rat pair? What are the effects of wild-domestic pairings? Are the differences obtained in the present study a function of genetic differences, early experience, the method of testing, or some other factor(s)?

The differences in the present study may have been due to the presence of the Os in the testing situation. If the observational technique was a greater "stressor" for wild rats, it might have served as a more potent stimulus for eliciting aggression in the wild pairs. Moreover, if, as Boice (1972) posits, a higher threshold for aggression has been bred into the domestic rat, the presence of Os may have been a suprathreshold stimulus for aggression for the wild rats but a subthreshold stimulus for the domestic rats. This suggests that without the obtrusive methodology, there would have been less aggression. However, Boice (1972) also makes reference to a personal communication from L. P. Baenninger which implies that an observational method which resulted in too much noise suppressed all activity on the part of wild rats. If one accepts this notion, more rather than less aggression would be expected if the Os were absent. The contradictory qualifications of the present results need to be resolved by direct tests.

The question of the proper classification of domestic behaviors which resemble aggressive behaviors in wild rats is still moot. In the present paper, it was decided to classify all observed domestic social contact as "gregariousness." As Boice has noted, domestication "appears to have mellowed the typical behaviors seen in an encounter between two males [1972, p. 212]." Observation of the domestics' behaviors leads one to compare them to the playful activity of adolescents rather than the serious fighting and posturing of the adult wild rat. Comparisons between social dominance hierarchies and dominance hierarchies resulting from food and water competition have been shown to be correlated in the wild rat, but not in the domestic rat (Baenninger, 1970; Boice, 1972). Likewise, dominance rankings are for the most part irreversible for wild rats, while this does not hold for pairs of domestics (Baenninger, 1970; Boice, 1972). These observations support the hypothesis that, in the laboratory, the social behaviors of domestic rats, including behaviors related to social dominance, are of a different nature than the social behaviors of wild rats.

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