The consistency of weanling and adult rats

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It was hypothesized that the degree of association between emotionality test scores on adjacent trials is less for weanling than adult rats. The hypothesis received strong, slight, and no support for the emerge-from-home-cage, open field, and timidity emotionality variables, respectively.

That the human infant can switch from crying at one minute to laughter at the next has often been noted. In addition, the infant's short attention span, its inability to recognize the permanence of objects (Piaget, 1954), its inability to divorce itself from control by the immediate stimulus situation (e.g., Hunt, 1961, Chap. 5, 6), and its general lability of behavior (Werner, 1961) suggest that the infant is less consistent than the adult in a wide variety of behaviors. The present study involved the consistency of young sub-human organisms. Its purpose was to compare the consistency of weanling and adult rats on the variables from three emotionality tests, the emerge-from-home-cage, open field, and C. P. Stone timidity (or stovepipe) tests. Consistency was defined in terms of the degree of association between scores on adjacent trials (e.g., as measured by a test-retest correlation). It was predicted that weanlings would exhibit a lower consistency than adults on the variables that were used.

METHOD

A fuller description of the method can be found in King (1966).

The Ss were Sprague-Dawley rats. The sample sizes for the weanling groups were 27, 18, and 14 and the sample sizes for the adult groups were 80, 39, and 64 for the emerge-from-home-cage, open field, and timidity tests, respectively. Both the weanling and adult groups included both sexes.

The emerge-from-home-cage apparatus was a runway 24-½ in. long, 6-½ in. wide, and 6-¾ in. high. It hooked onto the home cage. A line 13-½ in. from the start was painted on its floor.

The open field was an enclosed circular area, 33 in. in diameter, and marked off into inner and outer units. The outer units were adjacent to the wall, the remainder were considered to be the inner units.

The timidity apparatus consisted of a U-shaped runway made of galvanized metal with wooden start and goal boxes attached to the ends of the arms of the U. The top of the U-shaped section was opaque, but the tops for the start and goal boxes were transparent. The pathway from the start to the goal box was approximately 8 ft. A line was painted on the floor of the goal box 7 in. from the entrance.

The laboratory was maintained on a 12½ h on, 11½ h off light cycle. The weanling and adult groups were born and raised on shavings in solid-walled cages. The weanling groups were weaned at 21, 20, and 20 days of age for the emerge-from-home-cage, open field, and timidity tests, respectively, and the adult groups were weaned at 21 days. Ss were housed in individual wire cages during testing, and the weanling groups were placed into them at least 8 h before the first test trial began. At the first test trial the weanlings were 21 or 22, 20, and 21 and the adults were 51 to 63, 55 to 75, and 167 to 207 days of age for the emerge-from-home-cage, open field, and timidity tests, respectively. Testing was generally done on consecutive days. Ss were tested in the dark,² a dim red light being used to see the Ss.

Two 5 min trials were run on the emerge-from-home-cage test. The time (in seconds) that the S placed either front paw

past the line that was painted on the floor of the runway (the "emerge" score) was recorded.

Three 5 min trials were run on the open field. The "total activity" score was equal to the total number of units entered into. Another variable was obtained: it was the ratio of the number of inner to outer units entered into (the "inner/outer" score).

Five trials were run on the timidity test. This test is essentially a runway task for food reward. The weanling and adult Ss were food-deprived 10 to 16 and 21 h before each trial and were reinforced with a half and a whole piece of Nestle's Toll House Cookie Chocolate, respectively. The time (in 0.1 sec) that all four of the S's feet left the start box (the "start" score) and the time elapsed (in seconds) between leaving the start box and passing the line on the goal box floor with both front feet (the "goal" score) were recorded.

RESULTS

A natural log transformation was applied to the start and goal time scores. The emerge score was treated as a dichotomous variable because for both the weanlings and adults only about one-fourth of the Ss went past the line painted on the floor in the time permitted. Thus the chi square was used to test for the significance of the association between the Day 1 and Day 2 emerge scores.

There were no significant sex differences for weanlings, but significant sex differences were found for adults on every variable of the study. Because the chi square and test-retest correlations of the adults would be increased by just pooling the male and female data, the chi squares for the adults of the two sexes were calculated separately, and within-group (McNemar, 1962, p. 368) rather than total correlations were obtained.

The sum of the chi squares for the adult males and females equalled 40.34. This is a highly significant result because the chi square for $df = 2$ at the .001 level equals 13.82. The chi square between the Day 1 and Day 2 emerge scores for the weanlings equalled, however, only 0.27 ($p < .50$, $df = 1$).

The Day 1-Day 2, Day 2-Day 3, and (for the start and goal scores only) Day 3-Day 4 and Day 4-Day 5 test-retest correlations for the weanlings and adults on the open-field and timidity variables appear in Table 1.

There were 12 possible comparisons between the reliabilities of weanlings and adults that involved the same variable and the same test days, and of them the adults were higher in nine instances. The Fisher z transformation was used to test for the significance of the difference between the pairs of weanling and adult correlations. The only significant differences were in the total activity Day 2-Day 3 and the goal Day 4-Day 5 correlation pairs (adults higher than weanlings, $p < .01$, two-tailed).

DISCUSSION

It was predicted that the degree of association between the scores on adjacent test days would be less for weanlings than

Table 1
Weanling and Adult Test-Retest Reliabilities

Variable	r ₁₋₂		r ₂₋₃		r ₃₋₄		r ₄₋₅	
	W	A	W	A	W	A	W	A
Tot act	.160	.463	.127	.735				
I/o	.142	.533	.744	.622				
Start	.201	.321	.397	.618	.640	.437	.519	.538
Goal	.636	.582	.442	.731	.711	.831	.170	.809

Note: W = weanling, A = adult, Tot act = Total activity, I/o = Inner/outer.

for adults. This prediction was confirmed for the emerge variable. In discussing the differences between the weanlings and adults on the remaining variables, differences in the standard deviations of the scores of the two groups must also be considered. The standard deviations for the weanlings were calculated straightforwardly and those for the adults were obtained by taking the weighted averages of the standard deviations of the male and female groups.

The standard deviations of the Day 1 through Day 3 total activity scores were slightly higher for adults than for weanlings. The lower reliabilities for the weanlings on the total activity variable, with one comparison being significant, therefore suggests that the prediction of the study is confirmed for this variable. The standard deviations of the Day 1 through Day 3 inner/outer scores were more than twice as great for weanlings than they were for adults, the differences between the standard deviations for the weanlings and the adults being significant at the .001 level for all comparisons. This large a difference between the standard deviations of the weanlings and adults should raise the correlations of the weanlings over the adults', but the inner/outer Day 1-Day 2 reliability is nearly significantly lower for the weanlings than for the adults ($p < .15$, two-tailed). Thus the inner/outer variable offers some support for the hypothesis that weanlings exhibit less reliability than adults.

The standard deviations of the Day 1 through Day 5 start and goal scores were always higher for adults than for weanlings, varying from about one and one-half to three times as high. The Day 4-Day 5 goal reliability is significantly greater for the adults: both the Day 4 and Day 5 standard deviations for the adults were more than two and three times as high as those for the weanlings. Because of the higher standard

deviations for the adults, and since the differences between the reliabilities for the weanlings and adults were usually small, with two reversals occurring, the start and goal variables do not appear to support the prediction of the study.

Because the study's hypothesis was not uniformly supported, an alternative explanation for the clear inconsistency of the weanlings on the emerge variable must be sought. Perhaps the large difference between weanlings and adults on this variable resulted from the weanlings' seeming lack of curiosity and fear of the runway. While the adults exhibited a repetitive approach and retreat sequence of behavior at the entrance to or inside the runway, the weanlings either remained back in their cages or quickly emerged. Perhaps the test situation had little positive or negative valence (meaning) to the weanlings, and perhaps the consistency of the weanlings on the timidity test was due to the presence of a strong valence, the food reward; i.e., in a neutral stimulus situation organisms may respond more randomly than otherwise.

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NOTES

1. Research done in partial fulfillment of the requirements for the Ph.D. degree at Stanford University.
2. This procedure was followed because it was once thought that Ss tested in the dark would exhibit greater reliability.