Atti Accademia Nazionale dei Lincei

Classe Scienze Fisiche Matematiche Naturali

Rendiconti

Antonio Quaglia

Early food learning in the ring dove (Streptopelia risona)

Atti della Accademia Nazionale dei Lincei. Classe di Scienze Fisiche, Matematiche e Naturali. Rendiconti, Serie 8, Vol. **69** (1980), n.5, p. 260–263.

Accademia Nazionale dei Lincei

<http://www.bdim.eu/item?id=RLINA_1980_8_69_5_260_0>

Etologia. — *Early food learning in the ring dove* (Streptopelia risoria) (*). Nota di DAVIDE CSERMELY (**), presentata (***) dal Socio S. RANZI.

RIASSUNTO. — Sono stati costituiti due gruppi di individui di *Streptopelia risoria* nutriti, dalla nascita fino a due mesi di vita, con frumento oppure riso integrale. Successivi periodici tests di scelta tra i due alimenti, hanno rivelato che esiste una preferenza marcata per il cibo conosciuto in giovane età e che questa tende a mantenersi anche con il trascorrere del tempo.

A phenomenon closely related to food imprinting has been observed in some species with precocial offspring. Thus, the research of Burghardt and Hess [1] with *Chelydra serpentina*, and that of Fuchs and Burghardt [2] and Arnold [3] with *Thamnophis sirtalis* have shown that early experience, even if restricted to the food first eaten, can lead to the acquisition of almost permanent preferences.

Similarly, in adults of *Larus argentatus* and *L. delawarensis*, Rabinowitch [4] observed a preferential choice for the food eaten when young. In chickens (*Gallus gallus*), Burghardt [5] was able to demonstrate that there is a critical period for the learning of the preference, at the age of approximately three days.

In other cases, given appropriate reinforcement, the food preference could be modified, and a higher appetence for the food usually eaten could be obtained. This phenomenon was observed in *Taeniopygia castanotis* [6], in chickens [7], in *Cavia porcellus* [8], in mice [9, 10], and in rats [11, 12, 13]. In the latter, a form of social learning was observed, since the young rats learn from their mothers which food should be eaten [14, 15].

In all the species above, however, the change in the preference was not permanent. This is biologically sensible since these species have a wide spectrum of foods, and thus would gain nothing by eating exclusively one kind of food.

The aim of my experiment was to assess early learning and its retention for two kinds of food usually preferred by the ring dove.

The subjects used were 16 individuals of *Streptopelia risoria*, 9 of which belonged to the Isabel variety and 7 to the White variety. They were raised by their parents and the experimenter did not interfere with them.

(*) This research has been financed with a grant from the C.N.R. (Progetto Finalizzato Biologia della Riproduzione, contract. no. 78.00435.85).

(**) Cattedra di Biologia Generale, Facoltà di Medicina, via Gramsci 14, 43100 Parma, Italy. Present address: Istituto di Zoologia, via Università 12, 43100 Parma, Italy.

(***) Nella seduta dell'8 novembre 1980.

The subjects were divided into two groups: the first group was given a mixture of approximately 64 % wheat (*Triticum sp.*) and 9 % each of hemp, maize, panic and canary grass; the second was given a mixture of 64 % rice (*Oryza sp.*) and 9 % each of hemp, maize, panic and canary grass.

This diet was maintained up to the end of the second week preceding the first test. During the week preceding this test, wheat or rice respectively were eliminated and the subjects were fed only the mixture of seeds.

In order to study the development of the preference from juvenile to adult and to reveal the retention or changes of the same, the subjects were tested at the age of two, three, six and ten months. Before each test the doves were placed separately in cages $46 \times 42 \times 39$ (h) cm. Each cage had a full supply of water, fine sand, salt, and two food-boxes made of transparent plexiglas. One box contained 100 g of unpolished rice and the other 100 g of wheat. At the end of each test, 96 hours later, the quantity of food eaten was weighed on a scale.

During the interval between two subsequent tests the doves could eat no wheat or rice. The sixteen subjects were equally divided according to the diet they had been fed. The food preference was measured by percentage amount of rice eaten per total amount of food eaten.

The performance of the individuals raised on rice was relatively uniform and constant, while a greater variation was observed in the second group (Table I). In the first case the average values were 89.91 ± 2.06 at two months, 86.78 ± 2.86 at three months, 88.80 ± 2.86 at six months and 82.95 ± 9.41 at then months of age. In the second group the average values were 32.75 ± 12.82 at two months, 44.97 ± 12.77 at three months, 43.18 ± 17.12 at six months and 62.44 ± 16.81 at ten months of age.

TABLE I

Mean values and standard deviations observed in the two groups at various ages (percentage of rice eaten).

AGE IN MONTHS	RAISED ON RICE			RAISED ON WHEAT		
	n	*x*	s. e.	*n*	*x*	s. e.
2	8	89.91	2.06	8	32.75	12.82
3	8	86.78	2.86	6	44.97	12.77
6	6	88.80	2.86	5	43.18	17.12
10	5	82.95	9.41	5	62.44	16.81

The mean values of the results observed at each age have been compared using Student's t test (Table II). Significant differences were found at juvenile ages (t (2 months) = 4.401, 14 degrees of freedom, $p < 0.01$; (3 months) = 3.668, 12 d.f., $p < 0.01$), but they diminish and completely vanish in adulthood (t (6 months) = 2.893, 9 d.f., $p < 0.02$; t (10 months) = = 1.064, 8 d.f., $p > 0.05$).

TABLE II

Comparison between food preferences in the two groups at various ages using Student's t test.

AGE IN MONTHS	t	d. f.	P
2	4.401	14	< 0.01
3	3.668	12	< 0.01
6	2.893	9	< 0.02
10	1.064	8	> 0.05

The wide variation in the results concerning the individuals raised on wheat, and the shift of the preference toward rice, are likely to reflect a higher appetance for the latter, presumably sweeter, food. Thus the individual bred only on wheat would increasingly choose rice, though to a lesser extent than the individuals bred on unpolished rice.

Since the data obtained are widely variable and are not sufficiently numerous, further cumulative statistical analysis was not carried out. Consequently, analysis of the data concerning each individual shows that the preference observed in the first test does not vary with time. In fact, values of the correlation coefficient r, obtained from the tests and the corresponding individual preferences do not differ significantly.

It is to be concluded, therefore, that early food experiences in the ring dove can influence later choices, though not permanently. Later experience can induce a shift in the preference toward another kind of food, as in the case of the individuals grown on wheat. These will increasingly prefere unpolished rice to wheat to which they were used, but they will remain fundamentally " faithful " to the food they have known as juveniles.

REFERENCES

[1] G. BURGHARDT and E. H. HESS (1966) – *Food imprinting in the snapping turtle*, Chelydra serpentina. « Science », *151*, 108–109.

[2] J. FUCHS and G. BURGHARDT (1971) – *Effects of early feeding experience on the responses of garter snakes to food chemicals*. « Learning and Motivation », *2*, 271–279.

[3] S. J. ARNOLD (1978) – *Some effects of early experience on feeding responses in the common garter snake*, Thamnophis sirtalis. « Animal Behaviour », *26*, 455–462.

[4] V. RABINOWITCH (1968) – *The role of the experience on the development of food preferences in gull chicks*. « Animal Behaviour », *16*, 425–428.

[5] G. BURGHARDT (1969) – *Effects of early experience on food preference in chicks*. « Psychon Science », *14*, 7–8.

[6] V. RABINOWITCH (1969) – *The role of experience in the development and retention of seed preferences in Zebra finches*. « Behaviour », *33*, 3–4.

[7] P. J. CAPRETTA and P. M. BRONSTEIN (1967) – *Effects of first food ingestion on later food preferences of chicks*. « Proc. 75th Ann. Conv. Amer. Psychol. Assoc. », *2*, 109–110.

[8] H. S. REISBICK (1973) – *Development of food preferences in newborn guinea pigs*. « J. Comp. Physiol. Psychol. », *85*, 427–442.

[9] D. MAINARDI, M. MAINARDI, S. PARMIGIANI and A. PASQUALI (1975) – *An analysis of seed preferences of the house mouse*. « Ateneo Parmense », *11*, 133–139.

[10] M. MAINARDI, S. PARMIGIANI, D. CSERMELY and A. PASQUALI (1976) – *Food preferences in mice: an analysis using wheat, rice, chrysalis flour and commercial food pellets*. « Acc. Naz. Lincei », *61*, 635–640.

[11] B. J. GALEF JR. and K. M. CLARK (1972) – *Mother's milk and adult presence: factors determining initial dietary selection by weaning rats*. « J. Comp. Physiol. Psychol. », *78*, 220–223.

[12] V. PARISI, A. PASQUALI and M. P. FAVORITI (1975) – *Effetto di esperienze sulla scelta alimentare del* Rattus norvegicus (*Berk.*). « Ateneo Parmense », *11*, 41–50.

[13] S. REVUSKY (1974) – *Retention of a learned increase in the preference for a flavored solution*. « Behav. Biology », *11*, 121–125.

[14] P. M. BRONSTEIN, M. J. LEVINE and M. MARCUS (1975) – *A rat's first bite: the nongenetic, cross-generational transfer of information*. « J. Comp. Physiol. Psychol. », *89*, 295–298.

[15] B. J. GALEF JR. (1977) – *Social transmission of food preferences: an adaptation for weaning rats*. « J. Comp. Physiol. Psychol. », *91*, 1136–1140.