

BEHAVIOURAL ASPECTS OF FOOD SELECTION IN YOUNG CHICKENS

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Summary

Day old chickens of three breeds were offered the choice of 14 varieties of seeds to peck at and eat, Commercial Payer and broiler chickens both preferentially selected sorghum while feral chickens selected wheat, Once having eaten a particular seed, chickens tended to select that seed when offered the various seeds a day later, If unable to eat the preferred seed at first experience, chicks tended to peck at random when offered seeds a day later. Debeaking tended to reduce pecking activity but facilitated ingestion of the selected seeds. When in groups, certain individuals will initiate feeding more frequently than others. When learning to choice feed a grain and protein concentrate isolation housing is a disadvantage.

I, INTRODUCTION

In natural broods, the development of ability to select food from a wide variety of materials in young chickens is considerably helped by the behaviour of the mother hen, who leads her brood to profitable places and shows them which materials to select (Stokes, 1971).

In modern husbandry situations where eggs are hatched in incubators, young chickens have to learn to select feed materials by themselves. It has been shown that modern egg type and broiler chickens when offered a free choice of energy feeds (grains) and protein concentrates, learn to accurately balance their diets, probably on the basis of physiological feedback (Mastika, 1981). These chickens do not benefit from the hen's experience, but in most cases they are in large groups of the same age and their social experience could play a role in food selection.

In this paper we will examine some of these aspects and see how individual experience can influence food selection, through visual preferences and the association of stimuli with a reward. Various breeds are compared and the role social experience plays.

II. BASIC VISUAL PREFERENCES IN CHICKS - EFFECTS OF THE BREED

Several studies (Hess, 1956; Frantz, 1957; Dawkins, 1968) of newly hatched domestic chicks have shown that these birds are very sensitive to particular shapes and colours and peck preferentially red regular hemispheric shapes. The preference for red seems to be related to a peak of photosensitivity in the wavelengths. Natural feedstuffs, such as grains, vary in their shape, size and colour and we investigated the response of day old chickens to different seeds.

One day old chicks from three breeds were used: 25 each of a commercial layer type (White Leghorn x Black Australorp) and commercial broiler strain and 38 feral chicks, bred at the University of New England from birds originally caught on North West Island, Queensland, The chicks were kept in electrically heated brooders with water ad libitum but no food until the experiment. They were individually tested in cardboard boxes (60 x 60 cms) where they were allowed

to peck at 14 different kinds of seeds (Table 1) for a 5 minute period. Records were made of which seeds they pecked **preferentially** and which one they first pecked.

Table 1 Characteristics of seeds used in testing pecking preferences of young chickens

Seed type	Shape	Colour	Regularity	Relative size
Sorghum	round	red-brown	regular	big
Clover	round	brown	regular	small
Rape	round	brown	regular	very small
Japanese Millet	round	grey-white	irregular	small
White Millet	round	white	regular	small
Canary	long oval	white	regular	small
Rye	long oval	grey	irregular	small
Lucerne	round	yellow	irregular	very small
Wheat	± long	white	regular	big
Oats	very long	white	regular	big
Barley	long	white	irregular	big
Grey Sunflower	elliptic	black	regular	very big
Black Sunflower	& flat	black & white	regular	very big
Corn	± flat round	yellow	regular	very big

Both breeds of domestic chicks showed a strong preference for sorghum; and then clover seed (Table 2). Some other seeds seem to be "avoided" since they are pecked less often than expected; corn, grey sunflower, rye, oat, rape, lucerne and barley. The preference of naive domestic chicks for sorghum is probably related to the structure of this seed, which corresponds to the basic preferences of chicks stated above; round shape, brown-red colour and regularity. In general, they avoid pecking very large seeds (sunflower, corn, oat) or very small ones (rape, lucerne), as well as long and irregular seeds (barley, rye).

Table 2 Pecking preferences exhibited by young layer and broiler chickens,

	Sorghum	Clover	Corn	Grey Sunflower	Black Sunflower	Wheat	Rye	Oat	Japanese Millet	White Millet	Canary	Rape	Lucerne	Barley	T*
* preferences of all chickens	34**	10	2	4	5	9	4	2	4	6	9	2	7	2	724
Number of individuals preferring each seed	20**	1				1							3		25

*T = total number of observations

**highly significant preference for sorghum in both results (p<.001)

The feral chicks showed very different basic preferences and pecked mainly wheat and canary seed - both creamy in colour and long, oval in shape. They preferred to peck fairly long creamy coloured seeds (wheat, canary seed) but avoided pecking dark seeds like clover, sunflower and rape or very long ones (rye, oats).

All the chicks tried to swallow the seeds they pecked but were not always able to do so because of the size of some of the seeds.

III. EFFECT OF AN EARLY INDIVIDUAL EXPERIENCE ON PECKING BEHAVIOUR

We next compared the pecking behaviour of debeaked and not debeaked domestic chicks, as debeaking may provide information on two aspects. Firstly debeaking is considered as an early stress which may disturb the chickens' feeding behaviour. Secondly - for mechanical reasons, debeaked birds can open their beaks more widely and therefore swallow bigger seeds than the not debeaked chicks. For chickens able to swallow seeds, the rewarding value of this stimulus is different from those who do not swallow a seed. Thus we are able to examine the role of such an experience by comparing their reactions to those of not debeaked chicks.

Essentially the same experimental procedures as used previously were adopted. The chickens were commercial broilers, 25 not debeaked and 25 debeaked, the debeaking being carried out at the hatchery in Tamworth. A second test, again of 5 minutes duration, was carried out 24 hours later with the aim of seeing if the experience acquired in test 1 (one day old) could influence the choices in test 2 (two days old).

In the first test (at 24 hours) the number of pecks observed in 5 minutes was lower and the first peck was recorded after a longer latency period in debeaked birds (Table 3). Although 24 hours had elapsed between debeaking and the first test, this operation still had an effect on pecking behaviour, in terms of a greater emotivity in isolation and/or a lower motivation to peck. Again the chickens preferred sorghum to the other seeds and more debeaked chickens successfully swallowed the sorghum seeds than the not debeaked chickens.

Table 3 Comparison of the effect of debeaking on pecking in day old chickens

	Mean number or pecks	Latency to first peck (sec)
Not debeaked	30.8	29.3
Debeaked	12.7 ^{***}	120.5 ^{***}

*** t test: $p < .001$

Both groups of birds showed a strong pecking preference for sorghum at test 1 (Table 4). However, clear differences appeared 24 hours later as the not debeaked chicks pecked sorghum less frequently than some other seeds, whereas the debeaked birds maintained their preference for that seed. This suggests that the experience acquired at test 1 (rewarding in terms of ability or not to swallow the sorghum) influenced the choices 24 hours later.

In order to verify this hypothesis further, a third experiment was carried out. Again it was basically the same as experiment 1, but only 3 seeds (sorghum,

Japanese and white millet) were used and they were stuck to the cardboard. Thus neither the debeaked nor the not debeaked chicks could swallow them. There were 50 birds used for each group.

Table 4 Comparison of debeaking on the evaluation of pecking preferences in young chickens

		Sorghum	Clover	Corn	Grey Sunflower	Black Sunflower	Wheat	Rye	Oats	Japanese Millet	White Millet	Canary	Rape	Lucerne	Barley	T*	
% Preference of all chicks	Not debeaked	Test 1*	34 □	10	2	4	5	9	4	2	4	6	9	2	7	2	724
		Test 2*	7	8	1	2	1	12	5	1	20	12+	13+	4+	12+	2	1555
	Debeaked	Test 1	46	6	9	3	8	5	1	3	4	7	2	1		2	265
		Test 2	46	12+	4	3	3	4	1	2	6	9	3	2	3	1	859

*T = total number of observations

□+,-, significant diminution or augmentation of pecking proportion of this seed (X^2)

Again the chickens pecked mainly at the larger sorghum grains in test 1, but both groups of chicks switched their preferences at test 2 and pecked mainly the smaller seeds (Table 5). This switch appeared at the first seed observed to be pecked in test 2, thus the influence of the experience gained in test 1 was immediately apparent.

Table 5 Pecking preferences of chickens exposed to seeds which cannot be swallowed

			Sorghum	Japanese Millet	White Millet	T
% preference of all chicks	Not debeaked	Test 1	69	14	17	

	Test 2	25	29	46		

Debeaked	Test 1	78	9	13		

	Test 2	32	24	44		

Number of individuals pecking given seed first	Not debeaked	Test 1	39	0	5	44

	Test 2	13	8	16	37	

Debeaked	Test 1	40	0	3	43	

Test 2	10	2	21	33		

T = total number of birds

*** significant change from test 1 to test 2 ($p < .001$ t test)

We therefore conclude that swallowing is a rewarding value necessary for the chick to maintain its basic visual preference.

IV. SOCIAL INFLUENCE ON **THE** ABILITY TO BALANCE THE DIET

Finally we examined how living in a group can influence the food selection in young chickens. For this we used another aspect of food selection - the ability to balance a diet based on a choice between a grain (energy) and protein concentrate. One week old broilers were placed in groups of 5 in wire pens for three weeks. Each pen was fitted with two feeders, one filled with sorghum and the other with a protein concentrate (38% crude protein). Feed and water were given ad libitum.

The groups were observed during the three weeks to determine whether there were leaders which tended to initiate certain activities more than others. A variety of behaviours was recorded. The birds were then placed in individual cages, still on choice feeding, where they were weighed twice a week for a further two weeks. Control birds were placed in individual cages with the same choices of food as the experimental ones from one week of age for the whole experimental period. Their body weights were similarly recorded.

The observations of social relations in the groups revealed clear leadership for each activity, one particular individual tending to be followed by the others in that activity (Table 6). The body weights recorded over the final two weeks reveal that birds which initiate feeding tended to be the heavier individuals in the group (Table 6).

Table 6 Initiation of feeding and body weight in chickens in groups of five **birds**

	Individual					
	A	B	C	D	E	T
Number of initiations of feeding	4	12	7	22	13	58
Body weight increase during the last two weeks (g)	478	504	460	698	490	

v. DISCUSSION

The experiments on the pecking at seeds indicate that very young chickens have *inate* tendencies to peck at various seeds, with definite preferences. If such pecking results in the successful ingestion of a seed and a satisfactory physiological feedback occurs, these chickens will subsequently (24 hours later) concentrate on these specific seeds. This suggests that they realise by associative learning that the morphological characteristics of a particular seed material is related to a beneficial physiological response if ingested. This allows the chicken to develop an efficient pecking system and to correctly orientate their basic visual preferences.

When the seeds were stuck down and it was impossible to swallow them, the chickens were unable to build up this association. They then tended to peck seeds almost at random when tested 24 hours later. This suggests therefore that the very first experience of pecking should be at food that is of suitable form, size and colour.

The fact that breeds demonstrate preferences for different seeds at day old is interesting. 'The preference that the ferals demonstrated for wheat is in line with the observations of Tomaszewska (pers. **comm.**) that grown feral fowl on North West Island could only be caught in traps baited with wheat and that they ignored sorghum baited traps. It is difficult to explain this preference as no wheat or similar grains are known to grow on North West Island. Subsequently the captured feral birds preferred sorghum grains in captivity (**Cumming**, unpublished). The preference demonstrated by the broiler chickens for sorghum is in agreement with previous observations (Cumming, 1983).

Debeaking is generally considered a stressful procedure in day old chickens and significantly retarded the pecking of seeds by the day old chickens. However it is indeed surprising that debeaking appears to facilitate feed intake in this situation.

The role of leaders in initiating feeding emphasises the importance of group feeding and the learning process that takes place. The poor performance of the birds individually housed from one week of age is in agreement with earlier observations of **Mastika (unpub. data)**. Marked breed differences have been recorded with broilers tending to be less able to balance their diets when housed individually.

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VII. REFERENCES

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