A BEHAVIOURAL STUDY OF LAYING HENS WITH POLYPEEPERS OR SPECS

A. Arbi, R.B. Cumming and Manika Wodzicka-Tomaszewska

Departments of Biochemistry & Nutrition and Physiology,
University of New England, Armidale, N.S.W.

In an earlier experiment (Cumming, 1974) it was found that that the mortality due to salpingitis and peritonitis was significantly reduced by fitting polypeepers or specs to the laying hens as well as death from cannibalism being practically eliminated. Moreover, at the same time it was also found that specs produced a positive response in egg production and reduced food consumption (Cumming and Epps, 1976). The aim of the study reported here was to determine the reasons for the improved egg production and feed efficiency. Initially, the investigation was dire ted to the behavioural aspects as we suspected that fitting specs which obstruct the forward vision of the fowls might alter their behavioural patterns.

I. MATERIALS AND METHODS

a. Time and Place of Work

The experiments were conducted in an isolation poultry shed of the University of New England, Armidale, N.S.W. from April, 1976 up to February, 1977.

b. Specs or Polypeepers

The "specs" of "polypeepers" used in this experiment (hereafter referred to as specs) were "Kuhl-polypeepers" with C clips. They are made of plastic and fitted to the beak of the hens by inserting the "C" clips through the nostrils of the hens with special pliers.

Specs were put on after the birds had been in their experimental cages for at least 2 weeks to allow them to become familiar with their new surroundings.

c. Animals, Housing and Management

The hens were White Leghorn cross Black Australorp pullets 22 weeks of age, reared on deep litter at the Poultry Section, Laureldale Rural Research Station. Eighteen hens were placed in 2 banks of nine single bird cages (dimension 20 x 46 x 42 cm) and 36 hens were placed in 2 banks of six multiple (three bird) cages (dimension 30 x 41 x 42 cm). The hens in one bank of each type of cage were fitted with specs (hereafter called spec hens) and the remainder were the controls.

A commercial layer mash ration and water were provided *ad libitum.* Feed wastage was caught by placing an aluminium plate under the feed trough.

The house was lighted on an 18 hours schedule, from 0500 to 2300 hours. Individual hens were identified by spraying with various colours.

d. Behavioural Observations

Two methods of observing the behaviour of the hens were used:

1. Direct method (visual observation)

2. Indirect method (filming)

1. Direct method

The behaviour of the hens was observed from a ladder 2 metres high so that all the hens were in view. The observer alwayswore a white overall and recordings were made after a 10 minutes settling period unless otherwise stated.

Recording sheets and a stop watch were used to record the observations at the time.

2. Filming

An 8 mm Minolta cine camera (Model XL-400) was used to obtain a permanent record which could be studied and analysed at leisure.

A large clock and a portable calendar were used to record the hour and date of filming.

e. Activity

The activity of the hens was observed following the classification applied by Black and Hughes (1974). This was done by observing the hens in the single and multiple cages for a total of 8 min and 6 min per day respectively, divided into sub-units lasting 30 seconds. At the end of each sub-unit all activity observed during the preceding 30 seconds was recorded.

Activity was divided into 6 categories as defined by Black and Hughes (1974):

a. Resting. The hen did not move during the observation period.
b. Part movement. A part of the body, for example the head or a leg was moved.
c. Body movement. The entire body was moved, for example, a sitting hen rose to its feet or twisted itself around.
d. Pacing. At least one step forward was taken.
e. Feeding. This implied pecking at and swallowing food.
f. Drinking. All activity at the water trough.

The first four categories of activity are exclusive, only the category involving the greatest degree of movement was noted; for example if a hen showed both part movement and pacing, only pacing was noted.. Feeding and drinking were recorded in addition to the categories of bodily movement. The observation periods were randomised between 0900 h and 1700 h.

f. Feeding Behaviour

The manner in which the hens ate was studied by continuous

film sequences. The time spent on feeding by hens in the single cages was investigated by using a stop watch. Each hen was observed for a total of 2 ten hour periods (from 0700 h 1700 h). A record was kept of the amount of food consumed and the length of time the hen spent eating. In order that one person could collect all the data, observations were made intermittently instead of 10 hour period continuously, concentrating on two hens in adjacent cages chosen randomly at a time. For example, on the first day, observations were made from 0700 to 0800, then 0900 to 1000, 1100 to 1200, 1300 to 1400 and 1500 to 1600 h. The next day the observations were continued at 0800 to 0900, 1000 to 1100, 1200 to 1300, 1400 to 1500 and 1600 to 1700 h. When the data for the two hens was complete, two other adjacent hens were chosen randomly for observation, and so on until all the data for eighteen hens was completed.

g. Agonistic Behaviour

Three methods of observations were made, in each case for 20 minutes:

a. Method A. The hens were deprived of food for 12 hours. Then feed was replaced and observations made.
b. Method B. No deprivation of food was used but feeding was stimulated by adding new feed to the trough.
c. Method C. No stimulus by depriving or adding food was used and a settling time of 10 minutes was allowed before observations began.

The agonistic activities recorded were numbers of interactions and number of hens involved in interactions during the 20 minute period: the interactions were peckings and threatenings delivered, avoidances not associated with threats, number of times the subordinates stopped eating for a while until no further attack by despot, number of times the subordinates were driven away from the feed trough.

The degree ofaggressivenesswas assessed by the scoring method described by Williams and McGibbon (1956) as shown in Table 1.

TABLE 1: Scoring method of the aggresiveness of pecking or threatening issued.

Score	Description
0	Voice bossing
1	Slight
2	Average
3	Severe
4	Extremely severe or driving away of subordinate

h. Preening and Head Shaking

After preliminary observations it was found that preening and head shaking activity differed between some but not all spec hens and control hens. Preeing was studied by using the camera. Head shaking was recorded by direct observation for 8 minute periods of single cage hens.

i. Pecking Damaa

The damage was rated by visual estimation and scored by the method described by Hughes and Duncan (1972) as shown in Table 2.

TABLE 2: Scoring system for estimating the severity of feather pecking

Score	Description
0	No denuded areas of skin
1	Denuded area less than 1 cm^2
2	Denuded area less than 5 x 5 cm^2
3	Denuded area more than 5 x 5 cm^2
4	Denuded area with skin damage

Four areas were examined as suggested by Allan and Perry (1976): ventral surface, dorsal surface, tail and wing. Each area was scored separately giving a maximum score of 16 points.

j. Statistical Analysis

All data was subjected to analysis of variance (AOV) (Snedecor and Cochran, 1967) using Neva User Computer Program (Burr, 1976) with a missing data subroutine. When significant differences were detected, comparisons due to treatments were evaluated by Duncan Multiple Range Test accoding to Steel and Torrie (1960). However, when tests were made only between 2 adjacent treatment means, L.S.D. (Least Significance Difference) values tabulated in the AOV result were used.

II. RESULTS AND DISCUSSION

a. Activity and Feeding Behaviour

Results of mean activity of each category are presented in Table 3. Inspection revealed that specs have some effect on the hens activity. The incidence of part and body movement did not differ between groups in multiple cages, but the control hens spent more time pacing than the spec hens ($P<0.05$) which tended to spend more time resting ($P<0.01$). The increased amount of pacing which was found in the control group was partly due to the higher incidence of agonistic activity. The dominant hens jostled the subordinates which had to then avoid them or even sometimes tried to escape from the cage.

Similar results also applied to the hens in single cages, but were not as dramatic as those in multiple cages. The differences in time spent in body movement approached significance ($P<0.1$) suggesting, that spec hens were slightly quieter than the control hens.

Control hens spent a longer time in eating activity than spec hens did ($P<0.05$ and $P<0.1$ for single and multiple cages respectively). There was a difference in eating technique. The spec hens did not play as much with the feed, hence eating faster and spending less time ($P<0.01$) in eating the same amount of feed compared with the control hens (Table 4).

TABLE 3: The effect of spectacles on bodily movement, feeding and drinking

		Resting	Part Movement	Body Movement	Pacing	Feeding	Drinking
Single Cage	Control	.54	1.08	.19	.15	.67	.06
	Spec hens	.57	1.11	.16	.16	.57	.07
	Significance of effect[1)]	NS	NS	†	NS	*	NS
Multiple Cage							
	Control	1.61	3.17	.28	.60	2.06	.19
	Spec hens	2.12	3.98	.23	.34	1.54	.22
	Significance of effect[1)]	†	NS	NS	*	†	NS

1) Statistical significance by analysis of variance: NS, not significant; † $P<0.01$; * $P<0.05$.
The values represent the number of 60 sec period observation during which the particular behaviour was recorded (see text), expressed as means per hen(s) per observation period.

TABLE 4: Average time spent eating 10 gram food.

Treatment	(min)
Control	16.2
Spec hens	9.8
Significance	P<0.01

The control hens spent a longer time eating because of their habit of selecting food, flicking it around and piling it up or pecking the trough, whereas in spec hens this activity was not observed. Reduced eating time, and thereby reduced energy expenditure, may partly explain the significant response of specs in terms of feeding efficiency.

b. Agonistic Behaviour

Results of agonistic behaviour observation are summarized in Table 5. Average % birds in multiple cages involved in interaction during 20 minute observation period is presented in Table 6.

TABLE 6: Percentage of hens involved in interactions during 20 minute observation

Treatment	% hens	Significance
Control	63.9	P<0.01
Specs	52.0	

Both tables suggest differences in some of the patterns of agonistic behaviour. The control hens exhibited aggressiveness far more than the spec hens (P<0.001). Number of peckings issued by dominant hens was reduced by fitting the specs. Moreover the response of subordinate hens when eating and attacked by a despot differed between groups. In the controls they had to stop eating until no further threat by the despot more often than was the case with the spec hens.

General agonistic behaviour was not eliminated by fitting specs but its intensity was reduced. The pecks delivered by the dominant spec hens was often ignored by their subordinates. As a result the subordinate spec hens had freer access to food than the subordinate control hens. The reduced social interaction among the spec hens might be evidence of reduced "social stress" by specs which might then contribute to the increased egg production. Furthermore, reduced physical interaction might mean another saving of energy expenditure; with more energy available for productive performances rather than being wasted for social interaction.

c. Preening and Head Shaking

For the first few weeks, some but not all of the spec hens seemed to have difficulty in preening the front area of their neck. They spent a very long time on this behaviour; once they tried, they tried over and over again. This frustration behaviour lasted about 3-4 weeks, and then they settled down. The head shaking was found more often in the few weeks after specs were put on (Fig. 1) suggesting that

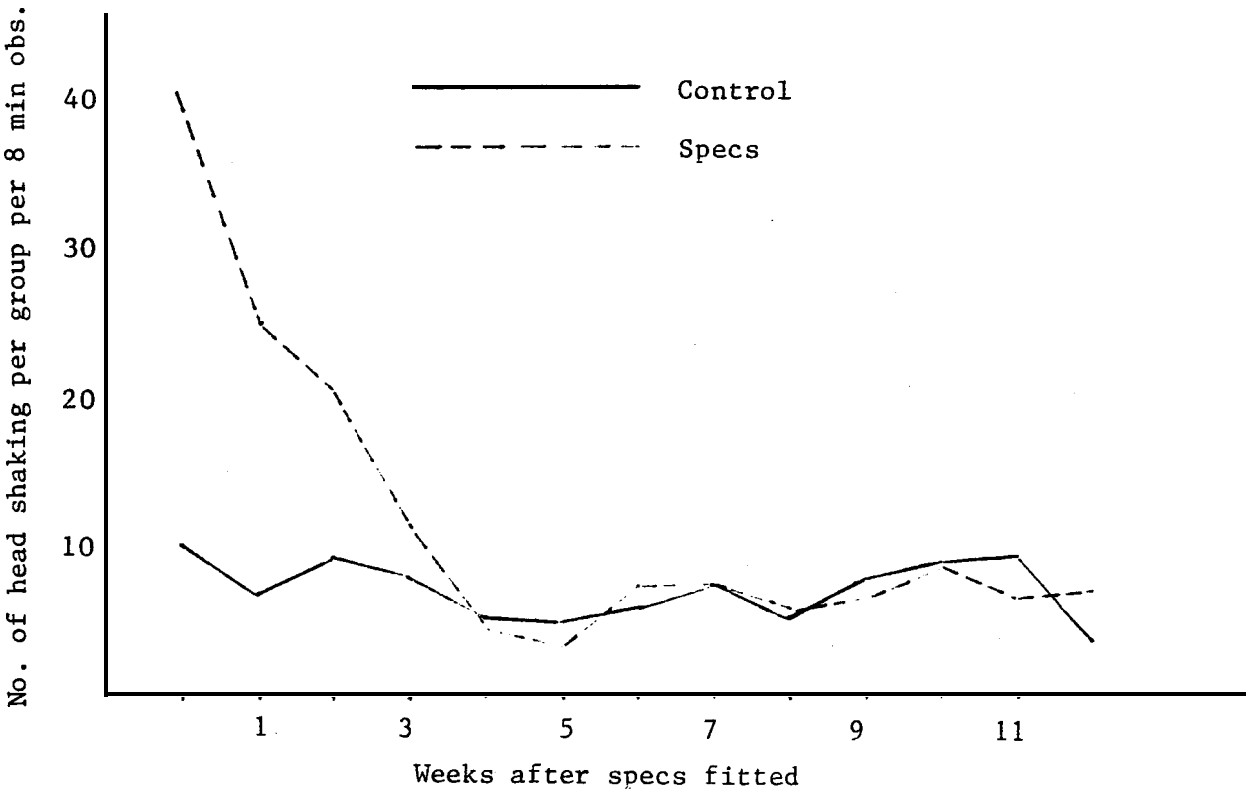

Fig. 1. *Effect of specs on the incidence of head shakings.*

TABLE 5: Agonistic behaviour of control and spec hens.

	Method [1] A		Method B		Method C	
	C[2]	S	C	S	C	S
No. of bouts of encounters/20 min obs.	35.7	25.0†	27.7	18.4*	15.3	9.7
No. of peckings delivered/20 min obs.	52.5	31.6*	45.1	23.3**	22.0	9.3*
Av. peckings delivered/interaction	1.4	1.2	1.6	1.2*	1.4	0.9**
No. of threatenings delivered/20 min obs.	4.7	3.5	3.0	2.6	2.4	2.5
No. of avoidances/20 min obs.	0.9	0.8	2.2	0.7**	0.9	0.4
Freq. subordinates stop eating for a while	5.7	2.5**	5.6	2.3†	4.3	1.5*
Freq. subordinates have to withdraw from the trough	3.4	1.0***	2.5	0.4***	1.1	0.5
Degree of aggressiveness	1.8	1.0***	1.8	0.8***	1.4	0.6***

1) Method of observation: see text.

2) C = Control hens; S = Spec hens

3) Significance: † $P<0.1$; * $P<0.05$; ** $P<0.01$; *** $P<0.001$.

they are under some stress with their new specs (Levy, 1944), Bareham (1972) and Black and Hughes (1974).

Cumming and Epps (1976) reported reduced performance in egg production by spec hens for approximately 5 weeks after fitting the specs. This period of adaptation to specs may be partially evidenced by the frequent stereotypic neck preening and head shakings. Furthermore spec hens initially had some difficulty in eating as the specs occasionally caught on the wires of the cages. But this took only a few weeks, after which they had no further difficulty in eating.

d. Pecking Damage

Result of pecking damage is illustrated in Fig. 2. The specs reduced the damage ($P<0.001$) particularly in the ventral, dorsal and wing areas. A small amount of damage in spec hens was found in the tail area. This was probably due to rubbing against the sides when the hens turned round in the cages. Better feathering in the spec hens might be an advantage in reducing heat loss in cold weather which would lead to better feed efficiency. Thus, the feather pecking was not eliminated by specs, but its severity was significantly reduced.

e. Egg Production and Feed Consumption

Results are not given, but are essentially in agreement with those of Cumming and Epps (1976) on large numbers of birds.

III. SUMMARY AND CONCLUSIONS

1) The behaviour of laying hens with specs in cages was studied.

2) Spec hens were less active, spent less time on eating and showed less agonistic activity apparently leading to reduced social stress amo g these hens. Pecking damage was also reduced.

3) In the first few weeks after the specs were put on the hens seemed to have difficulty in preening the front area of the neck, showed stereotypic head shaking and some difficulty in eating.

These factors could explain the drop in production recorded by Cumming and Epps (1976) immediately following the application of specs.

IV. ACKNOWLEDGEMENTS

The authors wish to thank Professor G. McBride of the University of Queensland and Mr. B. Beeton of Department of Zoology, University of New England for making valuable suggestions. The helpful assistance in filming the hens given by Dr. J. Hecker and Mr. J. Roberts of the Department of Physiology, U.N.E. is much appreciated. We are also indebted to Dr. V.J. Bofinger, Department of Mathematics, U.N.E. for his help in analysing the data. The generosity of the University of New England in providing facilities for the work, the Australian Government, through the Colombo Plan for the monetary support are gratefully appreciated.

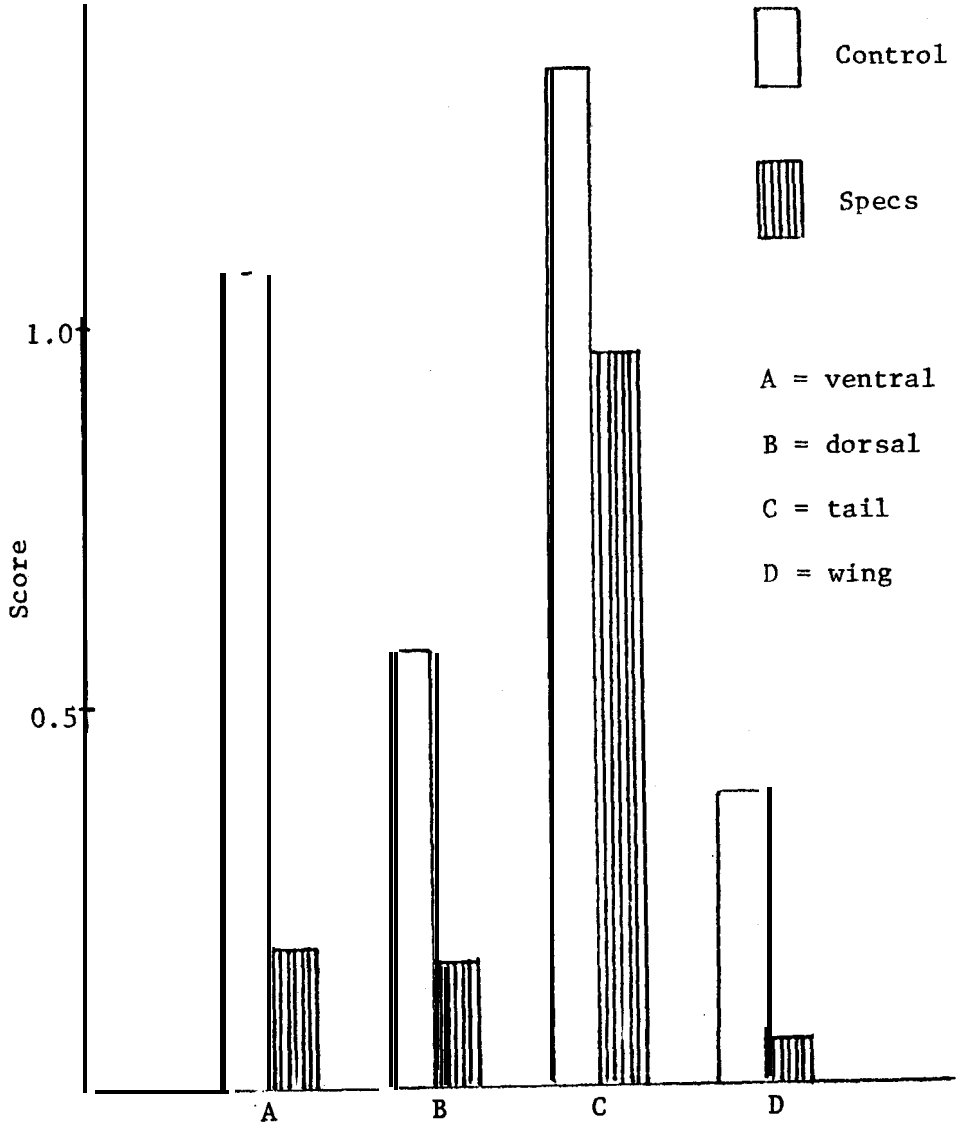

Fig. 2: *The effect of specs on pecking damage.*

V. REFERENCES

ALLEN, J. and PERRY, G.C. (1975) - Feather pecking and cannibalism in a caged layer flock. *Br. Poult. Sci.* 16: 441-451.

BAREHAM, J.R. (1972) - Effects of cages and semi-intensive deep litter pens on the behaviour, adrenal response and production in two strains of laying hens. *Br. Vet. J.* 128: 153-162.

BLACK, A.J. and HUGHES, B.O. (1974) - Patterns of comfort behaviour and activity in domestic fowl: A comparison between cages and pens. *Br. Vet. J. 130: 23-32.*

BURR, E.J. (1976) - Neva User's Manual. Analysis of variance for complete factorial experiments. Computer Centre, University of New England.

CUMMING, R.B. (1974) - The etiology of salpingitis and peritonitis (Abstract). *Proc. 1974 Aust. Poult. Sci. Con.,* Hobart, Tasmania. p. 207.

CUMMING, R.B. and EPPS, W.R. (1976) - The use of polypeepers *or* spectacles on caged layers. *Proc. 1st Aust. Poult. and Stock Feed Con.,* Melbourne. pp. 273-274.

HUGHES, B.O. and DUNCAN, I.J.H. (1972) - The influence of strain and environmental factors upon feather pecking and cannibalism in fowls. *Br. Poult. Sci.* 13: 525-547.

LEVY, D.M. (1944) - On the problem of movement restraint. *Am. J. Orto-psychiat.* 14: 644-671.

SNEDECOR, G.W. and COCHRAN, W.G. (1967) - "Statistical Methods". 6th ed. Iowa State University Press: Iowa.

STEELE, R.G.D. and TORRIE, J.H. (1960) - "Principles and Procedures of Statistics with Special References to the Biological Sciences". McGraw-Hill Book Company Inc.: New York, Toronto, London.