RESPONSES OF LAMBS TO MODEL EWES

by

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(With 3 Figures)
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While making observations of ewes and lambs in the field, it was noticed that the lambs bleated and scanned the field and often ran towards any ewe which stopped grazing and lifted up her head. This initial orientation was checked by the lamb about 8-10 m away from the ewe.

The importance of visual recognition of ewes by lambs has been investigated for Merino sheep by ARNOLD, BOUNDY, MORGAN & BARTLE (1975); ALEXANDER (1977) and ALEXANDER & SHILLITO WALSER (1978). These latter results showed that 3 week old lambs were more responsive to changes in the visual appearance of the ewe than 1 week old lambs. SHILLITO & ALEXANDER (1975) found that young lambs of Clun Forest, Finnish Landrace, Jacob and Soay breeds would run to ewes which looked similar to their dams, but hesitated when the ewes appeared to be different; older lambs behaved in the same way. SHILLITO WALSER (1980) also demonstrated that breed identity seemed to depend mainly on sight.

Visual clues can be features of the ewe such as colour, shape and size, and they can also be specific movements. It is difficult to separate movement from visual characteristics in live ewes, so that movements aiding recognition may have obscured previous observations on visual characteristics.

This paper reports a series of experiments carried out with Dalesbred and Jacob lambs, to investigate the importance of sound and movement in getting the lambs to run towards their dams or another adult, using life size models of ewes with moving heads. Winfield and Kilgour (1976) used a model ewe to investigate following behaviour in young lambs.

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They found that the lambs followed the model and that playing recordings of bleating made no difference to the following response.

Material and methods

Experimental animals.

Twenty-nine Dalesbred lambs and 42 Jacob lambs were tested at 22 days of age (Dalesbreds 22 ± 0.9 and Jacobs 22.5 ± 0.2 days). Eight Dalesbred and 2 Jacobs were tested again at 42 days but the lambs did not respond and the second age group tests were abandoned.

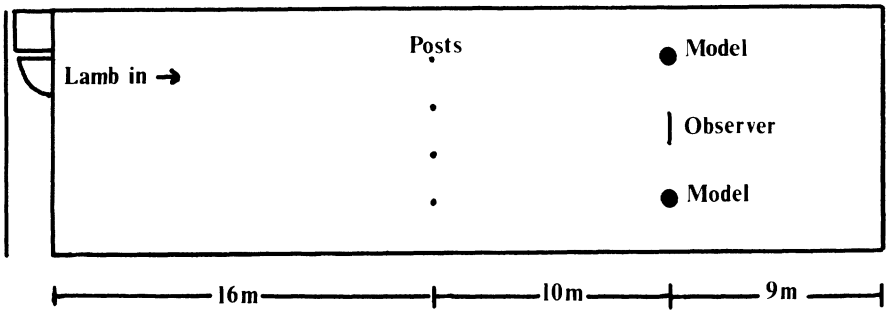

Fig. 1. Plan of the experimental area.

Experimental procedure.

The experimental area was a rectangular paddock 35 × 10 m wide, fenced on 3 sides with larch lap panels. The fourth side was made up with a hut and fence in which there was a gate (Fig. 1). Four posts across the area marked the 16 m line from the gate, and 10 m further on was one larch lap panel behind which stood the observer who operated a tape recorder and the models. The models were placed each side of the panel 6 m apart (Fig. 2). The loudspeaker was placed behind the active model.

Two models resembling Dalesbred ewes were made of a wood and wire frame covered with artificial long-haired fur fabric in a natural wool colour. When Jacob lambs were tested black long-haired fur fabric was added round the neck to make the model look like a Jacob ewe (Fig. 3). The heads of the models were made of moulded paper pulp (papier-maché) covering a polystyrene base, and they were painted black with white face markings which were altered as appropriate for the breed. Each head was attached to a wooden neck hinged onto the body, so that the head could be lifted by pulling a string attached to the neck and run through a pulley on an adjacent post, to the observer's position.

The lambs were separated from the ewes for at least 20 minutes before being tested. The ewes were moved away from the area and kept in a hut adjacent to the field. Before they were moved, each ewe's bleats were recorded for a minute on a Uher 4200 Report Monitor tape recorder using a Sennheiser 815T microphone, at 9.5 cm/sec. When these recordings were played back to the lambs, they were played through a Sony TA-313 integrated stereo amplifier and a Tangent TM3 loudspeaker, at a volume and tone judged to be similar to the real ewe's voice.

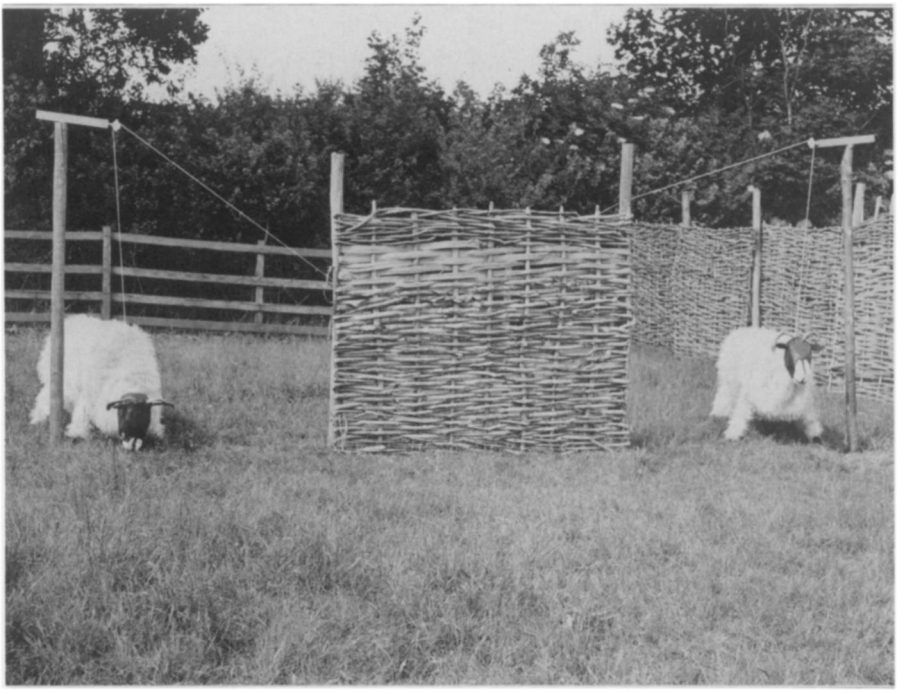

Fig. 2. The experimental area showing the Dalesbred models, one grazing and one with head up.

The two models were placed 6 m apart to appear as two grazing ewes. In each test only one ewe was made to move or bleat and the models were alternated between first and second tests. The lambs were allocated to 4 treatment groups as shown in Table 1, and each lamb was tested twice, either with a model that bleated or moved, or a model which did nothing, or both. For example, a lamb in the first group was tested first with bleats coming from the right hand ewe which did not move, and secondly, with a silent model on the left hand side which lifted up its head.

Four to six lambs were tested in one session. Each lamb in the group was tested once and then the second tests were carried out in the same order. The lamb to be tested was carried to the gate and released at one end of the enclosure. When released the observer at the other end either turned on the tape recorder to play bleats, pulled the string to raise the model's head or did both or nothing. The behaviour of the lambs was written down and the time taken for the lamb to run to the 16 m posts was noted. The lambs were observed for 60 sec and then removed from the test area.

The results were analysed for:

1) time to run to the central posts, as an initial measure of attraction and approach;
2) the number of lambs which stood at the posts and looked at and bleated at the model which had been made to move or bleat;
3) the number of lambs which ran within 2 m of the model which had been made to move or bleat.

Fig. 3. The models adapted to look like Jacob sheep.

Statistical analysis.

Two types of analysis were required to investigate the experimental effects in this trial. Analyses of variance were used to analyse times taken for the lambs to run to the posts. Since these data displayed some evidence of variance heterogeneity, analyses were carried out both on the linear scale and on the logarithmically transformed scale. For ease of presentation, and since the findings were very similar in both types of analysis, the details are presented on the original scale of measurement, that is in seconds.

The frequency data obtained from the numbers of lambs either running within 2 m of the model, or running to the post, were analysed by constructing 95% confidence limits on linear functions of proportions, these functions representing the effects of breed, bleating, movement, or the interaction of these factors. Thus for example in Table 4, the difference between the sum of the proportions in the first column (2.8) and those in the third column (2.6) is 0.2, and is a measure of the average breed effect. The method of calculating confidence limits on linear functions of proportions which is employed below has been described by WALTERS (1985). If the 95% confidence limits do not embrace the value zero, it suggests the presence of a real effect.

TABLE 1. Treatment groups for lambs

Nos. lamb		1st Run	2nd Run
Dalesbred	Jacob		
8	11	Bleating	Moving
7	11	Moving	Bleating
7	10	No movement No bleat	Movement and bleating
7	10	Movement and bleating	No movement No bleat

Results

1. Behaviour of the lambs.

On the first tests, the majority of lambs looked towards the models and ran up to the posts (Fig. 1). Some ran up the centre and orientated from the posts, some ran straight from the gate to the model which had moved or bleated. When recorded bleats were played, the lambs bleated quickly in answer to the ewes bleats. Most lambs bleated on release, a few were silent until near the models. The lambs responded more quickly to the moving or bleating models than in the trials when there were no bleats or movement. The general impression was that bleating increased the orientation of the lambs. Fewer lambs moved up near to the model ewes, some turned away at the posts. Those that went near, stood and looked and bleated and when the lambs were being removed from the area, they frequently ran very near to the models as if sheltering beside them.

During the second tests fewer lambs responded positively to the models, particularly with the Jacob lambs. Some lambs just stood by the gate bleating or moved from side to side and showed no orientation. The lambs that did respond were slower to approach, and again the models with bleating were more attractive than the silent models.

Numerical results

1. Time to run to posts.

In the first run there was a significant breed difference in the overall time taken to respond (Dalesbreds 7.2 ± 1.2 sec, Jacob 12.1 ± 1.0 $P<0.01$). Although the Dalesbred lambs that responded in the second run were on average faster than the Jacob lambs, this difference was not significant (Dalesbred 11.6 ± 2.9 sec, Jacob 14.5 ± 3.0).

TABLE 2. Time taken by lambs to run to the posts

Treatment group	Time in secs (± S.E.)			
	Dalesbred		Jacob	
	1st run	*2nd run*	*1st run*	*2nd run*
Nothing	10.5 ± 2.6	14.3 ± 5.3	18.8 ± 3.5	24.5 ± 3.4
Bleating	5.4 ± 0.8	10.6 ± 6.1	8.9 ± 1.2	12.2 ± 2.1
Moving	6.8 ± 2.9	9.0 ± 6.0	12.8 ± 2.3	8.5 ± 0.5
Moving and bleating	6.2 ± 1.0	12.5 ± 7.0	8.0 ± 0.9	12.8 ± 3.1

There was a significant difference in time to respond, on the first run, to the bleating and the non-bleating model, averaged over breeds. The lambs took 7.1 ± 1.0 sec to orientate to vocal models and 12.2 ± 1.1 sec to orientate to silent models ($P<0.01$). There was no significant difference in time to orientate, between the moving and non-moving models (not moving 10.9 ± 1.0; moving 8.4 ± 1.1). The results for the breeds are given in Table 2.

2. The number of lambs making a positive response to the models.

Sixty-four of the 71 lambs tested made a positive response to the models on the first test. This contrasts with the second test in which only 36 lambs made a positive orientation.

The high response in the first test masks the significance of any particular feature and there was no significant difference between the breeds

TABLE 3. The proportion of lambs which orientated to the models

Treatment group	Proportion of lambs orientating			
	Dalesbred		Jacob	
	1st run	*2nd run*	*1st run*	*2nd run*
Nothing	1.0	0.86	0.9	0.40
Bleating	1.0	0.71	1.0	0.54
Moving	0.71	0.25	0.82	0.18
Moving and bleating	0.86	0.86	0.90	0.50

2nd Run

Bleating effect: Average difference (Bleating - No Bleating) = 0.92 ($P<5\%$) 95% limits are 0.014 and 1.489.
Breed effect: Average difference (Dalesbred - Jacob) = 1.05 ($P<5\%$) 95% limits are 0.041 and 1.533.

TABLE 4. The proportion of lambs which ran up close to the models

Treatment group	Proportion of lambs responding			
	Dalesbred		Jacob	
	1st run	*2nd run*	*1st run*	*2nd run*
Nothing	0.7	0.3	0.6	0.2
Bleating*)	1.0	0.6	0.8	0.3
Moving	0.4	0.1	0.5	0.1
Moving and bleating	0.7	0.3	0.7	0.5

1st Run
Bleating effect: Average difference (Bleating-No Bleating) = 0.94 ($P<5\%$) 95% limits are 0.023 and 1.494.
2nd Run
Bleating effect: Average difference (Bleating-No Bleating) = 0.93 ($P<5\%$) 95% limits are 0.011 and 1.490.

of lambs, bleating and not bleating and no interaction between bleating and moving or breed and bleating. There was, however, a difference between the proportion of lambs responding to moving models and non-moving models ($P \simeq 0.05$) (Table 3), in that fewer lambs responded to the moving model.

The results of the second tests showed more significant differences, particularly between the Dalesbred and Jacob lambs. More Dalesbreds responded than Jacobs ($P<0.05$), and there was a difference between bleating and silent models as in the first test; also there was a significant difference between the lambs' response to models when they did or did not move. Adding the bleat to movement seemed to improve the response of the lambs on both tests, but movement alone elicited a very low response.

The Dalesbreds in the second test in treatment groups 3 and 4 (no movement and no bleat, and movement and bleat) made a good response but only a few of those lambs running to movement alone following bleating alone, made any orientation. So it appeared that movement reduced orientation rather than increasing it.

3. The number of lambs approaching within 2 m of the models.

The greatest response was made by lambs running to the models producing bleats only. All the Dalesbreds and all except 2 Jacob lambs ran up within 2 m of the models. This result was significantly different from the other groups, especially as there was a slight negative effect of movement in the first run and only half the number of lambs tested ran close to the model. The effect of bleating continued into the second run (Table 4).

Discussion

The original intention of these experiments was to determine whether it was the movement of the ewe which caused lambs to run towards her most readily. The results show that the movement alone had no effect and did not increase the attraction of the lambs more than other treatment groups. In fact the movement of the models seemed to deter the lambs in that fewer lambs orientated to the models from a distance, and fewer lambs investigated them by approaching closely. However, when both breeds of lambs went towards the models, they went more quickly to a moving than a stationary model. This last fact encourages one of two explanations, namely that when the heads of the models were lifted up, they looked less like real sheep and in detail the heads did not resemble accurately the faces of the lamb's own dam. Secondly, the lambs may have been frightened because the movement was insufficiently life-like.

One unforseen result of these experiments was the great attraction of the ewe's voice to the lamb. Each lamb heard a recorded sequence of bleats from their own dam, as previous experience had shown that a sequence of bleats is better than a tape loop of a few bleats. The model ewe with bleats and no movement attracted all the lambs in the first run and a high percentage of Jacobs in the second test. More of the Dalesbred than Jacob lambs were attracted by moving and bleating on the second run. The reason for testing the lambs at 3 weeks old was because they have learnt their dam's voice at that age (SHILLITO, 1975). This explains the difference between these results and those of WINFIELD & KILGOUR (1976) who used very young lambs.

The third treatment group in which the models did not bleat or move but stood as if grazing, attracted the lambs in the initial orientation. This shows that the first response of the lambs was to run towards any sheep. It is difficult to know how to counteract this tendency except by having a field with lots of models rather than just two! The 'grazing only' models failed to attract so much close investigation particularly during the second test. The results of the second tests showed a difference between the Dalesbred and Jacob lambs in that the Jacobs were the less responsive. Only 17/42 (40%) were attracted and approached the models compared with 19/29 (65%) Dalesbred lambs. However, of those that orientated to the models, 65% Jacobs went up close to the models while only 47% Dalesbreds did so. It appeared that the Jacobs responded to the models less than the Dalesbreds. This could indicate a greater dependence on vision in recognition, or a different response after previous experience, or that the Jacob models were not such good replicas as the Dalesbred models.

When the Dalesbreds and 2 Jacobs were tested again at 6 weeks, the lambs showed no approach and investigation of the models whether or not they vocalised or moved. Although previous experience and learning may have influenced the lambs, this suggests that the 6 week old lambs were responding to something different from the 3 week old lambs, possibly something more specifically like their own dam rather than only adult sheep. This change in response needs to be investigated in more detail using much younger lambs, up to 6 weeks, and perhaps different voices, face patterns and movements. It should provide more information about the way in which lambs visualise their dams at various ages.

The results from these experiments indicate that 3 week old lambs will respond at first sight to models of ewes by running up closer for more investigation. This response is increased if the dam's voice is used in addition to the models. SHILLITO WALSER *et al.* (1981) found that ewes paid more attention to recorded bleats from lambs, when a model was moved. A visual stimulus is also an attraction to lambs, although again only initially and not necessarily moving. It seems that the detailed appearance of the model and movement do not improve the initial response, but might influence close investigation. The second time the lambs saw the models, their response was reduced even with the correct voice; this suggests that the lambs learnt quickly after only one experience and then became more selective in their response.

Summary

Life sized models of sheep were used to determine the importance of sound and movement in eliciting orientation and approach of lambs. Dalesbred and Jacob lambs were tested at 3 weeks of age with two models, one of which appeared to be grazing while the other moved its head or bleated or both bleated and moved. Lambs were tested twice; their behaviour was recorded to note 1) time of orientation to models and approach; 2) positive or negative response; 3) approach within 2 m of the models. The Dalesbred lambs ran faster than the Jacobs towards the models, and more Dalesbreds responded positively on the second test. Both breeds responded more quickly to the vocal models than to the silent models; there was no difference in time of response to moving and non-moving models. 90% lambs approached and looked at the models on the first test, 51% responded on the second test. All lambs that responded went up close to bleating models, but not to moving models. Movement did not increase attraction and seemed to deter close investigation, whereas vocalisation made the models most attractive to the lambs.

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Zusammenfassung

Lebensgroße Modelle von Schafen wurden benutzt, um festzustellen, wie weit bei Lämmern Laute oder Bewegung für die Orientierung und Annäherung an die Mütter verantwortlich ist. Drei Wochen alte Dalesbred und Jacob Lämmer wurden mit 2 Modellen geprüft: das eine Modell war wie ein weidendes Schaf, während das andere den Kopf bewegte, oder blökte, oder beides gleichzeitig tat. Alle Lämmer wurden 2 mal geprüft. Ihr Verhalten wurde nach folgenden Gesichtspunkten registriert: 1) Zeitpunkt der Orientierung nach dem Modell hin und Annäherung an das Modell; 2) positive oder negative Reaktion; 3) Annäherung auf weniger als 2 m Entfernung.

Die Dalesbred Schafe liefen schneller als die Jacob Schafe zu den Modellen: mehr Dalesbredschafe reagierten positiv im 2. Test. Beide Rassen reagierten schneller auf rufende als auf stumme Modelle. Es bestand kein Unterschied zwischen Reaktionszeiten auf die sich bewegenden und die stationären Modelle. 90% der Lämmer reagierten positiv beim

ersten Test, 51% beim zweiten Test. Alle reagierenden Lämmer gingen ganz nahe an blökende Modelle heran, aber nicht an Modelle, die sich bewegten. Bewegung hatte keine Anziehungskraft und schien nähere Untersuchung zu unterbinden, während Modelle, die Rufe produzierten, die größte Anziehungskraft auf die Lämmer ausübten.