REPEATABILITY OF TEMPERAMENT SCORES IN BUNAJI AND FRIESIAN-BUNAJI CROSSES

B. Y. ABUBAKAR, O. O. ONI, S. A. S. OLORUNJU and V. BUVANENDRAN
National Animal Production Research Institute
Ahmadu Bello University, P.M.B. 1096,
Shika, Zaria, Nigeria.

Received 3 September, 1992 Accepted 30 December, 1992

ABSTRACT

Repeatabilities of temperament scores were estimated by breed, sex, age, weight and body condition in an enclosed weighbridge (method 1) and in a cattle crush (method 2). The model used included animal, scorer, animal x scorer and replicate within scorer effects. The within and between animal variation accounted for 44 and 54%, respectively, for method 1 and 67 and 32%, respectively, of total variation for method 2. Animal x scorer interaction was not significant. For both methods, repeatabilities for temperament scores were 0.56 and 0.54, for method 1 and 0.33 and 0.32, for method 2. Scoring animals in seclusion seems to enhance expression of temperament and hence is more repeatable and reproducible.

Key words: **Bunaji; Friesian-Bunaji cattle; Temperament scores; Repeatability.**

INTRODUCTION

Temperament scoring can be used as an effective management tool on cattle farms, just as body condition is used. Cattle with nervous temperaments pose serious management problems (Elder et al. 1980), but have received little attention from a research point of view. Any scoring system for temperament should reflect difficulties experienced by stockmen, when handling animals in a crush, pens or other confinements. Such methods must be repeatable to instil confidence in culling procedures. Temperament has been measured by an increase in heart rate (Czako 1979), and production of lactic acid in the blood (Holmes et al. 1972); other researchers (Hearnshaw and Morris 1984; Fordyce et al. 1985) have classified cattle into behavioural categories such as docile, restless or aggressive. Hearnshaw et al. (1979) used a modified temperament score described by Tulloh (1961) and reported that animals from crosses involving *Bos indicus* were more difficult to handle in a crush than pure or crossbred *Bos taurus* animals. Also breed, sex, season, liveweight, and body condition have been found to have significant effect on temperament (Abubakar *et al.* 1991). The present study was designed to compare temperament scoring in a cattle crush and in an enclosed weighbridge using repeatabilities estimated from variance components.

MATERIALS AND METHODS

The animals used in this study were part of the experimental herd of the National Animal Production Research Institute, Shika, in the Northern Guinea Savannah zone of Nigeria. The 175 animals used were either purebred Bunaji or 50% Friesian x Bunaji crosses and the latter were either progeny from purebred Bunaji or 50% Friesian x Bunaji crossbred dams. Both males and females of various ages were used. However, pregnant animals were excluded from the study. Location and management of animals have been described by Buvanendran *et al.* (1981).

Experimental Procedures

Temperament of each animal was scored simultaneously by two scorers (B.Y.A. and O.O.O) for 2 min in a weighbridge (method 1) and in a cattle crush (method 2). The weighbridge consists of an Avery weighing scale (2.2 x 1.5 m) that can weigh up to 500 kg. The weighing area is enclosed by horizontal bars at the sides with crossing vertical bars at 0.4 m apart. The inlet and outlet are controlled by doors on railings so that animals could enter the weighing area singly. The whole scale is housed in an open sided building. The crush is built of concrete and is 20.4 m long, 0.5 m wide with a depth of 0.7 m. On each side are two horizontal bars with crossing vertical bars (0.5 m high) that are 1.2 m apart. There are holding yards at both ends of the crush and also two doors controlling the inlet and outlet.

Except for some practice to familiarize themselves with the technique of scoring prior to the study, the two scorers had no previous experience. Vigour of movement was scored on a six-point scale as follows: 1, no movement; 2, slightly restless with minor movement; 3, almost continuous but non-vigorous movement; 4, quite vigorous movement; 5, very disturbed and continuous vigorous movement; 6, struggling violently and attempting to jump out.

Audible respiration was scored on four levels (Fordyce *et al.* 1985); O, no audible respiration; 0.5, heavy breathing; 1, very heavy breathing; 1.5, snorting.

Other behavioural features scored were whether an animal knelt or laid down, bellowed or kicked. As each of these behaviours was infrequent, their scoring was done collectively. Bellowing or kicking were scored as 1 if they occurred and 0 if they did not. An animal that bellowed and kicked still received a score of 1. A score of 2 was given for lying down. Therefore in this behavioral category the maximum score for an animal was 2. For each animal, scores for all behaviours were added to form the temperament score'. Each of the scores were replicated once within a period of 24 hours. Animals were not necessarily presented in the same order each time. Body condition was scored by the same two scorers following the technique outlined by Pullan (1978). The scoring was on a six-point scale as follows; 1, marked emaciation with individual lumbar processes projecting prominently and neural spines appearing sharply; 2, hips, pins, tail-head and ribs prominent; 3, ribs visible, little fat cover and spinous processes barely visible; 4, animal smooth and well covered with spinous processes that cannot be seen but easily felt; 5, fat cover in critical areas and lumbar processes cannot be seen or felt; 6, heavy deposit of fat clearly visible on tail-head, brisket and cod.

Statistical Analysis

A trial in which animals are individually scored once is not very satisfactory because animal scorer interactions are confounded. Replication allows the effects to be separated in an analysis of variance. The model used in this study was as follows:

$Yijk = \mu + a_i + s_j + (as)_{ij} + r_k (j) + e_{ijk}$

where

Y_{ijk} is temperament score for animal i, scorer j and replicate k;

μ is overall mean;

a_i is random effect of the i^{th} animal, i = 1, ..., n;

s_j is random effect of the j^{th} scorer j = 1, ..., m;

$(as)_{ij}$ is animal x scorer interaction effect;

$r_{k(j)}$ is replicate within scorer effect; k = 1, ..., p; and

e_{ijk} is random error term

The model assumes that successive scorings by a particular scorer are independent, and that the scorers assess each animal independently. The analysis was carried out within breed group, sex, age, weight and body condition. An overall analysis was also done irrespective of the above variables. In the ANOVA table for this model, if the components of variance

TABLE 1: ESTIMATES OF VARIANCE COMPONENTS FOR TEMPERAMENT SCORES IN CATTLE IN AN ENCLOSED WEIGHBRIDGE AND (IN PARENTHESES) IN A CRUSH.

Effects		Variances					
		Animal	Scorer	Animal x scorer	Replicate within scorer	Residual	Total
	n	σ^2a	σ^2s	σ^2as	$\sigma^2r(k)$	σ^2e	σ^2y
Breed							
Bunaji	33(29)	1.173(0.748)	0(0)	0(0)	0.042(0.045)	0.836(1.053)	2051(1846)
Friesian x Bunaji	47(53)	1.104(1.284)	0(0)	0(0)	0.022(0)	0.979(0.582)	2105(1866)
½ FrX x ½ FrX[a]	82(93)	0.384(0.793)	0(0)	0.069(0)	0.096(0.025)	0.841(0.830)	1390(1648)
Sex							
Male	36(37)	0.582(0.333)	0(0.009)	0(0)	0.452(0)	0.751(1.088)	1785(1430)
Female	126(138)	1.155(1.131)	0.001(0)	0(0)	0.001(0)	0.772(0.650)	1929(2197)
Age (years)							
<2	81(103)	1.004(0.529)	0(0)	0(0.132)	0.178(0.070)	0.949(0.768)	2033(1499)
≥	81(72)	1.004(1.308)	0(0.001)	0(0)	0(0)	0.601(0.888)	1605(2197)
Weight (kg) group							
≤100	35(38)	0.675(0.718)	0(0.026)	0(0)	0.501(0.041)	1.060(0.676)	2236(1461)
101 - 200	62(54)	1 208(0.977)	0(0)	0(0)	0.020(0.109)	0.761(0.827)	1989(1913)
>200	65(63)	0.881(0.336)	0.012(0.004)	0(0.032)	0(0.007)	0.602(0.319)	1495(0698)
Body condition							
Score 1 to 3	88(77)	0.919(1.158)	0(0.021)	0(0)	0.125(0.011)	0.844(0.974)	1888(2.164)
Score 4 to 6	74(98)	1.147(1.140)	0(0)	0(0)	0(0.053)	0.716(0.700)	1863(1893)
Overall	162(175)	1.011(0.611)	0(0)	0(0)	0.046(0.019)	0.826(1.279)	1883(1909)

*FrX is Friesian-Bunaji cross

TABLE 2: REPEATABILITIES WITHIN (r1) AND BETWEEN (r2) SCORERS FOR TEMPERAMENT SCORES OF CATTLE IN AN ENCLOSED WEIGHBRIDGE AND IN A CRUSH.

Effects	Weighbridge r1	Weighbridge r2	Crush r1	Crush r2
Breed				
Bunaji	0.59	0.57	0.43	0.41
Friesian x Bunaji	0.54	0.52	0.69	0.69
½ FrX x ½ FrX[a]	0.39	0.28	0.50	0.48
Sex				
Male	0.58	0.33	0.24	0.23
Female	0.60	0.60	0.64	0.64
Age (years)				
<2	0.53	0.45	0.49	0.35
≥2	0.63	0.63	0.60	0.60
Weight (kg)				
≤100	0.53	0.30	0.54	0.49
101 - 200	0.62	0.61	0.57	0.51
>200	0.60	0.59	0.54	0.48
Body condition				
Score 1 to 3	0.55	0.48	0.55	0.54
Score 4 to 6	0.62	0.62	0.63	0.60
Overall	0.56	0.54	0.33	0.32

[a] FrX is Friesian-Bunaji cross

due to animals, scorers, animals x scorers, replicate within scorers and residuals are respectively σ^2a, σ^2s, σ^2as, $\sigma^2r(s)$, σ^2e, the expected mean squares are:

Effect	Expected mean squares
Animals	$\sigma^2e + p\,\sigma^2as + mp\,\sigma^2a$
Scorers	$\sigma^2e + n\,\sigma^2r(s) + p\,\sigma^2as + np\,\sigma^2s$
Animals x scorers	$\sigma^2e + p\,\sigma^2as$
Replicates/scorers	$\sigma^2e + n\,\sigma^2r(s)$
Residuals	σ^2e

These types of model have been discussed by Henderson (1959). Estimates of the variance components were used to give the following intra-class correlations:

$$r_1 = \frac{\sigma^2 y - \sigma^2 e}{\sigma^2 y} \qquad r_2 = \frac{\sigma^2 a}{\sigma^2 y}$$

where

r_1 is repeatability of scores within scorers,

r_2 is repeatability of scores between scorers, and

$\sigma^2 y$ is $\sigma^2 a + \sigma^2 s + \sigma^2 as + \sigma^2 r(s) + \sigma^2 e$

In cases where negative variance component estimates resulted, they were replaced by zeros, and other components were recalculated, following Searle (1971).

RESULTS

Estimates of variance components are shown in Table 1. Replicate effects were included to allow for the possibility that some scorers may revise their scores upward or downward on the second scoring. Animal x replicate effects were not included as the replicated scorings were made within 24h. Most of the variation was attributable to between and within animal components. Scorers and animal x scorer variations were negligible, and the replicate within-scorer variance accounted for < 2% of the total variation. The between-animal variation was generally higher for scores taken in the weighbridge than for those taken in the crush. Repeatabilities within and between scorers were estimated from the variance components (Table 2). The within-and between-scorer estimates were close. For both methods, there was clear indication that scores for females were more repeatable. Similar results were observed for younger animals and also for the better-conditioned animals. In the weighbridge, repeatabilities of scores of animals that had crossbred dams were much lower than those that had zebu dams or the purebred zebu animals. However, in the crush, scores for the zebu animals were less repeatable.

DISCUSSION

In this study, scorer and animal x scorer variations were negligible, indicating that the scorers did not differ much in their implied calibration of the scoring scale or in their interpretation of the subjective criterion. Evans (1978), in a similar study on condition scoring, found these variations to be significant and concluded that scorers need to be carefully trained. The between-animal variation in the weighbridge was almost twice that in the cattle crush, possibly because there was more freedom for movement for animals in the weighbridge. Exhibition of temperament was therefore more enhanced. Repeatability of scorers between scorers was moderate for method 1 and somewhat lower for method 2. A very high significant correlation (0.94) between scorers was obtained by Fordyce *et al.* (1985). However, in their study, both observers were experienced stock handlers and had practised scoring before the experiment. Here, the scorers were still unfamiliar with the procedure since it was their first time of scoring. Hearnshaw and Morris (1984) also obtained a low repeatability of 0.27 from inexperienced scorers. It appears that there is more reliability in scoring of female, older and better-conditioned animals. A similar observation on effect of age was made by Hearnshaw and Morris (1984) who reported repeatability of 0.67 for calves and 0.82 for cows. Fordyce and Goddard (1984) found repeatabilities of 0.28-0.52 for five of six measures of temperament in cows.

In conclusion, the results of this study show that scoring animals for temperament in an enclosure where the animals can be separated singly and scored (Weighbridge) is more reliable than scoring in cattle crushes. Under such situations, temperament is better expressed. Even though the repeatability estimates obtained were low to moderate, with more practice in scoring, the reliability can be improved. Temperament scoring could then be used as an effective management tool on farms particularly in the tropics where there is a predominance of temperamental cattle.

ACKNOWLEDGEMENT

The authors acknowledge with gratitude the technical assistance of Tanimu Waziri and Shehu Haruna. The kind permission of the Director to publish this work is also acknowledged.

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