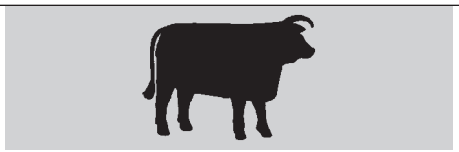
The Professional Animal Scientist 24 (2008):628–633



Case Study: Mississippi Cattle Producers Gain Insight into Temperament Effects on Feedlot Performance and Subsequent Meat Quality

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ABSTRACT

The Mississippi Farm to Feedlot program has supplied producers with information about feedlot cattle performance since 1993. To add to this information, the effects of temperament score on feedlot growth performance and subsequent carcass value were evaluated. Steers consigned to the Farm to Feedlot program in 2004 were evaluated for temperament in a cattle restraint chute [chute scores (CS) ranged from 1 = calm and no movement to 5 = rearing, twisting, or struggling] and for pen temperament [pen score (PS) ranged from 1 = nonaggressive, docile, not excited by humans or facilities to 5 = very aggressive, excitable, runs into fences and toward humans]. Analyses were conducted to determine the effects of feed group and farm of origin and correlations of exit velocity (EV) and chute and pen temperament with feedlot performance. Exit velocity and PS were positively correlated ($r = 0.70$; $P < 0.0001$). Farm of origin had a direct effect on PS, CS, and EV. Sire breed had an effect on CS, PS, EV, pay and final weight, total gain, ADG, hot carcass weight, and USDA QG and YG. Medicine costs, days treated, and net profits were influenced by PS and EV. As EV increased, final BW, total gain, and ADG decreased ($P < 0.05$). As EV increased, there was a tendency for net returns to decrease and the number of days treated to increase ($P < 0.07$). These results indicate the importance of educating beef cattle producers on cattle temperament and its relationship to cattle feeding production and economic measures.

Key words: temperament, feedlot performance, carcass merit, net return

INTRODUCTION

Temperament in domestic livestock is associated with a fear response to human-animal interactions. Human-animal interactions in cattle production commonly occur through handling coupled with various management practices. Cattle with wilder temperaments exhibit lower weight gain (Burrow, 1997; Voisinet et al., 1997b), produce tougher meat (Voisinet et al., 1997a), and yield increased amounts of bruise trim caused by injuries acquired during transportation (Fordyce et al., 1988). Assessments of cattle temperament can be evaluated by using subjective measures [chute (Grandin, 1993) and pen scores (Kunkle et al., 1986)] and an objective measure using chute exit velocity (**EV**; Burrow et al., 1988). Establishment of a reliable and repeatable method to assess the stress responsiveness of an animal is important for discerning cattle temperament. Exposure of cattle producers to subjective and objective temperament assessments and recognition of the correlation between temperament and future growth performance and carcass value is needed to encourage assessments of cattle temperament within their cattle herds. Many producers may not realize that cattle temperament affects future growth performance, health status, and carcass value. The objective of this study was to pro-

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vide cattle producers involved in the Mississippi Farm to Feedlot extension program with information regarding cattle temperament effects on feedlot performance, health costs, and carcass value.

MATERIALS AND METHODS

To incorporate new information for producers participating in the Mississippi Farm to Feedlot program, producer and experiment station cattle were assigned temperament scores and EV was measured the day of departure to the feedlot. This information was correlated with animal performance and treatment costs as well as carcass data of the consigned animals. Seventeen beef cattle producers and 2 Mississippi Agricultural Forestry and Experiment Station (**MAFES**) units were represented in this program. The three methodologies of temperament assessment used included 2 subjective measures, chute score (**CS**) and pen score (**PS**), and one objective measure, EV. Chute scoring was adapted from Grandin (1993), in which visual appraisals of each animal, while confined but not restrained in a working chute, were the basis of scoring in the present study. Pen scores (Kunkle et al., 1986) were based on visual assessments of each animal while being confined to a pen with groups of 3 animals. These groups of 3 animals were the first 3 animals that came into the pen randomly, and each animal was evaluated for several minutes to assess proper temperament to eliminate any effects other animals may have had on that individual. Exit velocity (Burrow et al., 1988) was determined as the rate at which the animals exited the working chute and traversed a fixed distance (1.83 m). Infrared sensors were used to remotely trigger the start and stop of a timing apparatus (FarmTek Inc., North Wylie, TX) to determine EV.

Steers (n = 186) and heifers (n = 24) consigned to the Mississippi Farm to Feedlot extension program in 2004 (total n = 210), representing 17 producers and 2 MAFES units, were evaluated by assigning a PS (scale of 1 to 5, with 1 = nonaggressive, not excited by humans or facilities; to 5 = very aggressive, excited, runs into fences, combative); calves were weighed on a digital platform scale and then assigned a CS. Measurements occurred at the day of shipment to the feedlot (DM&M Farms Inc., Cimarron, KS) at the Brown Loam Experiment Station (Raymond, MS) and the Leveck Animal Research Center (Mississippi State, MS). As a note, feeding groups were composed of cattle from several farms of origin in one feeding group, and the number of steers sent per owner ranged from 2 to 32 head. Cattle were weighed before shipment to the feedlot, upon arrival at the feedlot, and then again at the end of the feeding period. Cattle were processed and weighed individually, going on feed between 24 and 36 h after arrival to the feedlot. Cattle were randomly sorted into feeding groups based on BW and breed type. Cattle were fed a traditional feedlot diet with 4 diet changes until cattle were on the finishing diet. Cattle were slaughtered when the majority of the pen averaged 1.02 cm rib fat. Carcass data was collected at time of harvest. The carcass data were collected by the following individual USDA graders and at the following plants responsible for collecting and reporting carcass data: groups 1, 4, and 6, Sherry Anderson, Cargill (Cargill Meat Solutions Corporation, Cargill Inc., Wichita, KS); groups 2 and 3, Gale Seibert, Tyson (Tyson Fresh Meats, Emporia, KS, and Tyson Foods Inc., Springdale, AR); and group 5, Teresa Martin, National (National Beef Packing Co. LLC, Dodge City, KS). Individual feed costs were based on pen averages. The per-period individual feed cost was determined by the daily pen feed cost per period per number of days an animal was in the pen during that period. Daily pen feed costs per period were then summed over all periods for each animal. Net profit was calculated as follows: net profit = (slaughter value − beginning value − feeding cost − hauling cost − individual treatment cost).

Least squares means were obtained from PROC MIXED (SAS Inst. Inc., Cary, NC) with fixed effects of feed group and farm of origin. Pearson correlation coefficients were obtained by using the MANOVA (multivariate ANOVA) option of PROC GLM (SAS Inst. Inc.), accounting for feeding group, farm of origin, and age of animal. No interactions were significant and thus were not included in the model. One animal that had a PS of 1 provided an unprecedented high treatment cost and was determined to be a chronically morbid calf based on veterinary observation of bovine respiratory disease clinical signs toward the end of the feedlot period; thus this animal was omitted from the analyses. A total of 3 steers died, constituting one of each PS 1, 3, and 4, and were not included in the final analyses.

RESULTS AND DISCUSSION

Owner number had a significant effect on EV, CS, and PS ($P < 0.0002$; Table 1). Feeding group had a significant effect on EV ($P < 0.006$) and PS ($P < 0.023$) and tended to have an effect on CS ($P < 0.061$). As mentioned, feeding groups were composed of cattle from several farms of origin in one feeding group, and the number of steers sent per owner ranged from 2 to 32 head. Cattle were sorted into feeding groups on arrival based on similar weights and breed types. As PS increased, so did mean EV (Figure 1); however, as CS increased, EV did not differ among CS (Figure 1). Breed of sire did have a significant effect on CS ($P < 0.003$; Table 2), PS ($P < 0.006$; Table 2), EV ($P < 0.001$; Table 2), pay and final live weight ($P < 0.01$), total feedlot gain ($P < 0.005$), hot carcass weight ($P < 0.02$), USDA QG ($P < 0.002$), and USDA YG ($P < 0.003$). Numerous studies have reported sire breed effects on carcass QG and YG as well as other carcass characteristics (Wheeler et al., 2001; Casas and Cundiff, 2003). In addition, some studies have reported breed type and gender effects on temperament as well as temperament effects on ADG

Table 1. Least squares means and SE for chute and pen scores and exit velocity for each farm of origin and the number of cattle consigned by each owner for the Mississippi Farm to Feedlot program

Farm of origin	Animals, n	Chute score[1]	Pen score[2]	Exit velocity, m/s
1	25	2.64 ± 0.16	3.00 ± 0.18	2.77 ± 0.17
2	32	2.59 ± 0.14	2.78 ± 0.16	3.10 ± 0.15
3	7	2.29 ± 0.29	3.57 ± 0.33	3.46 ± 0.33
4	7	1.43 ± 0.29	2.71 ± 0.33	2.32 ± 0.33
5	5	1.20 ± 0.35	2.00 ± 0.40	2.01 ± 0.39
6	14	2.50 ± 0.21	3.43 ± 0.24	3.07 ± 0.24
7	13	2.69 ± 0.22	3.15 ± 0.25	2.72 ± 0.24
8	6	2.17 ± 0.32	2.67 ± 0.36	2.25 ± 0.36
9	15	2.40 ± 0.20	3.27 ± 0.23	3.56 ± 0.23
10	12	1.83 ± 0.22	2.33 ± 0.26	2.45 ± 0.25
11	5	2.60 ± 0.35	3.00 ± 0.40	3.14 ± 0.39
12	6	1.67 ± 0.32	2.33 ± 0.36	1.73 ± 0.36
13	10	2.60 ± 0.25	3.50 ± 0.28	3.42 ± 0.28
14	10	2.40 ± 0.25	2.90 ± 0.28	3.23 ± 0.28
15	2	3.50 ± 0.55	2.00 ± 0.63	2.66 ± 0.62
16	2	3.50 ± 0.55	1.50 ± 0.63	2.63 ± 0.62
17	10	2.77 ± 0.25	3.60 ± 0.28	3.44 ± 0.28
18	24	2.17 ± 0.16	3.42 ± 0.18	3.29 ± 0.18
19	5	3.00 ± 0.35	3.40 ± 0.40	4.20 ± 0.39
P-value	—	$P < 0.003$	$P < 0.001$	$P < 0.004$

[1]Chute score scale: 1 = calm, no movement; 2 = restless, shifting; 3 = squirming, occasional shaking of the squeeze chute or scale; 4 = continuous vigorous movement and shaking of the device; and 5 = 4 plus rearing, twisting, or struggling violently. Animals are confined but not restrained in a cattle chute or weigh box.

[2]Pen score scale: 1 = nonaggressive, docile, walks slowly, can approach slowly, not excited by humans; 2 = slightly aggressive, runs along fences, will stand in corner if humans stay away, may pace fence; 3 = moderately aggressive, runs along fences, head up and will run if humans come closer, stops before hitting gates and fences, avoids humans; 4 = aggressive, runs away, stays in back of group, head high and very aware of humans, may run into fences and gates even with some distance, will likely run into fences if alone in pen; 5 = very aggressive, excited, runs into fences, runs over humans and anything else in path, "excitable." Pen scores (Kunkle et al., 1986) were based on visual assessments of each animal while being confined to a pen with groups of 3 animals.

in beef cattle (Voisinet et al., 1997b; Baker et al., 2003; Vann and Randel, 2003). Within all breeds of cattle, some individual sires can also be identified that possess less desirable temperaments. In addition, individual sires can be identified that have greater genetic potential to produce offspring with increased BW gain and carcass characteristics as well as improved expected progeny differences for these traits. Thus, considering the impact of temperament on production and the impact of expected progeny differences of an individual sire on the performance of their progeny, sire selection is one of the most important decisions for cattle producers.

Sire breeds that were Angus (**AN**) or AN influence had the greatest ($P < 0.003$) QG, and the sires of continental breeding had the lowest QG. Quality grade values from greatest to least were as follows: AN; Gelbvieh (**GV**) × AN; Red Brangus (**RB**); Hereford, horned; Brangus; Hereford, polled; GV; Charolais; and Crossbred. In addition, sire breeds with the greatest ($P < 0.001$) to least ADG are as follows: GV × AN; AN; Hereford, horned; Charolais = Crossbred; Brangus; Red Brangus; and Hereford, polled. Because the focus of this work was on temperament effects on production performance, the differences in means attributable to breed of sire for QG and ADG were not presented graphically. Casas and Cundiff (2003) reported that sire breed had significant ($P < 0.05$) influences on live weight, hot carcass weight, LM area, and bone weight. However, PS did not have a significant effect ($P > 0.05$) on QG, YG, marbling score, ribeye area, rib fat, or total gain in this study.

Previous and ongoing research at the Brown Loam Experiment Station and Texas A&M University Research and Extension Center, Overton, has indicated that PS and EV are highly correlated and that both these parameters tend to be the best indicators of overall temperament (Curley et al., 2006). In addition, research has indicated correlations between calf EV and cow EV (Curley et al., 2003; Vann et al., 2004a). One animal that had a PS of 1 provided an unprecedented high treatment cost and was determined later to be a chronically morbid calf. This calf displayed clinical signs of bovine respiratory disease toward the end of the feedlot period; thus, this animal was omitted from the analysis. The animal

did not exhibit any signs of illness or lethargy at the time of processing. However, cattle assigned a PS of 2 and 3 had lower treatment costs compared with cattle assigned a PS of 4 and 5 (Figure 2). Once the chronic animal was removed from the data set, no animals assigned a PS of 1 were treated at all during the feedlot period. The overall distribution of cattle by PS was as follows: 1, n = 12; 2, n = 41; 3, n = 87; 4, n = 54; and 5, n = 7. A total of 29 cattle were treated for illness, and the number of days treated ranged from 3 to 9 d. The distribution of cattle by PS that were treated for illness was as follows: 2, n = 12, 29%; 3, n = 12, 14%; 4, n = 4, 7%; and 5, n = 1, 14%. A total of 6 cattle that were classified as PS 2 and 3 (n = 3 per each PS) had treatment costs as high as $25; a total of 15 cattle that were classified as 2, 3, and 4 (n = 7, n = 6, and n = 2, respectively) had treatment costs ranging from $25 to $50; and a total of 8 cattle that were classified as 2, 3, 4, and 5 (n = 2, 3, 2, and 1, respectively) had treatment costs greater than $50. A total of 3 cattle died, which constituted one each from PS 1, 3, and 4, and 2 cattle identified as PS 3 and 5 were determined to be cattle that were not assigned USDA grades at harvest. Cattle with PS of 1, 2, or 3 returned greater net returns compared with cattle with PS of 4 and 5 (Figure 3). Exit velocity and PS were highly correlated (r = 0.70; $P < 0.0001$). Individual feedlot treatment costs increased as PS and EV increased (Figure 2). As EV increased, final BW, total BW gain, and ADG decreased ($P < 0.05$). In addition, as

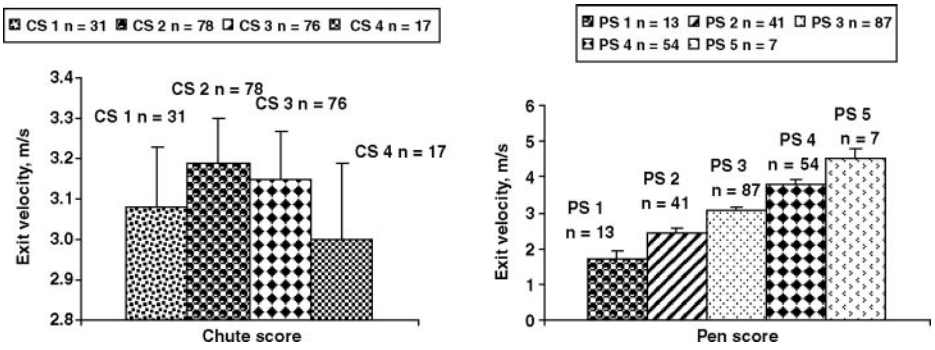

Figure 1. Exit velocity (m/s) least squares means for chute and pen scores for all cattle at the time of departure to the feedlot. Chute score (CS) scale: 1 = calm, no movement; 2 = restless, shifting; 3 = squirming, occasional shaking of the squeeze chute or scale; 4 = continuous vigorous movement and shaking of the device; and 5 = 4 plus rearing, twisting, or struggling violently. Animals are confined but not restrained in a cattle chute or weigh box. Pen score (PS) scale: 1 = nonaggressive, docile, walks slowly, can approach slowly, not excited by humans; 2 = slightly aggressive, runs along fences, will stand in corner if humans stay away, may pace fence; 3 = moderately aggressive, runs along fences, head up and will run if humans come closer, stops before hitting gates and fences, avoids humans; 4 = aggressive, runs away, stays in back of group, head high and very aware of humans, may run into fences and gates even with some distance, will likely run into fences if alone in pen; 5 = very aggressive, excited, runs into fences, runs over humans and anything else in path, "excitable." Pen scores (Kunkle et al., 1986) were based on visual assessments of each animal while being confined to a pen with groups of 3 animals.

Table 2. Least squares means and SE for pen and chute scores and exit velocity by sire breed

Sire breed	Chute score[1]	Pen score[2]	Exit velocity, m/s
Angus	2.44 ± 0.07	3.02 ± 0.08	2.94 ± 0.08
Brangus	2.44 ± 0.19	3.30 ± 0.21	3.14 ± 0.20
Charolais	1.55 ± 0.29	2.27 ± 0.32	2.45 ± 0.31
Gelbvieh	2.77 ± 0.39	3.32 ± 0.41	3.88 ± 0.39
Gelbvieh × Angus	1.80 ± 0.27	2.31 ± 0.30	2.94 ± 0.28
Horned Hereford	2.35 ± 0.19	3.26 ± 0.22	3.23 ± 0.20
Polled Hereford	2.13 ± 0.47	3.93 ± 0.52	4.16 ± 0.49
Red Brangus	1.45 ± 0.33	2.25 ± 0.37	1.58 ± 0.35
Crossbred	1.67 ± 0.47	3.43 ± 0.18	3.71 ± 0.21
P-value	$P < 0.003$	$P < 0.005$	$P < 0.001$

[1]Chute score scale: 1 = calm, no movement; 2 = restless, shifting; 3 = squirming, occasional shaking of the squeeze chute or scale; 4 = continuous vigorous movement and shaking of the device; and 5 = 4 plus rearing, twisting, or struggling violently. Animals are confined but not restrained in a cattle chute or weigh box.

[2]Pen score scale: 1 = nonaggressive, docile, walks slowly, can approach slowly, not excited by humans; 2 = slightly aggressive, runs along fences, will stand in corner if humans stay away, may pace fence; 3 = moderately aggressive, runs along fences, head up and will run if humans come closer, stops before hitting gates and fences, avoids humans; 4 = aggressive, runs away, stays in back of group, head high and very aware of humans, may run into fences and gates even with some distance, will likely run into fences if alone in pen; 5 = very aggressive, excited, runs into fences, runs over humans and anything else in path, "excitable." Pen scores (Kunkle et al., 1986) were based on visual assessments of each animal while being confined to a pen with groups of 3 animals.

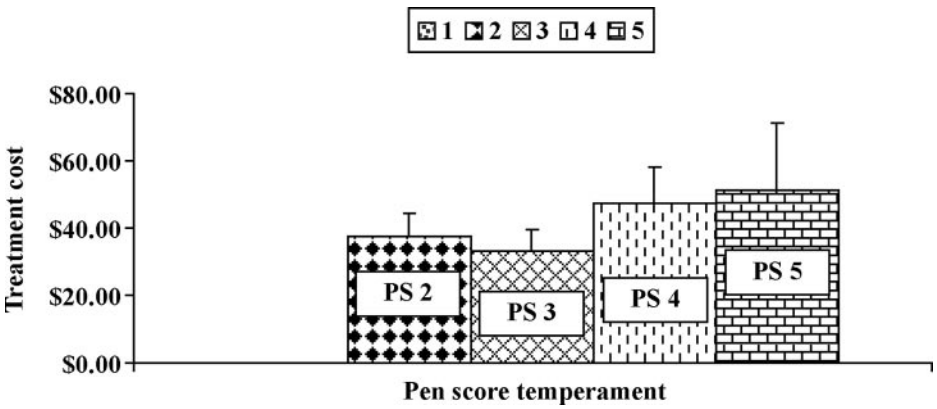

Figure 2. Treatment costs as incurred by the number of days cattle were treated and cost of drugs used as defined by the pen score (PS) temperament method. Pen score scale: 1 = nonaggressive, docile, walks slowly, can approach slowly, not excited by humans; 2 = slightly aggressive, runs along fences, will stand in corner if humans stay away, may pace fence; 3 = moderately aggressive, runs along fences, head up and will run if humans come closer, stops before hitting gates and fences, avoids humans; 4 = aggressive, runs away, stays in back of group, head high and very aware of humans, may run into fences and gates even with some distance, will likely run into fences if alone in pen; 5 = very aggressive, excited, runs into fences, runs over humans and anything else in path, "excitable." Pen scores (Kunkle et al., 1986) were based on visual assessments of each animal while being confined to a pen with groups of 3 animals.

EV increased, net returns decreased along with an increase in the number of days treated ($P < 0.07$). Researchers at Iowa State University reported that not only does cattle disposition influence convenience traits, but disposition also influences feedlot performance and carcass quality (Busby, 2005). In conclusion, cattle that possess more excitable temperaments have increased treatment costs and lower net profits compared with cattle with calmer temperaments. In addition, temperament assessment of herd replacements, whether sire or dam, needs to be an important consideration for cattle producers, because cattle temperament is a moderately heritable trait that can have an effect on progeny and their temperament and production performance.

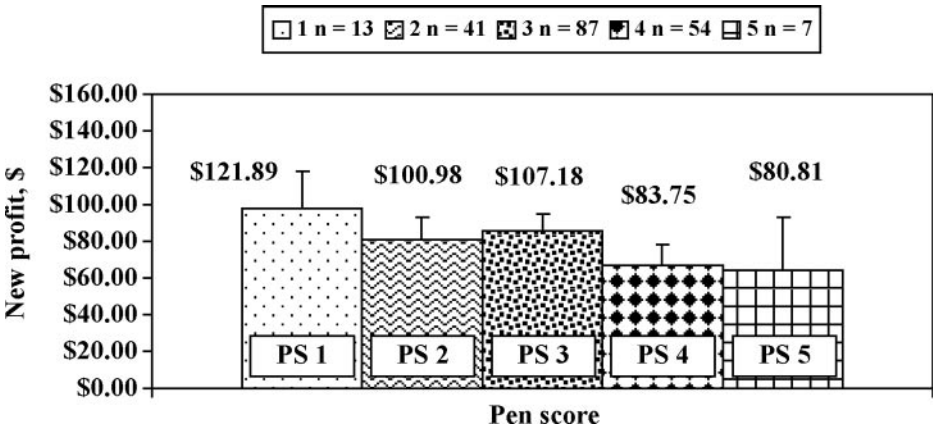

Figure 3. Net profit of calves associated with the pen score (PS) temperament method. The number of calves included in each pen score is listed in the legend. Net profit was calculated as follows: net profit = (slaughter value − beginning value − feeding cost − hauling cost − individual treatment cost). Individual feed costs were based on pen averages. The per-period individual feed cost was determined by the daily pen feed cost per period per number of days an animal was in the pen that period. Daily pen feed costs per period were then summed over all periods for each animal. Pen score scale: 1 = nonaggressive, docile, walks slowly, can approach slowly, not excited by humans; 2 = slightly aggressive, runs along fences, will stand in corner if humans stay away, may pace fence; 3 = moderately aggressive, runs along fences, head up and will run if humans come closer, stops before hitting gates and fences, avoids humans; 4 = aggressive, runs away, stays in back of group, head high and very aware of humans, may run into fences and gates even with some distance, will likely run into fences if alone in pen; 5 = very aggressive, excited, runs into fences, runs over humans and anything else in path, "excitable." Pen scores (Kunkle et al., 1986) were based on visual assessments of each animal while being confined to a pen with groups of 3 animals.

IMPLICATIONS

Human-animal interactions in cattle production systems commonly occur through handling coupled with various management practices. The subjective pen temperament score and the objective EV temperament measurements had the best correlation with overall temperament scores of individual animals. Temperamental animals had increased feedlot treatment costs and decreased animal growth performance and net returns compared with calmer animals. Beef cattle producers can have an impact on their overall profitability by assessing the temperament of their cow herds and calf crops and culling those animals that are temperamental, because they pose an economic risk attributable to their reduced growth performance and profitability in a feedlot production system.

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