

**Correlation of Docility and Exit Velocity with Economically Relevant Traits**

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Docility is a trait that has gained increasing popularity among beef cattle producers for a variety of reasons. Not only are more docile animals perceived to be safer for the humans who own and/or work around them, but they have also been shown to have higher average daily gains (Burrow, 1997; Voisinet et al., 1997b), better carcass characteristics (Voisinet et al., 1997a; King et al., 2006; Vann, 2006), and to be more profitable in the feedlot (Busby et al., 2005). The advantage to having more docile animals appears to be undeniable, but correlations of docility across time and to many other traits of interest to producers are still relatively unknown.

Preliminary results from two ongoing projects at Michigan State University measuring docility in beef cattle are summarized here. Both are multi-year projects that have just completed or are in the process of completing their first year of data collection.

**Weaned feeder calves.** Project 1 involved measurement of docility in 23 weaned Limousin x Angus F<sub>2</sub> calves born in 2008 and currently in the feedlot. Docility and exit velocity, a potential indicator of docility, were measured in all animals at weaning, before transport to the feedlot (44 d post-weaning), and when arriving at the feedlot (a few hours later on d 44). Docility was measured using the scoring system of the North American Limousin Foundation (Table 1) and was independently evaluated by 2 (pre- and post-transport) or 3 (weaning) evaluators and later averaged. Exit velocity was measured by placing two pairs of electronic eyes approximately 6 feet apart and measuring the amount of time taken by the animal to cover the distance between the two pairs of eyes.

Summary statistics for docility and exit velocity as well as birth weight, weaning weight, weights pre- and post-transport to the feedlot, weight shrink following transport, and weaning hip height are shown in Table 2.

Correlations between all traits with docility and exit velocity are shown in Table 3. As expected, correlations between exit velocity and docility during the same event were positive and moderate in magnitude, as were correlations between both measures across the three time points. In general, weight and height traits were lowly correlated with docility scores and exit velocities, but showed the highest correlations with pre-transport exit velocity, indicating that taller, heavier animals tended to exit the chute faster than their smaller contemporaries. Birth weight showed a positive and moderate correlation between post-transport docility score and birth weight, although this may be a function of the small data set. Interestingly, shrink showed negative correlations with docility scores measured at weaning (-0.25) and post-transport (-0.20), indicating that

animals that were perceived as more hyperactive lost less weight in transport than more docile animals.

This study only included 23 animals and results are preliminary. Animals are currently in the feedlot and additional docility scores and exit velocities will be collected along with carcass data when animals are harvested. Animals will also be added to the dataset from the 2009 and 2010 calf crops.

**Yearling bulls.** Project 2 involved 108 bulls entered in the Michigan Cattlemen's Association/Michigan State University Bull Performance Test and measured for docility score and exit velocity at 28d intervals throughout the 112 d test. Both docility scores and exit velocities were measured in the same manner as in Project 1. .

Routine phenotypic measures such as weight and ultrasound carcass measurements were also collected and analyzed and summary statistics for these measures are shown in Table 4. Bulls represented 5 breeds (Angus, Charolais, Hereford, Red Angus, and Simmental) and averaged 283.9, 395.9, and 418.9 d of age with a standard deviation of 51.5 d when placed on test, off test, and on sale day, respectively.

The correlations for all traits with the various docility and exit velocity measures are shown in Table 5 for all bulls and in Table 6 and 7 for Angus and Simmental bulls, respectively. The majority of the bulls consigned to the test were Angus or Simmental with only 7 being from the other 3 breeds.

Across all bulls, exit velocity was not highly correlated with any of the other phenotypic traits. Docility score measured when bulls were put on test showed the highest correlation with most traits as shown in Table 5. Increased docility score (a more anxious animal) was correlated with lower weaning weights, greater average daily gain, lower off-test hip height, greater ultrasound ribeye area, more ultrasound intramuscular fat, more ultrasound backfat, and a lower sale price.

In this data, there appears to be a breed effect with regard to docility, as many of the correlations were different when comparing Angus to Simmental bulls. In general, the fat measurements in Angus tended to be more highly correlated with docility and exit velocity than in Simmental bulls, indicating that fatter Angus animals were more excitable and exited the chute and sale ring faster than their leaner contemporaries. Ultrasound percent intramuscular fat was highly correlated with sale day docility score in Angus (0.66), but lowly to moderately correlated (0.20) in Simmental. Ultrasound backfat was highly correlated with sale day docility score and on- and off-test exit velocities in Angus bulls (0.55, 0.50, and 0.43, respectively) while being lowly correlated in Simmental with off-test exit velocity being negatively correlated (0.14, 0.10, and -0.12, respectively).

Although correlation estimates were low, there appeared to be a trend that more anxious bulls, as exhibited by faster exit velocities, were more likely to fail their breeding soundness exam, and therefore be excluded from the sale, with these correlations

being stronger in Simmental bulls than in Angus. Also, though weakly correlated, there appeared to be a trend that Angus bulls that were more docile had a higher sale price, but Simmental bulls that were more docile received a lower sale price. For Angus, these correlations were the lowest in magnitude for the docility measurements taken on sale day (the only time when most buyers would have seen the bulls), but were highest on sale day for the Simmental bulls.

### Summary

Further data collection is necessary; however, at this time the data does support that docility score is correlated with weight traits in feeder heifers and steers, but may have a lesser effect in intact males. With regard to yearling bulls, there does appear to be a breed effect of docility scores and exit velocities on performance measures that warrant further investigation.

### Literature Cited

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**Table 1. North American Limousin Foundation docility score description**

1	DOCILE	Mild disposition, gentle and easily handled, stands and moves slowly during processing, undisturbed, settled, somewhat dull, does not pull on headgate when in chute, exits chute calmly
2	RESTLESS	Quieter than average but slightly restless, may be stubborn during processing, may try to back out of chute, pulls back on headgate, some flicking of tail, exits chute promptly
3	NERVOUS	Typical temperament, manageable but nervous and impatient, a moderate amount of struggling, movement and tail flicking, repeated pushing and pulling on headgate, exits chute briskly
4	FLIGHTY (WILD)	Jumpy and out of control, quivers and struggles violently, may bellow and froth at mouth, continuous tail flicking, defecates and urinates during processing, frantically runs fenceline and may jump when penned individually, exhibits long flight distance (see glossary for definition) and exits chute wildly
5	AGGRESSIVE	May be similar to score 4 but with added aggressive behavior, fearful, extreme agitation, continuous movement which may include jumping and bellowing while in chute, exits chute frantically and may exhibit attack behavior when handled alone
6	VERY AGGRESSIVE	Extremely aggressive temperament, “killers”, pronounced attack behavior

**Table 2. Summary statistics for all traits<sup>1</sup> measured in weaned calves**

	BWT	WWT	WHH	PRW	POW	SRK	WDS	PRD	POD	WEV	PRE	POE
Mean	89.6	460.0	43.6	509.1	487.4	21.7	2.54	2.33	2.39	9.21	8.11	5.72
Std. Dev.	7.4	70.1	1.6	87.6	85.5	12.1	0.73	0.83	0.69	2.83	3.31	2.09

<sup>1</sup> BWT – Birth Weight (lb); WWT – Weaning Weight (lb); WHH – Weaning Hip Height (in); PRW – Pre-Transport Weight (lb); POW – Post-Transport Weight (lb); SRK – Weight Shrink from Transport (lb); WDS – Weaning Docility Score; PRD – Pre-Transport Docility Score; POD – Post-Transport Docility Score; WEV – Weaning Exit Velocity (ft/sec); PRE – Pre-Transport Exit Velocity (ft/sec); POE – Post-Transport Exit Velocity (ft/sec)

**Table 3. Phenotypic correlations with docility and exit velocity across all traits<sup>1</sup> in weaned calves**

	WDS	PRD	POD	WEV	PRE	POE
BWT	0.10	-0.12	0.35	-0.12	-0.17	0.10
WWT	0.02	-0.14	0.09	0.05	0.20	-0.08
WHH	-0.02	-0.14	0.07	0.17	0.25	-0.09
PRW	0.07	-0.04	0.11	0.08	0.20	-0.07
POW	0.10	-0.06	0.15	0.07	0.18	-0.07
SRK	-0.25	0.09	-0.20	0.06	0.15	-0.06
WDS		0.40	0.62	0.53	0.47	0.45
PRD			0.48	0.25	0.39	0.60
POD				0.52	0.45	0.73
WEV					0.68	0.40
PRE						0.64

<sup>1</sup> BWT – Birth Weight (lb); WWT – Weaning Weight (lb); WHH – Weaning Hip Height (in); PRW – Pre-Transport Weight (lb); POW – Post-Transport Weight (lb); SRK – Weight Shrink from Transport (lb); WDS – Weaning Docility Score; PRD – Pre-Transport Docility Score; POD – Post-Transport Docility Score; WEV – Weaning Exit Velocity (ft/sec); PRE – Pre-Transport Exit Velocity (ft/sec); POE – Post-Transport Exit Velocity (ft/sec)

**Table 4. Summary statistics for all traits<sup>1</sup> measured in yearling bulls**

	BWT	WWT	ONW	OFW	ADG	WDA	HHT	REA	IMF	FAT	NDS	FDS	SDS	NEV	FEV	SEV	SPR
Mean	84.1	716.8	843.7	1251.5	3.6	3.2	50.9	12.1	3.1	0.3	2.4	1.6	2.8	6.7	6.3	5.3	1883.1
Std. Dev.	8.6	79.0	138.0	162.5	0.5	0.3	1.7	1.4	1.0	0.1	0.8	1.0	0.9	3.3	2.8	3.8	561.2

<sup>1</sup> BWT – Birth Weight (lb); WWT – Weaning Weight (lb); ONW – On-Test Weight (lb); OFW – Off-Test Weight (lb); ADG – Average Daily Gain on Test (lb/d); WDA – Weight per Day of Age (lb/d); HHT – Off-Test Hip Height (in); REA – Ultrasound Ribeye Area (in<sup>2</sup>); IMF – Ultrasound Intramuscular Fat (%); FAT – Ultrasound Backfat (in); BSE – Breeding Soundness Exam; NDS – On-Test Docility Score; FDS – Off-Test Docility Score; SDS – Sale Day Docility Score; NEV – On-Test Exit Velocity (ft/sec); FEV – Off-Test Exit Velocity (ft/sec); SEV – Sale Day Exit Velocity (ft/sec); SPR – Sale Price (\$)

**Table 5. Phenotypic correlations with docility and exit velocity across all traits<sup>1</sup> for all bulls**

	NDS	FDS	SDS	NEV	FEV	SEV
BWT	0.12	-0.04	-0.03	-0.05	-0.01	-0.07
WWT	-0.45	-0.08	0.01	-0.05	-0.14	0.00
ONW	-0.04	-0.05	-0.11	0.03	-0.03	0.05
OFW	-0.04	-0.01	-0.10	0.07	-0.04	0.07
ADG	0.56	0.04	-0.24	-0.11	0.03	0.00
WDA	0.09	-0.01	-0.14	-0.01	-0.07	0.00
HHT	-0.52	-0.02	0.16	0.08	-0.06	-0.03
REA	0.60	0.07	-0.17	-0.05	0.10	0.03
IMF	0.45	0.04	0.10	0.12	0.13	0.07
FAT	0.54	0.07	-0.11	0.04	0.13	0.04
BSE <sup>2</sup>	-0.15	-0.01	0.23	-0.15	-0.09	-0.01
SPR	-0.28	-0.07	0.10	0.18	0.00	0.02
NDS		0.33	0.07	0.38	0.36	0.15
FDS			0.13	0.35	0.40	0.22
SDS				0.45	0.41	0.37
NEV					0.74	0.49
FEV						0.25

<sup>1</sup> BWT – Birth Weight (lb); WWT – Adj. 205-d Weight (lb); ONW – On-Test Weight (lb); OFW – Off-Test Weight (lb); ADG – Average Daily Gain on Test (lb/d); WDA – Weight per Day of Age (lb/d); HHT – Off-Test Hip Height (in); REA – Ultrasound Ribeye Area (in<sup>2</sup>); IMF – Ultrasound Intramuscular Fat (%); FAT – Ultrasound Backfat (in); BSE – Breeding Soundness Exam; SPR – Sale Price (\$); NDS – On-Test Docility Score; FDS – Off-Test Docility Score; SDS – Sale Day Docility Score; NEV – On-Test Exit Velocity (ft/sec); FEV – Off-Test Exit Velocity (ft/sec); SEV – Sale Day Exit Velocity (ft/sec)

<sup>2</sup> Breeding soundness exam was coded as a 1 if a bull failed, 2 if a bull passed marginally, and 3 if a bull passed with no problem. Bulls that failed could not be sold and therefore any sale day measures only include bulls with a BSE coded as 2 or 3

**Table 6. Phenotypic correlations with docility and exit velocity across all traits<sup>1</sup> for Angus bulls**

	NDS	FDS	SDS	NEV	FEV	SEV
BWT	0.06	-0.21	0.03	-0.04	-0.06	-0.19
WWT	-0.14	-0.07	-0.14	-0.14	-0.15	0.08
ONW	-0.01	-0.02	-0.27	0.05	-0.04	0.08
OFW	-0.02	0.01	-0.29	0.05	-0.06	0.06
ADG	-0.01	0.09	-0.22	0.03	-0.06	-0.02
WDA	0.07	-0.02	0.06	0.10	-0.08	0.12
HHT	-0.09	-0.03	-0.31	-0.11	-0.11	-0.15
REA	0.29	0.07	0.27	0.32	0.30	0.15
IMF	0.00	0.03	0.66	0.24	0.28	0.03
FAT	0.16	0.19	0.55	0.50	0.43	0.23
BSE <sup>2</sup>	0.15	0.20	-0.03	-0.13	-0.06	-0.21
SPR	-0.10	-0.13	-0.04	-0.12	-0.17	-0.07
NDS		0.34	0.19	0.45	0.31	0.16
FDS			0.18	0.20	0.26	0.20
SDS				0.36	0.53	0.18
NEV					0.76	0.49
FEV						0.23

<sup>1</sup> BWT – Birth Weight (lb); WWT – Adj. 205-d Weight (lb); ONW – On-Test Weight (lb); OFW – Off-Test Weight (lb); ADG – Average Daily Gain on Test (lb/d); WDA – Weight per Day of Age (lb/d); HHT – Off-Test Hip Height (in); REA – Ultrasound Ribeye Area (in<sup>2</sup>); IMF – Ultrasound Intramuscular Fat (%); FAT – Ultrasound Backfat (in); BSE – Breeding Soundness Exam; SPR – Sale Price (\$); NDS – On-Test Docility Score; FDS – Off-Test Docility Score; SDS – Sale Day Docility Score; NEV – On-Test Exit Velocity (ft/sec); FEV – Off-Test Exit Velocity (ft/sec); SEV – Sale Day Exit Velocity (ft/sec)

<sup>2</sup> Breeding soundness exam was coded as a 1 if a bull failed, 2 if a bull passed marginally, and 3 if a bull passed with no problem. Bulls that failed could not be sold and therefore any sale day measures only include bulls with a BSE coded as 2 or 3

**Table 7. Phenotypic correlations with docility and exit velocity across all traits<sup>1</sup> for Simmental bulls**

	NDS	FDS	SDS	NEV	FEV	SEV
BWT	0.13	-0.02	-0.24	-0.05	0.01	-0.02
WWT	-0.16	-0.20	-0.26	-0.19	-0.16	-0.07
ONW	0.21	-0.05	-0.09	-0.08	0.03	0.02
OFW	0.18	0.00	-0.15	0.02	0.02	0.06
ADG	0.02	0.09	-0.18	0.21	-0.01	0.11
WDA	0.10	-0.05	-0.26	-0.01	0.00	-0.15
HHT	0.23	0.09	-0.45	0.10	0.09	-0.16
REA	0.17	0.01	0.16	0.09	0.16	-0.01
IMF	0.16	0.10	0.20	0.20	0.00	0.25
FAT	0.03	0.02	0.14	0.10	-0.12	-0.03
BSE <sup>2</sup>	-0.18	-0.27	-0.02	-0.28	-0.18	0.13
SPR	-0.09	0.10	0.14	0.19	0.17	0.29
NDS		0.41	0.15	0.61	0.58	0.11
FDS			0.01	0.59	0.62	0.22
SDS				0.55	0.38	0.65
NEV					0.79	0.60
FEV						0.35

<sup>1</sup> BWT – Birth Weight (lb); WWT – Adj. 205-d Weight (lb); ONW – On-Test Weight (lb); OFW – Off-Test Weight (lb); ADG – Average Daily Gain on Test (lb/d); WDA – Weight per Day of Age (lb/d); HHT – Off-Test Hip Height (in); REA – Ultrasound Ribeye Area (in<sup>2</sup>); IMF – Ultrasound Intramuscular Fat (%); FAT – Ultrasound Backfat (in); BSE – Breeding Soundness Exam; SPR – Sale Price (\$); NDS – On-Test Docility Score; FDS – Off-Test Docility Score; SDS – Sale Day Docility Score; NEV – On-Test Exit Velocity (ft/sec); FEV – Off-Test Exit Velocity (ft/sec); SEV – Sale Day Exit Velocity (ft/sec)

<sup>2</sup> Breeding soundness exam was coded as a 1 if a bull failed, 2 if a bull passed marginally, and 3 if a bull passed with no problem. Bulls that failed could not be sold and therefore any sale day measures only include bulls with a BSE coded as 2 or 3