


## Genetic Improvement of Beef Cattle Temperament

R. L. Weaber, Ph.D.  
[WeaberR@missouri.edu](mailto:WeaberR@missouri.edu)  
 F. E. Creason  
 Division of Animal Sciences  
 University of Missouri-Columbia



## Overview

- Why is temperament important?
- Measures of temperament
- Phenotypic relationships
- Genetic relationships


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## Why is temperament important?

- Animal well being
- Handler well being/safety
  - Mean age of operator increasing
  - Family operations
- Facility construction and maintenance
- Performance in correlated traits
  - Can we improve profitability?


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## Measures of temperament

- Chute score (subjective)
  - Measured on individual animal
  - 1 (docile)-6 (very aggressive) (BIF Guidelines)
- Pen score (subjective)
  - 1-5 animals in pen
  - 1 calm, 5 very aggressive
- Exit velocity or flight speed (objective)
- Chute tensometer (g force) (objective)


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## Genetic Evaluation of Temperament

- Genetic Evaluations (Chute score):
  - North American Limousin Foundation
  - American Salers Association
  - Other breeds collecting data
- Australian work
  - Exit velocity  $h^2 = 0.35$ , Chute score  $h^2 = 0.30$
- US work
  - Vann, Randle et al. MSU, TAMU (phenotypic)
    - Correlations with FI, BW, ADG, WBSF
  - MU

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## MU Research Objectives

- Establish relationship between disposition and production traits
- Evaluation of subjective and objective measures of disposition
- Investigate relationship of serial measures of disposition
- Estimate genetic relationships between measures of disposition and production traits
- Produce genetic evaluation for selection at MO-AES

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## MU Research Overview



- Effects of disposition on:
  - Post-weaning growing period
  - Placement weights, ADG, Feed Efficiency
- Genetic Evaluation of measures of disposition
  - Trait heritabilities
  - Genetic correlations

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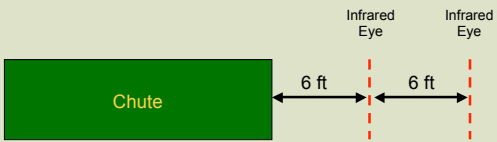
## Phase I: Materials and Methods





- 111 Spring Born Angus Cross Steers
  - Known Pedigree
  - MFA Health Track Program
- Disposition
  - Pen Score (PS)
    - 1=Gentle, 5=Aggressive
  - Exit Velocity (EV)
    - ft/sec
- Weight Gain
  - Back-grounding period - 55 days post-weaning
  - Diet included self-fed concentrate and improved fescue pastures

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## Exit Velocity





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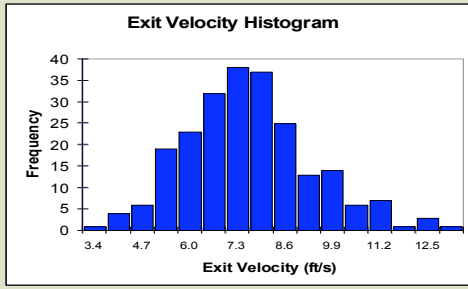
## Data Collection



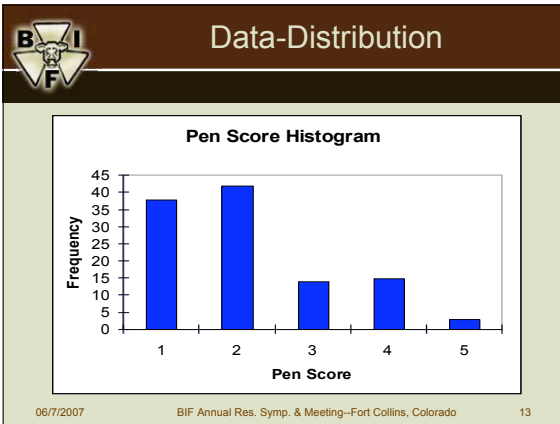
- Steers Weight
  - Initial- Avg. 533.94 ± 5.39 lbs (242.70 ± 2.45 kg)
  - Finished- Avg. 701.65 ± 1.78 lbs (318.93 ± 3.08 kg)
  - 55 Day Gain- Avg. 167.71 ± 2.45 lbs (76.23 ± 1.12 kg)
    - ADG=3.05 lbs/day (1.38 kg/day)
- Steers Disposition
  - PS= Avg. 2.09 ± 0.11
  - EV= Avg. 7.38 ± 0.16 ft/s (2.25 ± 0.05 m/s)

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## Data-Distribution

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### Data Analysis

$$Wt.Gain_i = EV_i + PS_i + Sire_{ji} + e_i$$

- Fixed Effects
  - Pen Score
  - Exit Velocity
- Random Effect
  - Sire
- Full Model (EV, PS, Sire)
  - EV only significant source of variation ( $P < 0.05$ )
  - Faster flight times were negatively associated with weight gain
- Reduced Model (EV, Sire)
  - EV and Sire both significant ( $P < 0.05$ )

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### Results-Linear Model

- Steers with faster EV gained less  
 $-11.88 \pm 4.7$  lb/sec ( $-5.39 \pm 2.13$  kg/sec)

EV Std. Dev (1.64 ft/s)	EV (ft/s)	Gain	Gain Difference	ADG	ADG Difference
-2	4.1	206.68	38.97	3.76	0.71
-1	5.7	187.19	19.48	3.40	0.35
0	7.4	167.71	0.00	3.05	0.00
1	9.0	148.23	-19.48	2.70	-0.35
2	10.7	128.74	-38.97	2.34	-0.71

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### Results-Correlations

Correlation—a measure of linear relationship between two variables.

	PS	EV	WG
PS	1.00	0.36	-0.21
EV	0.36	1.00	-0.24
WG	-0.21	-0.24	1.00

All  $P < 0.05$

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### Phase II: Materials and Methods


- 330 head of MFA steers on trial
  - All weight gain and carcass data collected
  - 2/3 have individual feed intake measured
  - Establish relationship between disposition, efficiency, gain and carcass merit
  - Various hormone profiles
- Genetic evaluation of disposition using EV and PS

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### Correlation of Measures of Disposition with Gain Performance of Steers

- Angus cross steers (n=332)
- Four sources, two processing facilities
- Weights, Exit Velocity (EV) collected on two consecutive days at initiation of test
- Pen Score (PS) collected during feeding period
- Average Wt. (AVGWT), Average EV (AVGEV) computed


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### Correlation of Measures of Disposition with Gain Performance of Steers

	Facility 1	Facility 2
AVGWT(kg.)	342.6 sd 25.3	305.3 sd 32.0
AVGEV (m/sec)	2.50 sd 0.68	2.68 sd 0.99
PS	1.95 sd 0.70	1.86 sd 0.81

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### Correlation of Measures of Disposition with Gain Performance of Steers

**Model 1:**  
MANOVA—SAS PROC GLM to compute partial correlation coefficients

AVGEV,AVGWT,PS=CL+SC+SID

CL, SC as Fixed Effects  
SID as Random Effect

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### Correlation of Measures of Disposition with Gain Performance of Steers

**Model 1: Partial Correlation Coefficients**

	AVGWT	PS
AVGEV	-0.34 ( <i>p</i> <0.0001)	0.43 ( <i>p</i> <0.0001)
AVGWT		-0.36 ( <i>p</i> <0.0001)


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### Correlation of Measures of Disposition with Gain Performance of Steers

**Increases in EV and PS were negatively associated with AVGWT at start of feeding trial.**


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### Relationship of Measures of Disposition and Feed Intake and Growth Performance of Steers

- Angus cross steers (n=192)
- Four sources, two processing facilities
- GROWsafe automated individual feed intakes
- EV and WT recorded on two consecutive days at initiation of test
- AVGEV, AVGWT, FI, RFI, ADG computed

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### Relationship of Measures of Disposition and Feed Intake and Growth Performance of Steers


Linear mixed model SAS PROC MIXED

AVGEV=Source+CL+PS+AVGWT+SID

Source, CL, PS - fixed effects  
AVGWT - covariate  
SID - random effect

Source, PS, AVGWT, SID significant (*p*<0.05)

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 Relationship of Measures of Disposition and Feed Intake and Growth Performance of Steers

Linear mixed model SAS PROC MIXED

FI, ADG, RFI = Source+CL  
+PS+Group+AVGEV+AVGWT+SID

Source, CL, PS, Group – fixed effects  
AVGEV, AVGWT – covariates  
SID – random effect

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 Relationship of Measures of Disposition and Feed Intake and Growth Performance of Steers


**Significance:**

**FI** – Group ( $p < 0.001$ ), SID ( $p < 0.01$ )

**ADG** – AVGWT, AVGEV, Group ( $p < 0.01$ )


**RFI** – Group ( $p < 0.03$ ), SID ( $p < 0.01$ )

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 Relationship of Measures of Disposition and Feed Intake and Growth Performance of Steers


- AVGEV and PS not significant predictors of variation in phenotypic performance for FI or RFI.
- AVGEV significant source of variation in ADG
- Sire effects significant, indicative of heritable component of disposition
- Selection for improved AVGEV may improve ADG

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 Genetic Evaluation of EV and PS

- Two trait, sire model
- 661 animals in 7 generation pedigree
- 319 animals with performance record
  - (MFA project)
- Fixed effects included:
  - Source (4)
  - Processing Location (2)
  - GrowSAFE group (3)
- Covariates
  - Age (quadratic)
  - Weight (quadratic)
- Random effect–Sire


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 Heritabilities and Correlations

Estimate (Std Error)	EV	PS
EV	<b>0.35</b> (0.078)	<b>0.20</b>
PS	<b>0.28</b> (0.825)	<b>0.15</b> (0.058)

\*Heritability on diagonal, phenotypic correlation above, genetic correlation below

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 EV and PS EPDs

	EV EPD	EV Acc.	PS EPD	PS Acc.
<b>Minimum</b>	-0.33	0.00	-0.10	0.00
<b>Maximum</b>	0.27	0.79	0.10	0.66
<b>Average</b>	-0.02	0.20	0.01	0.15

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# Questions

# Thank You!

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