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MONITORING THE LINEAR SYSTEM DATA COLLECTION IN SPANISH HORSE BREEDS

M^a Dolores Gómez Ortiz
MERAGEM Research Group



DESIGNING THE LINEAR SYSTEM

PROBLEM / OBJECTIVE	PROPOSED SOLUTION
Clear definition of traits to ensure adequate data collection	Selection of primary traits (related with body measurements) including a reference to body measurement for each class
Selection of conformation traits related with functional performance for adequate indirect selection	Test genetic correlations between conformation and performance traits periodically, review of genetic indexes and traits included
Promotion the use of breeding values for breeders in the design of mating	Use of traits with interest and knowledge for the breeders (i.e. height at withers) as reference in the system
Inclusion of defects and other traits with direct interest to breeders but with difficult definition (i.e. melanoma, cresty neck, vitiligo...)	Reduction of number of classes for these traits, including a clear definition of them (using pictures, images...)



FIELD DATA COLLECTION

PROBLEM / OBJECTIVE	PROPOSED SOLUTION
No homogeneous conditions for data collection (presentation, light conditions, fatigue...)	Homogenization of conditions for data collection: <ul style="list-style-type: none"> •Concentration of age of animals •Standardize presentation for evaluation of angles •Establish compulsory break times for appraisers •Homogenize environmental conditions (light, season, place...)
Ensure adequate data collection from the beginning	Pre-selection of appraisers to collect data: <ul style="list-style-type: none"> •Teach a course •Evaluate proposed persons •Select those with higher level •Periodical checking and training
Ensure equilibrate number of evaluations by appraisers to obtain adequate evaluation of data collected	Homogeneous distribution of animals between appraisers: <ul style="list-style-type: none"> •Repeated evaluations by the same appraiser •Evaluation of animals measured for body measures (primary traits) •Evaluation of the animals by different appraisers
Increase number of evaluated animals	Make the most of the concentration of animals in shows, competitions, test for mares and stallions...



EVALUATION OF SYSTEM AND APPRAISERS

- The evaluation of the system includes different statistical and genetic tests:

TEST	USE
<ul style="list-style-type: none"> •Basic statistics (mean, max., min., range, mode, CV...) •Analysis of frequencies 	Evaluation of the use of the scale and distribution of the population by classes.
•Reproducibility (Cervantes et al.,2010; Sánchez et al., 2013)	<p><i>DEF: Probability that two appraisers produced the same appraisal for the same trait and the same horse, estimated as an intra-class correlation between horses, measured by more than one appraiser.</i></p> <p>Evidence the capacity of appraisers to discern the small differences between classes within the biological scale of the population.</p>
•Heritabilities and genetic correlations	Evaluating the adequate response to selection for traits. Evidence the relationship between morphological traits to reduce the number of evaluated traits and to set up a genetic index.
•Partial least square regression analysis with request reduced rank regression methodology	Selection of the most predictive linear traits over Dressage traits using breeding values.
<ul style="list-style-type: none"> •Canonical analysis •Chi-square test •Regression analysis 	Evidence the relationship among traits and selecting a smaller number of traits to create a multi-character index.



EVALUATION OF SYSTEM AND APPRAISERS

- The evaluation of the appraisers includes different statistical tests:

TEST	USE
<ul style="list-style-type: none"> •Basic statistics (mean, max., min., range, mode, CV...) •Analysis of frequencies 	Evaluation of the use of the scale.
<ul style="list-style-type: none"> •Reliability (Cervantes et al.,2010) 	<p>DEF: Probability that the score given by the appraiser is in accordance with the measured value (body measurement), evaluated only for primary traits.</p> <p>Evidence the capacity of appraisers to measure the animal "with their eyes".</p>
<ul style="list-style-type: none"> •Repeatability (Cervantes et al.,2010; Sánchez et al., 2013) 	<p>DEF: Probability of awarding the same appraisal for the same trait and the same horse in two different appraisals by the same appraiser.</p> <p>Evidence the capacity of appraisers to repeat a measure for the same animal.</p>



EVALUATION OF SYSTEM AND APPRAISERS

PROBLEM / OBJECTIVE	PROPOSED SOLUTION
<p>Inadequate results for reliability, reproducibility or repeatability</p>	<p>Eliminating appraisers with values lower than 60%</p> <p>Intensive recycling of appraisers with values between 60-80%</p> <p>-Courses for appraisers:</p> <ul style="list-style-type: none"> •Clarify definition of traits •Detection of critical points •Advice to solve concrete problems <p>-Personal reports for each appraiser</p>
<p>Detection of divergence between appraisers</p>	<p>-Clarify definition of traits giving more information (pictures, videos, photos...)</p> <p>-Reduce subjective traits (secondary traits), i.e. divide secondary complex traits in different primary traits, selection of primary traits...</p>



EVOLUTION OF LINEAR ASSESSMENT

- Selection induces movement of biological scale.
- Periodical review of scale is compulsory, mainly for primary traits.
- Body measurements can be used to adequate the scale and to ensure the use of the whole range.
- Periodical review of system and appraisers to harmonize evaluation criteria is necessary.

