8th International Workshop on Linear Profiling in Horses
(14-15 April 2026 in Adelheidsdorf / Celle, Germany)

Comparing Linear Conformation Systems in Spanish Horse Breeds: the current status of the Arabian Horse

Mª Dolores Gómez Ortiz, Manuel Arcos, Davinia Perdomo-González, Mercedes Valera, Isabel Cervantes

MERAGEM Research Group

Evaluating conformation traits for genetic selection

- Reasons for selection of linear assessment:
  - **Rapid, simple and cost-effective:** does not require previous preparation of animals. All population is controlled
  - **Objective** (mainly for *primary traits): the appraiser does not compare the animal with the ideal
  - **Descriptive:** includes all variability of the population for each trait. All differences between animals are controlled
  - **Positive:** determinates the characteristics that individuals can transmit to the next generations. It is interesting for breeders to improve general conformation and correct defects
  - **Informative:** evidences the sense of deviation. It can be used for the genetic evaluations
  - **Flexible in time and space:** breeding evaluations are useful also if breeding objectives change

***Primary traits:** related with a body measurement, for example: length of head or length of neck.

Secondary traits: not related with a body measurement (subjective evaluation), for example: harmony or muscular development.

Linear Conformation Assessment

APRAISSERS

- **FUNCTION:** Responsible for official performance control
- **AIM:** Collect accurate data (providing accurate descriptions of the animals using the official form)

SCIENTISTS need APPRAISERS
to obtain adequate information for breeding evaluation

APPRAISERS need SCIENTISTS
to evaluate and improve their data control

SCIENTISTS

- **FUNCTION:** Responsible for official genetic evaluation
- **AIM:** Provide breeders with breeding values of animals for each evaluated trait (breeding stock catalogue)

Linear Conformation Assessment

- The **quality of genetic evaluations** depends to a large extent on the reliability of data collected.
- In the linear methodology, it also depends on the **quality of the appraisers** and how **appropriate the selected traits** are.
- To obtain **reliable information for genetic evaluations**, it is essential to ensure:
  - The correct selection of traits
  - The accurate evaluation of the animals, using the full scale and consistent scoring

Procedure for the correct development

1. DESIGN THE PERFORMANCE CONTROL (SELECTION OF TRAITS)

- Selection based on collected conformation data (body measures, angles, descriptions, biokinematic traits…), and different statistical and genetic analysis to ensure:
  - Enough **variability** to allow selection and ensure differentiation of classes by appraisers
  - Not negatively **correlated** traits to avoid negative response to selection
  - **Related** to performance, functional and biokinematic traits
  - Appropriate **heritability** level to ensure response to selection
  - Mainly ***primary** traits (more objectives and with an easier measurement by appraisers)

Livestock Science 185 (2016) 148–155

Contents lists available at ScienceDirect

Livestock Science

journal homepage: www.elsevier.com/locate/livsci

Relationship between morphology and performance: Signature of mass-selection in Pura Raza Español horse

M.J. Sánchez-Guerrero [a,*], A. Molina [b], M.D. Gómez [a], F. Peña [c], M. Valera [a]

[a] Departamento de Ciencias Agroforestales, Universidad de Sevilla, Ctra. Utrera km 1, 41013 Sevilla, España
[b] Departamento de Genética, Universidad de Córdoba, Ctra. Madrid-Cádiz Km.396', 14071 Córdoba, España
[c] Departamento de Producción Animal, Universidad de Córdoba, Ctra. Madrid-Cádiz Km.396', 14071 Córdoba, España

Archiv Tierzucht 56 (2013) 13, 137-148

Open Access

Original study

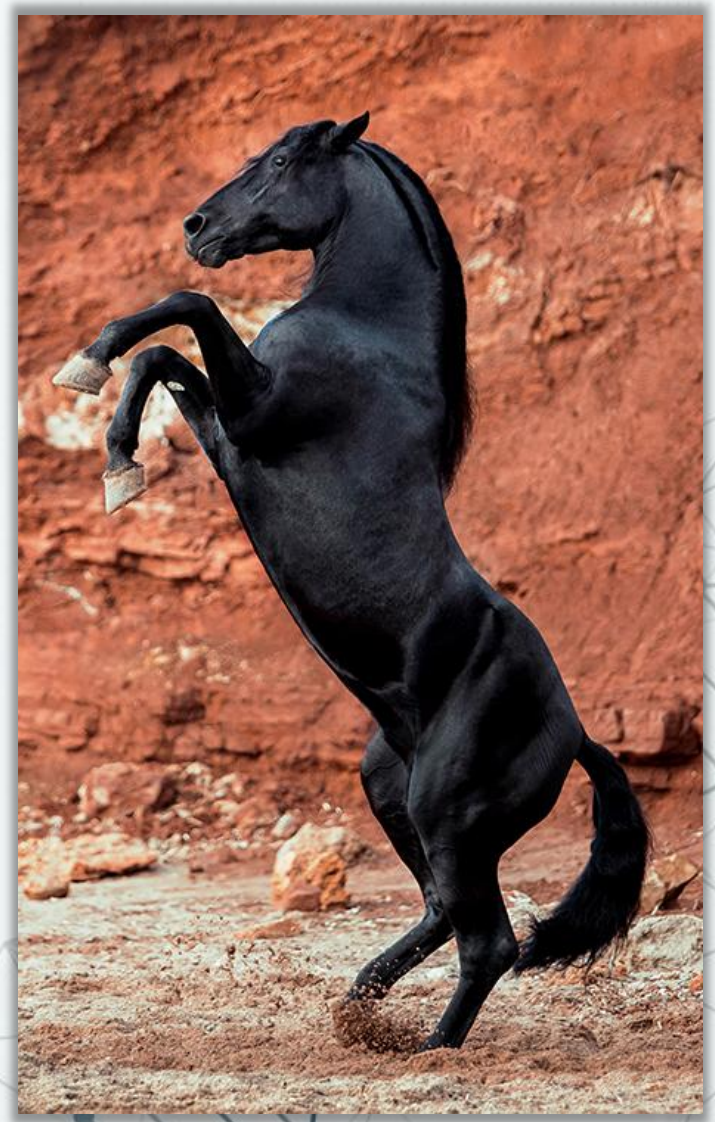
Relationship between conformation traits and gait characteristics in Pura Raza Español horses

María José Sánchez[1], María Dolores Gómez[1], Francisco Peña[3], José García Monterde[4], José Luís Morales[4], Antonio Molina[2] and Mercedes Valera[1]

[1]Department of Agro-Forestry Sciences, ETSIA, University of Seville, Seville, Spain, [2]Department of Genetics, University of Cordoba, Cordoba, Spain, [3]Department of Animal Production, University of Cordoba, Cordoba, Spain, [4]Department of Anatomy and Comparative Anatomy, University of Cordoba, Cordoba, Spain

Procedure for the correct development

PROBLEM / OBJECTIVE	PROPOSED SOLUTION
Clear definition of the traits to ensure adequate data collection	Selection of **primary traits** including a **reference to body measurement** for each class
Inclusion of defects and 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** (using pictures, images...)



Procedure for the correct development

2. IMPLEMENTATION OF THE PERFORMANCE CONTROL (AT FIELD)

PROBLEM / OBJECTIVE	PROPOSED SOLUTION
Non homogeneous conditions for data collection (presentation, light conditions, fatigue...)	**Homogenization of conditions** for data collection: • Concentration of animals by age, sex… • Standardize presentation for evaluation (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: • **Teach** a course • **Evaluate** proposed persons • **Select** those with higher level • Periodical **checking and training** of appraisers
Ensure **equilibrate number of evaluations** by appraisers to obtain adequate evaluation of data collected	**Homogeneous distribution** of animals between appraisers: • **Repeated** evaluations by each appraiser • Evaluation of animals **measured** for body measurements (primary traits) • Evaluation of the animals **by different appraisers**

Procedure for the correct development

3. EVALUATION OF THE PROCEDURE

***Reproducibility*:** the probability that two appraisers produced the same appraisal for the same trait and the same horse, for horses evaluated by more than one appraiser.

Evidences **capacity of appraisers** to distinguish differences between classes within biological scale

Repeatability: the probability of awarding the same rating for the same trait and the same horse in two ratings by the same appraiser.

Evidences the **capacity of appraisers** to repeat measurements on the same animal

Reliability: Probability that the score given by the appraiser is in accordance with the body measurement, evaluated only for primary traits.

Evidences the **capacity of appraisers** to evaluate the animal accurately by visual assessment

Procedure for the correct development

PROBLEM / OBJECTIVE	PROPOSED SOLUTION
Inadequate results for reliability, reproducibility or repeatability	• **Eliminating** appraisers with average values lower than 60% • Intensive **recycling** of appraisers with values between 60-80% • **Periodic courses** for appraisers: •Clarify definition of traits •Detection of critical points •Advice to solve concrete problems • **Personal reports** for each appraiser
Detection of **divergence between appraisers**	• **Clarify definition** of traits giving more information (pictures, videos, photos...) • **Reduce subjective traits** (secondary), i.e. divide secondary complex traits in different primary traits, selection of primary traits...

Procedure for the correct development

4. GENETIC EVALUATION OF LINEAR TRAITS

Livestock Science 253 (2021) 104701

Contents lists available at ScienceDirect

Livestock Science

journal homepage: www.elsevier.com/locate/livsci

Prediction of adult conformation traits from shape characteristics of Pura Raza Español foals

MD Gómez [a], A Molina [b], MJ Sánchez-Guerrero [a], M Valera [a,*]

[a] Departamento de Agronomía, ETSIA, Universidad de Sevilla, Sevilla, Spain
[b] Departamento de Genética, Universidad de Córdoba, Córdoba, Spain

animals

MDPI

Article

Morpho-Functional Traits in Pura Raza Menorquina Horses: Genetic Parameters and Relationship with Coat Color Variables

Davinia I. Perdomo-González [1], Rocío de las Aguas García de Paredes [1], Mercedes Valera [1], Ester Bartolomé [1] and María Dolores Gómez [1,2,*]

[1] Escuela Técnica Superior de Ingeniería Agronómica (ETSIA), Universidad de Sevilla, Carretera de Utrera km1, 41013 Sevilla, Spain
[2] Asociación de Criadores y Propietarios de Caballos de Raza Menorquina, Edificio Sa Roqueta, C/ Bijuters, 36, Bajos, 07760 Ciutadella de Menorca, Spain
* Correspondence: pottokamdg@gmail.com

Correspondence: mvalera@us.es

animals

MDPI

Article

Conformational Defects in the Limbs of Menorca Purebred Horses and Their Relationship to Functionality

Maria Ripollés-Lobo [1], Davinia I. Perdomo-González [1], Mercedes Valera [1] and María D. Gómez [2,*]

[1] Departamento de Agronomía, Escuela Técnica Superior de Ingeniería Agronómica, Universidad de Sevilla, Ctra, Utrera Km 1, 41013 Sevilla, Spain; marriplob@alum.us.es (M.R.-L.); dperdomo@us.es (D.I.P.-G.); mvalera@us.es (M.V.)
[2] Asociación de Criadores y Propietarios de Caballos de Raza Menorquina, Edificio Sa Roqueta C/Bijuters, 36 Bajos, 07760 Ciutadella de Menorca, Spain
* Correspondence: cavallmenorca@gmail.com

Jour
https
Adva
mal Genetics and Genomics
OXFORD
AMERICAN SOCIETY OF ANIMAL SCIENCE

esigning an early selection morphological traits index for eproductive efficiency in Pura Raza Española mares

vinia I. Perdomo-González,[†,1] María J. Sánchez-Guerrero,[†] Ester Bartolomé,[†] Rute Guedes dos ntos,[‡,||] Antonio Molina,[$] and Mercedes Valera[†]

partamento de Agronomía, Escuela Técnica Superior de Ingeniería Agromómica, Universidad de Sevilla, Sevilla 41013, Spain
lytechnic Institute of Portalegre, Portalegre 7300-110, Portugal
search Centre for Endogenous Resource Valorization (VALORIZA), Portalegre 7300-555, Portugal
partamento de Genética, Universidad de Córdoba, Córdoba 14014, Spain

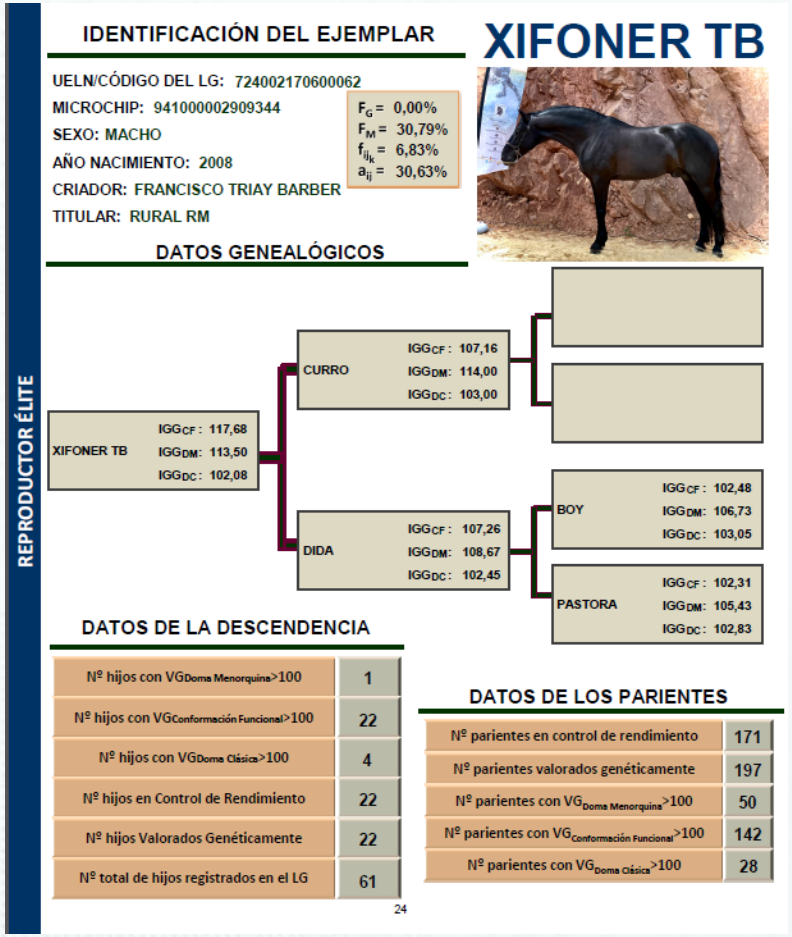
[1]Corresponding author: dperdomo@us.es

Procedure for the correct development

5. INFORMATION TO THE BREEDERS AND OWNERS (CATALOGUE OF BREEDING STOCK)

Procedure for the correct development

Example of a Catalogue of Breeding Stock for Pura Raza Menorquina Horses



REPRODUCTOR ÉLITE

IDENTIFICACIÓN DEL EJEMPLAR

XIFONER TB

UELN/CÓDIGO DEL LG: 724002170600062
MICROCHIP: 941000002909344
SEXO: MACHO
AÑO NACIMIENTO: 2008
CRIADOR: FRANCISCO TRIAY BARBER
TITULAR: RURAL RM

F_G = 0,00%
F_M = 30,79%
f_{ij_k} = 6,83%
a_{ij} = 30,63%

DATOS GENEALÓGICOS

XIFONER TB — IGG$_{CF}$: 117,68 — IGG$_{DM}$: 113,50 — IGG$_{DC}$: 102,08
- CURRO — IGG$_{CF}$: 107,16 — IGG$_{DM}$: 114,00 — IGG$_{DC}$: 103,00
  - [ ]
  - [ ]
- DIDA — IGG$_{CF}$: 107,26 — IGG$_{DM}$: 108,67 — IGG$_{DC}$: 102,45
  - BOY — IGG$_{CF}$: 102,48 — IGG$_{DM}$: 106,73 — IGG$_{DC}$: 103,05
  - PASTORA — IGG$_{CF}$: 102,31 — IGG$_{DM}$: 105,43 — IGG$_{DC}$: 102,83

DATOS DE LA DESCENDENCIA

Nº hijos con VG$_{Doma\ Menorquina}$>100	1
Nº hijos con VG$_{Conformación\ Funcional}$>100	22
Nº hijos con VG$_{Doma\ Clásica}$>100	4
Nº hijos en Control de Rendimiento	22
Nº hijos Valorados Genéticamente	22
Nº total de hijos registrados en el LG	61

DATOS DE LOS PARIENTES

Nº parientes en control de rendimiento	171
Nº parientes valorados genéticamente	197
Nº parientes con VG$_{Doma\ Menorquina}$>100	50
Nº parientes con VG$_{Conformación\ Funcional}$>100	142
Nº parientes con VG$_{Doma\ Clásica}$>100	28

24

Information of the animal (identification, pedigree, conservation criteria), descendants and relatives

REPRODUCTOR ÉLITE

XIFONER TB

VALORES GENÉTICOS PARCIALES DE DOMA MENORQUINA

CARÁCTER	VALOR	FIAB.
MOVIMIENTOS MENORQUINES	111,66	****
PUNTOS POR REPRISE	113,95	****

VALORES GENÉTICOS PARCIALES DE DOMA CLÁSICA

CARÁCTER	VALOR	FIAB.
PASO	99,23	***
TROTE	98,66	***
GALOPE	99,39	***
EXPECTATIVAS DE FUTURO	98,96	***
SUMISIÓN	99,06	***
PUNTOS POR REPRISE	103,92	**

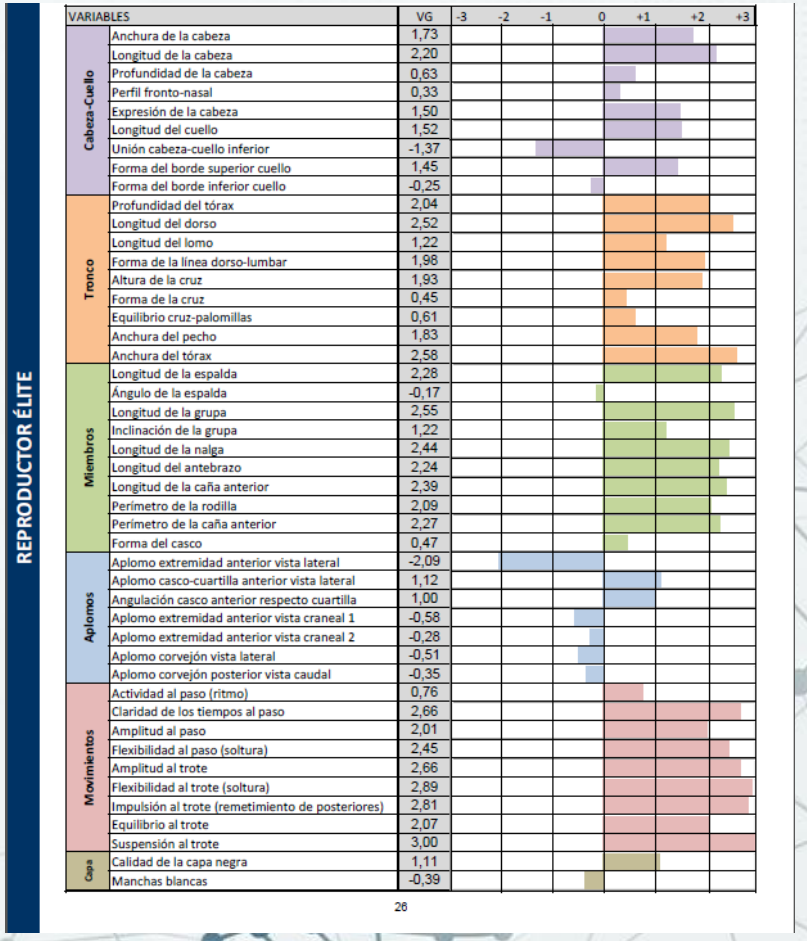
ÍNDICES GENÉTICOS GLOBALES

*ÍNDICE	VALOR	FIAB.
CONFORMACIÓN FUNCIONAL	117,68	****
DOMA MENORQUINA	113,50	****
DOMA CLÁSICA	102,08	**

* Según el Programa de Mejora, para ser Reproductor Élite, el animal debe ser Reproductor Mejorante en al menos 2 categorías, siendo obligatoria la conformación funcional y movimientos básicos. Para no repetir información, no se incluirán en este catálogo las fichas del animal como Reproductor Mejorante que han dado lugar a la obtención de la Categoría de Élite.

25

Information about functional breeding values (individual traits) and genetic indexes



REPRODUCTOR ÉLITE

	VARIABLES	VG	-3 -2 -1 0 +1 +2 +3
Cabeza-Cuello	Anchura de la cabeza	1,73	
	Longitud de la cabeza	2,20	
	Profundidad de la cabeza	0,63	
	Perfil fronto-nasal	0,33	
	Expresión de la cabeza	1,50	
	Longitud del cuello	1,52	
	Unión cabeza-cuello inferior	-1,37	
	Forma del borde superior cuello	1,45	
	Forma del borde inferior cuello	-0,25	
Tronco	Profundidad del tórax	2,04	
	Longitud del dorso	2,52	
	Longitud del lomo	1,22	
	Forma de la línea dorso-lumbar	1,98	
	Altura de la cruz	1,93	
	Forma de la cruz	0,45	
	Equilibrio cruz-palomillas	0,61	
	Anchura del pecho	1,83	
	Anchura del tórax	2,58	
Miembros	Longitud de la espalda	2,28	
	Ángulo de la espalda	-0,17	
	Longitud de la grupa	2,55	
	Inclinación de la grupa	1,22	
	Longitud de la nalga	2,44	
	Longitud del antebrazo	2,24	
	Longitud de la caña anterior	2,39	
	Perímetro de la rodilla	2,09	
	Perímetro de la caña anterior	2,27	
	Forma del casco	0,47	
Aplomos	Aplomo extremidad anterior vista lateral	-2,09	
	Aplomo casco-cuartilla anterior vista lateral	1,12	
	Angulación casco anterior respecto cuartilla	1,00	
	Aplomo extremidad anterior vista craneal 1	-0,58	
	Aplomo extremidad anterior vista craneal 2	-0,28	
	Aplomo corvejón vista lateral	-0,51	
	Aplomo corvejón posterior vista caudal	-0,35	
Movimientos	Actividad al paso (ritmo)	0,76	
	Claridad de los tiempos al paso	2,66	
	Amplitud al paso	2,01	
	Flexibilidad al paso (soltura)	2,45	
	Amplitud al trote	2,66	
	Flexibilidad al trote (soltura)	2,89	
	Impulsión al trote (remetimiento de posteriores)	2,81	
	Equilibrio al trote	2,07	
	Suspensión al trote	3,00	
Capa	Calidad de la capa negra	1,11	
	Manchas blancas	-0,39	

26

Information about breeding values for the individual conformation traits

Spanish breeds: Selection criteria

- **Pura Raza Española (PRE):**
  - Conformation
  - Classical Dressage performance

- **Pura Raza Menorquina (PRMe):**
  - Conservation criteria
  - Conformation
  - Classical and Menorca Dressage performance

- **Pura Raza Árabe (PRÁ):**
  - Conformation
  - Endurance performance

Spanish breeds: Available linear controls

- The Linear Assessment for the main Spanish Horse Breeds includes:

BREED	PRE	PRMe	PRÁ
N	175,024 (175,024 animals)	1253 (584 animals)	1768 (966 animals)
REQUERIMENT	≥ 3 years	≥ 3 years	≥ 3 years
PRIMARY	27 (measures)	19	29
SECONDARY	14	16	19
MOVEMENT	3	9	9
BEHAVIOUR	0	0	1
OTHERS	Defects (8, cresty neck, melanoma, ewe neck…)	Coat color and quality (2, black quality and white marks)	Temperament (1)
WHERE*	ST, MC, PT	ST, MC	YHPT

*Where: ST is studs, MC is morphological contests, PT is performance test and YHPT is young horses performance tests.

Spanish breeds: Comparison of morphological evaluation forms

FEATURE	PRE	PRMe	PRÁ
MAIN AIM	Certificate of **basic breeding aptitude** (Breeding stock status)	**Linear scoring** for breed control	**Linear scoring** for breed control
SCALE	**Mixed:** • Absolute values body measurements • 1-9 linear scale for conformation traits • 1-10 linear scale for gaits	1-7 level scale using letters from A to G	1-7 numerical scale
MEASUREMENTS	**27** specific measurements (cm and degrees)	**Integrates** measurement ranges (cm and degrees) directly for each trait	A **supplementary sheet** defining ranges (cm and degrees) for each level of the scale
GAITS	**Walk, Trot and Canter (3)**	**Walk and Trot (4, 5)**	**Walk and Trot (4, 5)**
SECTIONS	• Body measurements • Linear variables • Defects (serious/very serious) • Gaits • Reproductive status	• Anatomical regions (head to croup) • Limb conformation • Coat quality/white markings • Gaits	• Overall conformation • Views (front, lateral, rear) • Temperament • Gaits
SPECIFIC ATRIBUTES	Focuses on **defects, breed fidelity, harmony and health**	Focuses on black **coat quality** and the presence/extent of **white markings**	Focuses on **temperament** (from passive to irritable) and **character**

Breeding programme in PRÁ

Conformation	Linear conformation traits	≥3 years old
Functional Young Horses	Young Horse Competitions (YHC)	4-7 years old
Functional performance	Royal Equestrian Federation Competitions (REC)	All ages

Linear Assessment in PRÁ: the form

Traits related with:

- Breed quality
- Temperament
- Performance for endurance
- Lifetime (durability)

Traits in grey show the ranges for each class on the supplementary sheet (inclinations in degrees and the rest in centimetres).

Trait	Definition	1	2	3	4	5	6	7	Definition
GENERAL CONFORMATION									
Harmony	Not harmonious				Medium				Harmonious
Breed type	Poor				Medium				Very good
FRONT VIEW									
Head width	Narrow				Medium (21-22)				Wide
Chest width	Narrow				Medium (30-32)				Wide
Thoracic width	Narrow				Medium (50-52)				Wide
Thoracic girth	Small				Medium (175-180)				Large
Forelimb: conformation	Closed in				Vertical				Open
Forelimb: knee	Closed in				Straight				Open
Forelimb: hoof	Toe-in				Centred				Toe-out
LATERAL VIEW									
Head size	Small				Medium				Large
Head length	Short				Medium (55-56)				Long
Head expression	Poor				Medium				Marked
Head profile	Concave				Sub- concave				Straight
Neck length	Short				Medium (70-73)				Long
Upper neck border	Straight				Sub-convex				Convex
Lower neck border	Concave				Straight				Convex
Neck inclination	Horizontal				Medium (43-48)				Vertical
Scapula inclination	Horizontal				Medium (49-52)				Vertical
Scapula length	Short				Medium (58-60)				Long
Arm inclination	Horizontal				Medium (37-41)				Vertical
Arm length	Short				Medium (34-35)				Long
Forearm length	Short				Medium (40-42)				Long
Cannon length	Short				Medium (25-26)				Long
Cannon girth	Small				Medium (19-20)				Large
Fore pastern inclination	Very horizontal				Medium (55-59)				Vertical
Forelimb: conformation	Camped-in				Vertical				Camped-under
Forelimb: knee	Buck-kneed				Straight				Calf-kneed
Height of withers	Low				Medium (6-7)				High
Thoracic depth	Shallow				Medium (64-67)				Deep
Back length	Short				Medium (29-31)				Long
Loin length	Short				Medium (28-30)				Long
Thoracic-lumbar line	Convex				Straight				Concave
Tail set-on	Low				Medium (1-3)				High
Croup length	Short				Medium (47-48)				Long
Croup inclination	Flat				Medium (10-13)				Steep
Croup–buttock musculature	Poor				Muscled				Very muscled
Distance point of croup-stifle	Short				Medium (41-43)				Long
Distance point of buttock-stifle	Short				Medium (45-46)				Long
Leg inclination	Horizontal				Medium (52-56)				Vertical
Leg length	Short				Medium (52-54)				Long
Hind cannon length	Short				Medium (34-35)				Long
Hind pastern inclination	Very horizontal				Medium (58-63)				Vertical
Hind limb conformation	Camped-out				Vertical				Camped-under
Hind limb hock (angle)	Very angular				Medium				Straight

Linear Assessment in PRÁ: the form

Trait	Definition	1	2	3	4	5	6	7	Definition
REAR VIEW									
Croup width	Narrow				Medium (48-49)				Wide
Hindlimb: conformation	Closed				Vertical				Open
Hindlimb: hock	Closed				Vertical				Open
Hindlimb: hoof	Toe-in				Centred				Toe-out
CHARACTER									
Temperament	Passive				Balanced				Irritable
MOVEMENTS									
Walk:									
Activity	Poor				Medium				High
Rhythm Clarity	Poor				Medium				High
Stride length	Short				Medium				Long
Flexibility	Poor				Medium				High
Trot:									
Stride length	Short				Medium				Long
Flexibility	Poor				Medium				High
Impulsion	Poor				Medium				High
Balance	Poor				Medium				High
Suspension	Poor				Medium				High

Note: The variables shaded in grey show the ranges for each class on the supplementary sheet. Inclinations are expressed in degrees and the rest in centimetres.

Performance data in PRÁ: the genetic model

Young Horse Competitions (YHC)

Trait	Model	Systematic effects (levels)	Random effects (levels)
Race time	Linear	Km (cov), sex (3), age (5), event (448)	Rider (1779)
Recovery time	Linear	Sex (3), age (5), event (448)	Rider (1779)
Placing (Dis/qualification*)	Threshold	Sex (3), age (5), event (456)	Rider (1779)

*Vet check

Royal Equestrian Federation Competitions (REC)

Trait	Model	Systematic effects (levels)	Random effects (levels)
Placing*	Threshold	Sex (3), age (7), event (1341)	Rider-Horse interaction (5185)
Ranking	Thurstonian	Sex (3), age (7), event (1713)	Rider (1359), Rider-Horse interaction (3953), PEE (2441)

Young Horse Competitions (YHC)

- 4895 records from 2416 horses (68% PRÁ)
- Period 2006-2024

Royal Equestrian Federation (REC)

- 11,286 records from 2796 horses (69 % PRÁ)
- Period 2000-2024

Pedigree matrix: 17,254 horses (59% PRÁ)

Performance data in PRÁ: the genetic parameters (univariate models)

Functional trait	h^2	r^2	rhi^2	p^2	e^2
Race time (YHC)	**0.14 (0.03)**	0.09 (0.02)	-	-	0.77 (0.03)
Recovery time (YHC)	**0.25 (0.03)**	0.09 (0.02)	-	-	0.66 (0.03)
Placing (YHC)	**0.04 (0.02)**	0.02 (0.01)	-	-	0.94 (0.02)
Ranking (REC)	**0.13 (0.03)**	0.23 (0.06)	0.11 (0.03)	0.06 (0.02)	0.47 (0.12)
Placing (REC)	**0.11 (0.02)**	-	0.18 (0.02)	-	0.71 (0.02)

YHC: Young horse competitions , REC: Royal Equestrian competitions.
h^2: heritability, r^2, rider effect ratio, rhi^2: rider horse interaction ratio, p^2: environmental permanent effect ratio, e^2: residual ratio

- **Low to moderate heritability.**
- **Limited rider influence in YHC**, which increases in REC, highlighting the increased importance of rider at higher competition levels.
- **Relevant rider–horse interaction**, specific rider-horse pairings significantly influence performance.
- As competition level increases (YHC → REC), **performance has greater contributions from rider effect and rider–horse interaction**.
- At higher levels, performance is not only dependent on the horse's genetic merit but also on **training, management and the quality of the rider-horse partnership**.

Performance data in PRÁ: the genetic parameters (multivariate models)

Young Horse Competitions (YHC)

Functional trait	Race time	Recovery time	Placing
Race time	0.14 (0.03)	**0.13 (0.11)**	**0.24 (0.26)**
Recovery time		0.25 (0.03)	**-0.39 (0.18)**
Placing			0.04 (0.02)

Clear genetic link between **Recovery Time and Placing.**

Horses with shorter recovery time tend to achieve worse placing (are disqualified).

Royal Equestrian Federation Competitions (REC)

Functional trait	Ranking	Placing
Ranking	0.13 (0.02)	**-0.03 (0.28)**
Placing		0.11 (0.02)

No evidence of a genetic link between Ranking and Placing.

Traits appear to be genetically independent

Linear Conformation Assessment in PRÁ: the genetic model

Linear Trait = Sex (3)+ Age (5) + Event (60) + Appraiser (13) + Animal + Residual

The dataset: 199 horses with linear records + 1476 YHC records (also related animals).

The pedigree matrix contained 6819 animals.

Linear Conformation Assessment in PRÁ: the genetic parameters (preliminary results)

Group of traits	h^2 range
General and temperament	0.37-0.45
Head	0.21-0.36
Neck	0.06-0.44
Chest, Thorax and height	0.19-0.35
Shoulder, arm, back and loin	0.07-0.31
Croup, leg and tail	0.06-0.33
Forelimb stance	0.07-0.43
Hind limb stance	0.10-0.28


Photo: Manuel Arcos

- Moderate heritability.
- Genetic selection can produce **measurable improvement**, although environmental factors still play an important role.

Linear Conformation Assessment in PRÁ: the genetic parameters (preliminary results)

Trait	Harmony	Breed type	Temp.	Head size	Head length	Neck length	Neck upper line	Chest width	Thoracic width	Thoracic perim.	Scapula inclination	Scapula length	Leg inclination	Leg length	Forelimb: conform.	Forelimb : knee
h^2	*0.37*	*0.45*	*0.45*	*0.21*	*0.29*	*0.18*	*0.44*	*0.32*	*0.27*	*0.35*	*0.14*	*0.31*	*0.06*	*0.15*	*0.07*	*0.10*
Race time	n.s.	n.s.	**0.53**	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	**0.60**	**0.47**	**0.91**	**0.68**
Recovery time	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	**0.51**	**0.50**	**0.61**	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Placing	**0.65**	**0.65**	**0.56**	**0.53**	**0.60**	**0.70**	**0.71**	n.s.	n.s.	n.s.	**0.61**	**0.62**	**0.81**	**0.71**	**0.49**	**0.49**

- Traits related with **thoracic development** are biologically linked to recovery time.
- Traits related with **limb structure** are biologically linked to race time.
- Traits related with **head and neck, limb structure, temperament and general conformation** are biologically linked to placing.
- Significant genetic correlations indicates that **selection on conformation traits can indirectly affect functional traits**.


POEMA. Photo: AECCA

Genetic correlations between gaits and YHC traits in PRÁ (preliminary results)

- **Low to moderate heritability** (more influenced by environmental and training factors).
- **Stride length (walk and trot) and flexibility** present relatively higher heritability values.
- Selection for gait quality will not directly impact on **race time or recovery capacity** (n.s.)
- Moderate to strong positive genetic correlations are observed between gait traits and **placing**:
  - Horses with better gaits tend to achieve better competitive results.
  - Walk-related traits may be particularly important selection criteria (higher correlations), potentially reflecting coordination, biomechanics and functional soundness.

Gait	Walk			Trot	
Trait	**Rhythm Clarity**	**Stride length**	**Flexibility**	**Stride length**	**Balance**
h^2	*0.10*	***0.26***	***0.22***	***0.20***	*0.10*
Race time	n.s.	n.s.	n.s.	n.s.	n.s.
Recovery time	n.s.	n.s.	n.s.	n.s.	n.s.
Placing	**0.61**	**0.82**	**0.78**	**0.56**	**0.52**


Photo: Manuel Arcos

Conclusions

Preliminary results for the **design of the GGI in PRÁ horses** because of their relationship with endurance performance.

Further analyses are still needed (in progress 2026).

Expect these results to contribute to more efficient selection strategies in PRÁ horses, as has already been the case for PRE and PRMe.

Genetic Global Index
Neck Upper line
Thoracic perimeter
Leg length
Forelimb: conformation
Temperament
Walk: Stride length

With the collaboration of:

THANK YOU VERY MUCH FOR YOUR ATTENTION

Mª Dolores Gómez
Researcher

pottokamdg@gmail.com