

Portuguese Sorraia horse dynamics study with innovative technology: Three natural gaits and strides

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1. Introduction

Portuguese native Sorraia horse is considered a primitive breed and an ancestor of horses in Iberian Peninsula, where they inhabited since the Pleistocene. A closed mating system allowed to maintain the breed standard since its discovery, around one century ago. Sorraia horses are considered ponies (1.46m mean height at withers).

The aim of this study was to characterize the dynamics of gaits by Sorraia Stallions, using innovative technology equipment (EquiMoves).

2. Material and methods

Three natural gaits, according to the Fédération Équestre Internationale (FEI) :

1. Walk (W) "... is a marching pace in a regular and well-marked four (4) times beat with equal intervals between each beat.";

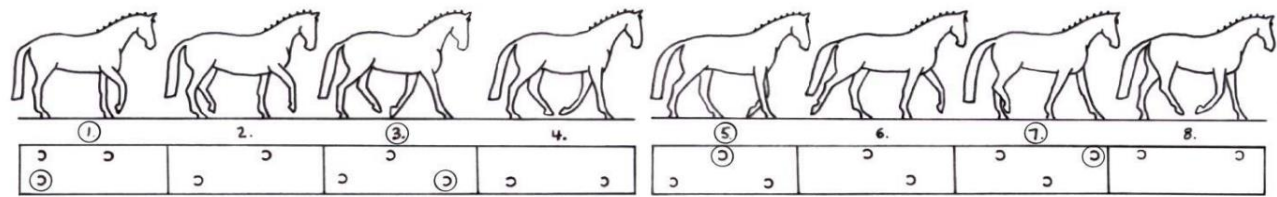


Figure 1. The walk is a pace in four (4)-beat rhythm with eight (8) phases (numbers in circles indicate the beat).

2. Trot (T) "... is a two (2)-beat pace of alternate diagonal legs (left fore and right hind leg and vice versa) separated by a moment of suspension.";

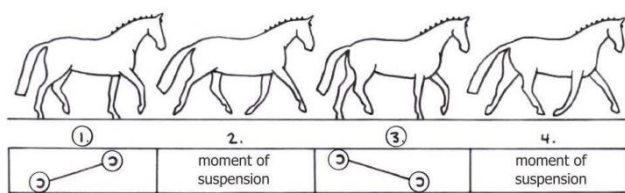


Figure 2. The trot is a pace in two (2)-beat rhythm with four (4) phases (Numbers in circles indicate the beat).

3. Canter (C) "... is a three (3)-beat pace where, in canter to the right, for example, the footfall is as follows: left hind, left diagonal (simultaneously left fore and right hind), right fore, followed by a moment of suspension with all four (4) feet in the air before the next stride begins.

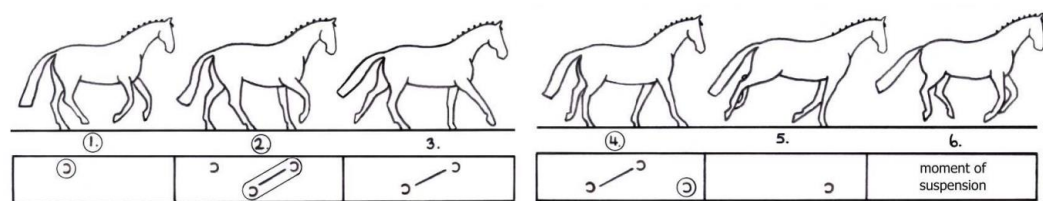
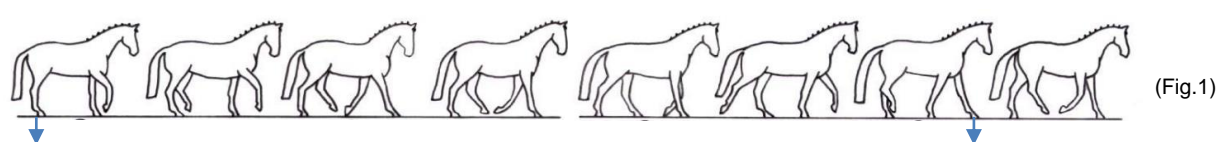


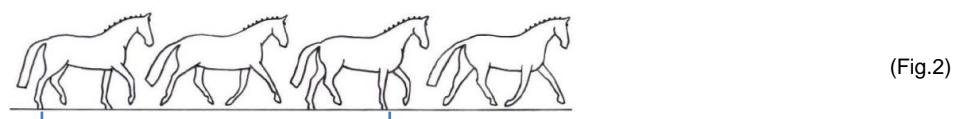
Figure 3. The canter is a pace in three-beat rhythm with six (6) phases

The gaits were evaluated using the variables:

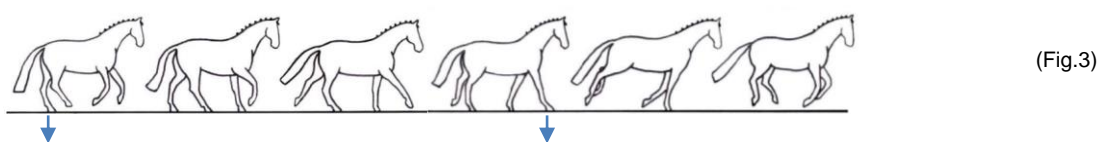
- a) Stride duration (sD) in seconds (s)



- b) Length (sL) in meters (m)



- c) Speed (sS) in kilometers per hours (km/h)



Considering the stride as a complete movement of the four limbs, using innovative technology equipment (EquiMoves.NL).



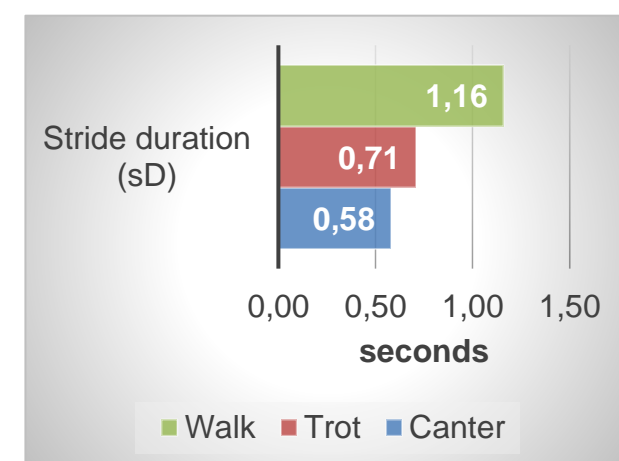
Differences in LS means between W, T and C within each variable were significant (p-value < 0.05).

Figures 1, 2 and 3 of the gaits are taken from the dressage regulations of the Fédération Équestre Internationale (FEI).
Figures 4, 5 and 6 of the gaits were kindly provided by Dr. Antonio Vicente (IPS - ESAS).

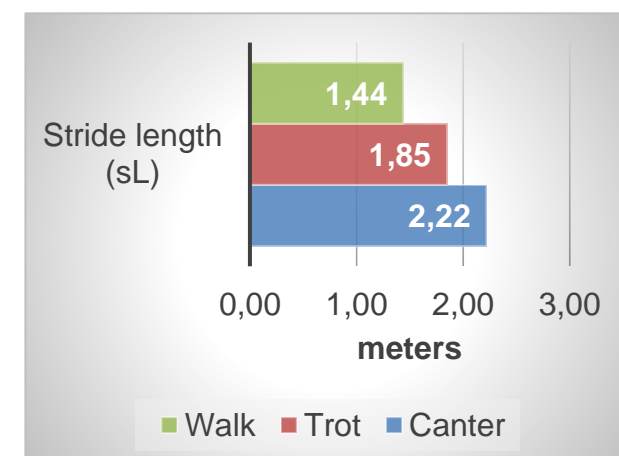
A. Hardware EQUIMOVES.nl.
B. Software EQUIMOVES.nl.
C. Reports EQUIMOVES.nl.

3. Results

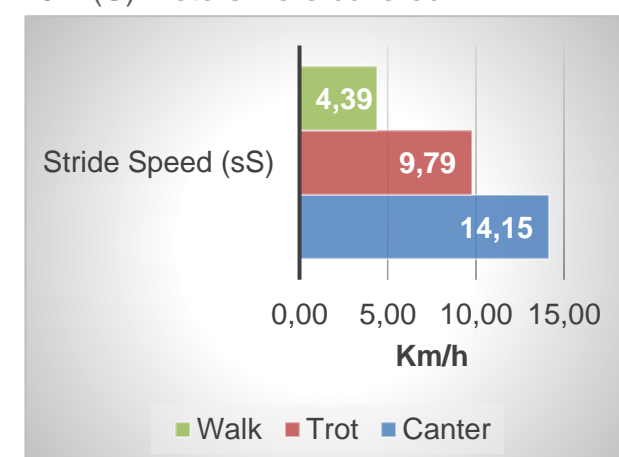
The values of the variable sD decrease in stride duration from W to T by -41.8% and half the time from W to C (-100 %) and from T to C was -18.3%



Values with opposite trends from W to T to C were observed in the variables sL and sS. Variable sL, indicating increases in sL of 28.5% (W to T), 53.7% (W to C) and 19.9% between T and C.



The values of the sS variable with increases from W to T of 223.0%, W to C of 322.3% and from T to C of 144.5%. 52 (W), 85 (T) and 103 (C) strides were observed per minute, and 74.4 (W), 156.3 (T) and 229.7 (C) meters were covered.



To run 100 m Sorraia horses need an average of 69 (W), 54 (T) and 45 (C) strides and take 80.0 (W), 38.3 (T) and 26.1 (C) seconds.



Figure 4. Sorraia horse at walk.



Figure 5. Sorraia horse at trot.



Figure 6. Sorraia horse at canter.

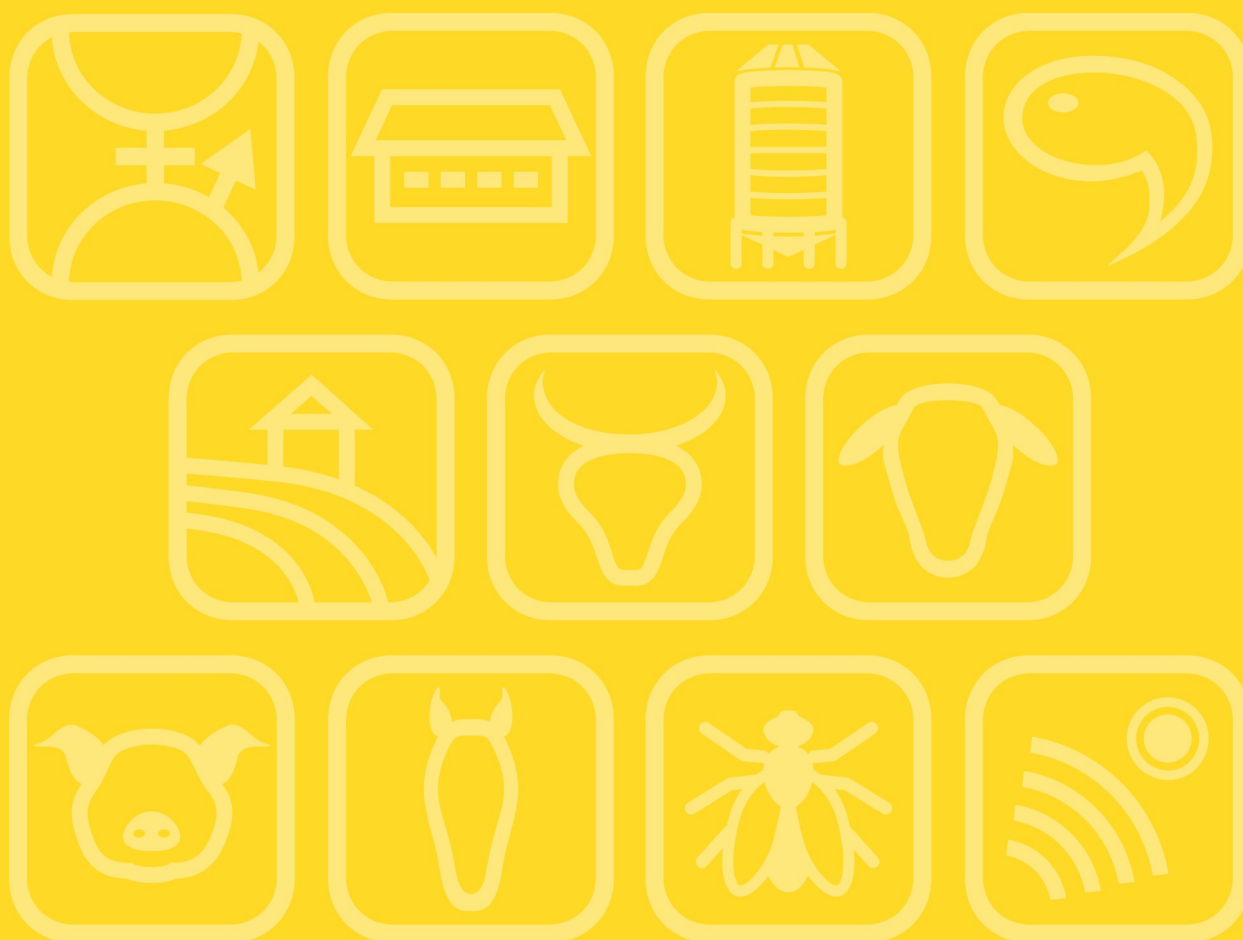
4. Final Considerations

Sorraia horses are considered ponies (1.46m mean height at withers) and their height influences the variables evaluated and should not be compared with horses of different structures and sizes. Evaluation of variations within Walk, Trot and Canter traits should be observed in future studies.

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Portuguese native Sorraia horse is considered a primitive breed and ancestor of horses in Iberian Peninsula, where they inhabited since the Pleistocene. A closed mating system allowed to maintain the breed standard since its discovery, one century ago. The aim of this study was to characterize the dynamics of 6 Sorraia Stallions, considered very endangered (± 300 living animals), using innovative technology equipment (EquiMoves). Three natural gaits, walk (W), trot (T) and canter (C), were evaluated using the variables stride duration (sD) in seconds (s), length (sL) in meters (m) and speed (sS) in kilometres per hours (km/h), considering the stride as a complete movement of the four limbs. Differences in LS mean between W, T and C within each variable were significant ($P < 0.05$). The values of the variable sD were 1.16 ± 0.10 s (W); 0.71 ± 0.06 s (T) and 0.58 ± 0.02 (C), with a decrease in stride duration from W to T by -41.8% and half the time from W to C (-100%) and from T to C was -18.3%. Values with opposite trends from W to T to C were observed in the variables sL and sS. Variable sL provided means of 1.44 ± 0.06 m (W); 1.85 ± 0.14 m (T) and 2.22 ± 0.77 m (C), indicating increases in sL of 28.5% (W to T), 53.7% (W to C) and 19.9% between T and C. The values of the sS variable were equal to 4.39 ± 0.18 km/h (W), 9.79 ± 0.77 km/h (T) and 14.15 ± 0.33 km/h (C), with increases from W to T of 223.0%, W to C of 322.3% and from T to C of 144.5%. 52 (W), 85 (T) and 103 (C) strides were observed per minute, and 74.4 (W), 156.3 (T) and 229.7 (C) meters were covered. To run 100 m (s) Sorraia horses need an average of 69 (W), 54 (T) and 45 (C) strides and take 80.0 (W), 38.3 (T) and 26.1 (C) seconds. Sorraia horses are considered ponies (1.46 m mean height at withers) and their height influences the variables evaluated and should not be compared with horses of different structures and sizes. Evaluation of variations within Walk, Trot and Canter traits should be observed in future studies.

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