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# Body and hoof biometrics of Mangalarga Marchador equine athletes participating in exhibitions

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# ABSTRACT



The biometric evaluation of equine athletes is important to determine their morphological condition, especially when it comes to showing animals. These evaluations analyze the proportionality of the body, observed as a whole or individually, to determine its adaptive functions. This study aimed to take biometric measurements of Mangalarga Marchador horses participating in an agricultural show in the state of Alagoas to assess their morphometric indices, groin proportions, and claw angulation.



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# ABSTRACT



Eighty-two animals were used, divided into four groups: M1, M2, F1, and F2. Using a tape measure and a hoof angulometer, various measurements were collected, tabulated, their means and standard deviation, and submitted to statistics. The results of the indices and calculations were that all the groups had contracted grooves and a short biometric conformation.



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# ABSTRACT



The young animals were suitable for the saddle, and the adults for light traction (ICC1 and ICC2), and both the claw angles ( $51.3 - 51.9^\circ$ ) and the load indices (ILD1 and ILD2) were lower than those consulted, except for M2.



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# ABSTRACT



The linear indices, when compared to the biometric measurements, were closer to the data, disregarding variations in gender and age. There was no significant difference when comparing ages and sexes. As a result, the young animals did not match the values in the literature, compared to the adult animals, where the majority did, especially the adult males, both in terms of measurements and indices.



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# ABSTRACT



In general, the females had better hoof biometrics, and the males had better body biometrics.

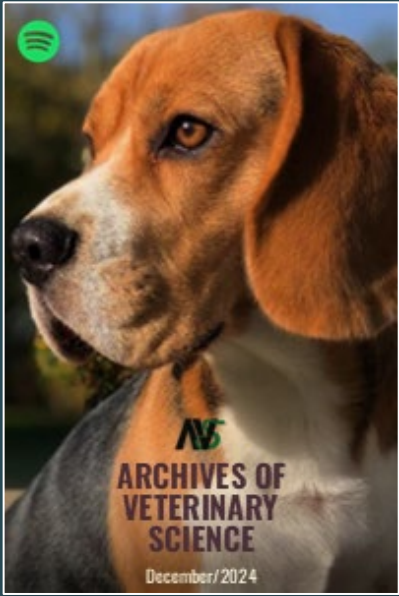
Keywords: Conformation, morphometric indices, grooves, angulation.



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Index	Definition	Formula	Values
ICC1: Compactness index 1	Relationship between body mass and running strength	ICC1: $(W / HT) / 100$	Heavy traction: > 3,15; Light traction: > 2,75; Saddle: 2,6
ICC2: Compactness index 2	Relationship between body mass and running strength	ICC2: $[W / (HT - 1)] / 100$	Heavy traction: > 9,5; Light traction: 8 - 9,5; Saddle: 6 - 7,75
ICF: Conformation index	Indicates whether the animal is fit to pull or run	ICF: $TP^2 / HT$	Brevillians: >2,11; Mediolines: = 2,11; Longilines: <2,11
ILD1: Load index 1	Indicates the weight the animal can bear without exaggerated strain on the back, working at a trot or gallop	ILD1: $TP^2 \times 56 / HT$	-
ILD2: Load index 2	Suggests the weight that the animal can bear without exaggerated strain on its back, working at a walking pace	ILD2: $(TP^2 \times 95) / HT$	-
IDT: Dactylo- thoracic index	Indicates the relationship between the animal's mass and the limbs that support it	IDT: $(SP \times 100) / PT$	Hypermetric: > 11,5 Eumetric: 10,5 - 10,8 Hypometric: < 10,5
RLW: Real live weight	Shows the animal's real weight	RLW: $TP^3 \times 80$	-
BI: Body index	Determines the fitness of animals	BI: $BL/TP$	Brevillians: >0.85 Mediolines: 0.86-0.88 Longilines: <0.90



**Table 1** – Morphometric indices used in this study to assess the body biometry of Mangalarga Marchador horses participating in agricultural shows. Adapted from Tavares et al. (2015).



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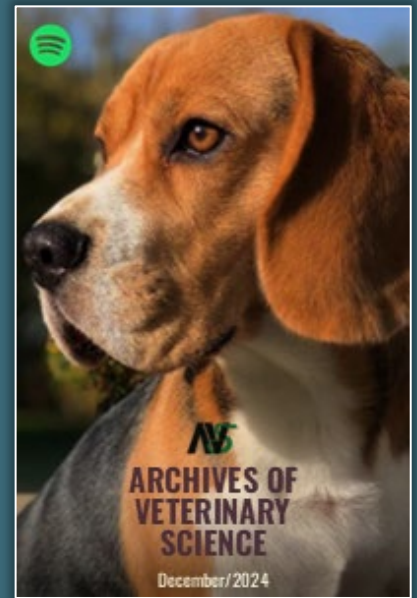
	General	M1	M2	F1	F2
HT	143,8(±5,7)	139,2(±5,3)	146,2(±3,5)	141,6(±7,6)	146,1(±3,7)
BL	144,2(±8,1)	138,5 (±7,4)	138,5 (±7,4)	142,1 (±11,6)	148,5 (±5,2)
TP	168,3(±10,3)	158,6(±11,6)	171,8(±5,6)	163,7(±10,3)	174,8(±6,4)
SP	17,8(±1)	17,4(±1)	18,3(±0,9)	17,3(±1,2)	17,8(±0,6)
CW	52,4(±4,4)	49,1(±4,7)	53,9(±3,2)	50,6(±4,3)	54,6(±3,7)
BW	34(±2,8)	32,2(±3,2)	34,9(±2,5)	33,1(±2,2)	35(±2,7)

**Table 2** – Means and standard deviation of body biometrics of Mangalarga Marchador horses from different regions of Brazil participating in shows in Maceió-AL. HT: Height at withers, BL: Body length, TP: Thoracic perimeter, SP: Shin perimeter, CW: Croup width and BW: Breast width. ns: there were no differences between the comparisons made between the groups ( $p > 0.05$ ).



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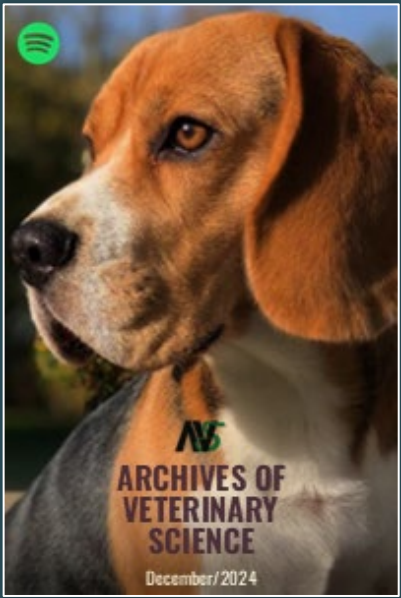
		General	M1	M2	F1	F2
RTL	CA (°)	51,3(±2,9)	51,2(±3,0)	51,4(±2,9)	51,5(±2,1)	51,7(±2,5)
	CL (cm)	8,3(±0,8)	8,0(±0,8)	8,8(±0,9)	7,9(±0,6)	8,4(±0,5)
	HL (cm)	12,8(±1,3)	11,7(±1,2)	13,9(±1,2)	12,3(±0,9)	12,7(±0,6)
	HW (cm)	10,7(±0,9)	9,9(±1,1)	11,2(±0,7)	10,5(±1,0)	10,7(±0,6)
	GL (cm)	8,0(±1,0)	7,6(±0,9)	8,7(±0,8)	7,4(±0,9)	8,1(±0,8)
	GW (cm)	4,2(±0,8)	3,8(±0,9)	4,6(±0,7)	4,2(±0,6)	4,0(±0,7)
LTL	CA (°)	51,9(±2,5)	52,2(±2,9)	52,2(±2,7)	51,3(±1,7)	51,9(±2,0)
	CL (cm)	8,4(±0,9)	7,7(±0,9)	9,0(±0,7)	8,2(±0,8)	8,5(±0,6)
	HL (cm)	13,0(±1,2)	12,0(±1,0)	14,0(±1,1)	12,4(±1,3)	13,1(±0,7)
	HW (cm)	10,8(±0,8)	10,0(±0,8)	11,3(±0,6)	10,5(±0,7)	11,0(±0,7)
	GL (cm)	8,1(±0,9)	7,7(±0,9)	8,7(±0,8)	7,7(±1,0)	8,0(±0,9)
	GW (cm)	4,3(±0,8)	4,0(±0,9)	4,7(±0,7)	4,2(±0,7)	4,1(±0,9)
RPL	CA (°)	51,8(±2,7)	51,7(±2,5)	52,3(±3,1)	51,3(±2,9)	51,8(±2,2)
	CL (cm)	8,8(±1,1)	8,0(±0,7)	9,1(±1,0)	8,5(±0,8)	9,1(±0,9)
	HL (cm)	12,6(±1,0)	11,6(±1,1)	13,2(±0,8)	12,5(±1,0)	12,7(±0,9)
	HW (cm)	10,0(±0,2)	9,4(±0,7)	10,1(±1,9)	9,8(±0,9)	10,3(±0,7)
	GL (cm)	7,8(±0,9)	7,3(±1,2)	8,1(±0,7)	7,5(±0,7)	8,1(±0,8)
	GW (cm)	4,1(±0,7)	3,6(±0,7)	4,4(±0,8)	4,2(±0,5)	3,9(±0,7)
LPL	CA (°)	51,7(±3,1)	52,3(±2,7)	53,5(±3,2)	51,8(±2,2)	51,1(±2,1)
	CL (cm)	8,8(±1,0)	8,1(±0,8)	9,4(±0,9)	8,4(±0,9)	9,1(±0,9)
	HL (cm)	12,7(±1,1)	12,1(±1,3)	13,2(±1,1)	12,3(±1,0)	12,9(±1,0)
	HW (cm)	10,0(±0,9)	9,4(±0,7)	10,5(±0,9)	9,6(±1,2)	10,3(±0,7)
	GL (cm)	7,7(±1,0)	7,3(±1,2)	8,0(±1,0)	7,5(±0,7)	7,9(±0,9)
	GW (cm)	4,1(±0,8)	3,8(±0,7)	4,3(±1,0)	4,1(0,5±)	4,0(±0,7)

**Table 3** – Means and standard deviation of hoof biometrics of Mangalarga Marchador horses from different regions of Brazil participating in shows in Maceió-AL. HL: Hoof length, HW: Hoof width, GL: Groove length, GW: Groove width, CL: Claw length, CA: Claw angle, RTL: Right thoracic limb, LTL: Left thoracic limb, RPL: Right pelvic limb and LPL: Left pelvic limb. ns: there were no differences between the comparisons made between the groups ( $p > 0.05$ ).



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		General	M1	M2	F1	F2
RTL	GW	4,2(±0,8)	3,8(±0,9)	4,6(±0,7)	4,2(±0,6)	4,0(±,7)
	GL	8,0(±1,0)	7,6(±0,9)	8,7(±0,8)	7,4(±0,9)	8,1(±0,8)
	2/3 GL	5,33	5,06	5,8	4,93	5,4
LTL	GW	4,3(±0,8)	4,0(±0,9)	4,7(±0,7)	4,2(±0,7)	4,1(±0,9)
	GL	8,1(±0,9)	7,7(±0,9)	8,7(±0,8)	7,7(±1,0)	8,0(±0,9)
	2/3 GL	5,4	5,13	5,7	5,13	5,33
RPL	GW	4,1±0,7)	3,6(±0,7)	4,4(±0,8)	4,2(±0,5)	3,9(±0,7)
	GL	7,8(±0,9)	7,3(±1,2)	8,1(±0,7)	7,5(±0,7)	8,1(±0,8)
	2/3 GL	5,2	4,86	5,4	5	5,4
LPL	GW	4,1(±0,8)	3,8(±0,7)	4,3(±1,0)	4,1(±0,5)	4,0(±0,7)
	GL	7,7(±1,0)	7,3(±1,2)	8,0(±1,0)	7,5(±0,7)	7,9(±0,9)
	2/3 GL	5,13	4,86	5,33	5	5,26

**Table 4** – Average and standard deviation of the width and length of the ranilla of Mangalarga Marchador horses and the proportion of 2/3 of their ranilla length. RTL: Right thoracic limb, LTL: Left thoracic limb, RPL: Right hind limb, LPL: Left hind limb, GW: Groin width and GL: Groin length. ns: There were no differences between the comparisons made between the groups ( $p > 0.05$ ).

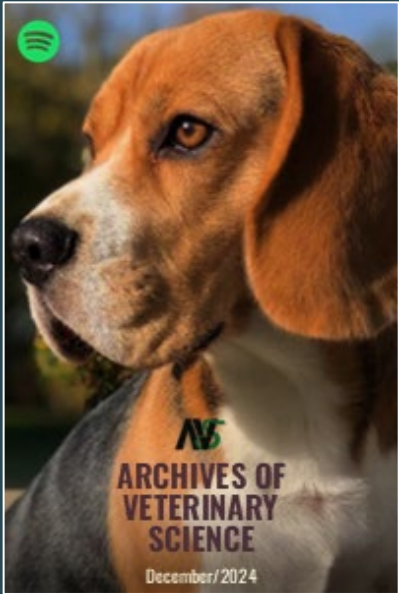


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	General	M1	M2	F1	F2
ICC1	2,63	2,30	2,71	2,48	2,84
ICC2	8,76	8,20	8,63	8,53	9,02
ILD1	110	100	112	105	116
ILD2	187	170	190	179	197
IDT	10,5	10,9	10,6	10,5	10,1
BI	0,85	0,87	0,84	0,86	0,84
ICF	1,97	1,79	2,00	1,88	2,07
RLW	379,33	315,5	400,0	346,4	421,4

**Table 5** – Morphometric indices of Mangalarga Marchador horses from different regions of Brazil participating in shows in Maceió-AL. ICC1: Compactness Index 1, ICC2: Compactness Index 2, ILD1: Load Index 1, ILD2: Load Index 2, IDT: Dactylo-thoracic Index, BI: Body index, ICF: Conformation Index and RLW: Real live weight. ns: There were no differences between the comparisons made between the groups ( $p > 0.05$ ).



	General	M1	M2	F1	F2
SP	12,4	12,5	12,5	12,2	12,1
TP	117,4	113,9	117,5	115,6	119,6
CW	36,6	35,2	36,8	35,7	37,3
BW	23,7	23,1	23,8	23,3	23,9
BL	100,6	99,4	99,3	100,3	101,6

**Table 6** – Linear indices of biometric measurements in relation to withers height in Mangalarga Marchador horses  
BL: Body length, TP: Thoracic perimeter, SP: Shin perimeter, CW: Croup width and BW: Breast width. ns: there were no differences between the comparisons made between the groups ( $p > 0.05$ ).

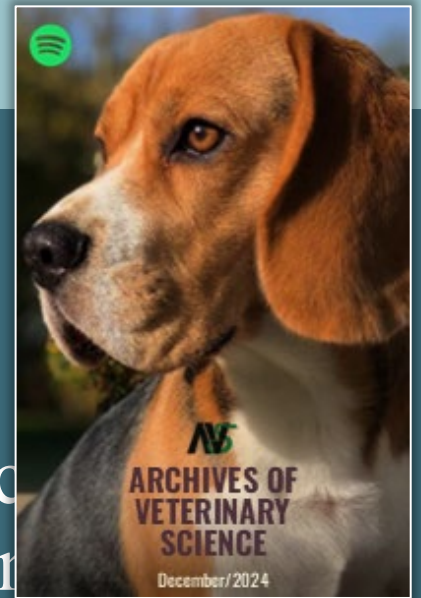


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# CONCLUSION



When the animals were divided into groups according to sex and age, there were no statistically significant differences in the morphometric measurements of the different groups. In addition, the younger animals did not fit most of the measurements found in the literature, and few studies provide values for younger animals. The calculation of the true live weight was close to that found when using the conventional weighing tape. Finally, the adult animals had measurements and biometric indices closer to the reference values, especially the M2 animals, and the females (F1 and F2) had better measurements in terms of hoof biometrics and load indices, and the males in terms of body weight.



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