

THE DIFFERENCES IN ARABIAN HORSE BODY MEASUREMENTS USED IN DIFFERENT HORSE SPORTS (RACING AND JEREED)

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Abstract

Numerous sports disciplines employ Arabian horses. The use of Arabian horses bred in Turkey for flat racing and javelin (jereed) sport was examined in this study, as well as the effects of aging. 13 different physical sections of Arabian male horses were measured, 43 of which competed in races at the racetracks in Ankara, Adana, Bursa, and Şanlıurfa, and 58 of which took part in javelin competitions in the heart of Erzurum. When the body measurements of male Arabian horses used for javelin and racing were compared, it was found that there were differences in the croup length ($p < 0.01$), back length ($p < 0.001$), chest depth ($p < 0.05$), chest circumference ($p < 0.001$), pectoral chest width ($p < 0.01$), neck circumference ($p < 0.001$), and hock circumference ($p < 0.001$). The changes in the withers height, croup length, and chest circumference of male Arabian horses at different ages were found to be significant ($p < 0.05$), but not in the other body measurements ($p > 0.05$). The pectoral chest breadth and hock circumference were shown to be significant in the usage area of horses (JAVELIN-RACING) \times age interaction ($p < 0.05$). The choice of Arabian racing horses for the javelin or training purposes was thought to have altered the anatomical structure, which could account for the differences in various body measurements between racing and javelin horses.

Key words: age assessment; body measurements; sport horses.

INTRODUCTION

Horses are one of the world's oldest pure breeds, having been raised on the Arabian Peninsula and in its environs from B.C. 2000 (Özbeyaz & Akçapınar, 2005; Doğan et al., 2002). The Arabian horse has made a significant contribution to the development of new breeds through hybridization research in the horse breeding industry because of its symmetrical body, grazing, resistance to various environmental conditions, ability to perform well in long-distance racing, and high hereditary power (Doğan et al., 2002; Evans, 2000). Horses can be identified by their body measurements, which are used to evaluate how well their anatomy fits together or to contrast normal and pathological growth (Sadek et al., 2006; Anderson & McIlwraith, 2004). The swift acceleration, halt, and spinning movements of the javelin horses are different from those of the racing horses used in flat races because the way the body responds to exercise differs depending on the activity (Freeman, 2022). Pack horses, riding horses, and race horses can all develop physically differently from one another (Özbeyaz & Akçapınar, 2005; Akçapınar & Özbeyaz, 1999).

The researchers propose that the male Arabian horses have the following body measurements based on the literature: Withers height, 149-156 cm (Sadek et al., 2006; Altinel & Küçük, 1992; Antalyalı, 2008; Koç, 1990; Özdemir, 1998; Schuster, 1992; Fuentes et al., 1989; Gücüyener & Akçapınar, 2011; Kaygısız et al., 2011; Yılmaz et al., 2012; Prisacaru et al., 2012; Yildirim & Yildiz, 2013a); Croup height, 151-157 cm (Sadek et al., 2006; Antalyalı, 2008; Özdemir, 1998; Gücüyener & Akçapınar, 2011; Yılmaz et al., 2012; Yildirim & Yildiz, 2013a); Croup length, 48 cm (Yildirim & Yildiz, 2013a); Back length, 82 cm (Yildirim & Yildiz, 2013a); Chest depth, 67-69 cm (Sadek et al., 2006; Gücüyener & Akçapınar, 2011; Yılmaz et al., 2012; Yildirim & Yildiz, 2013a); Chest circumference, 158-182 cm (Sadek et al., 2006; Altinel & Küçük, 1992; Antalyalı, 2008; Koç, 1990; Özdemir, 1998; Schuster, 1992; Gücüyener & Akçapınar, 2011; Kaygısız et al., 2011; Yılmaz et al., 2012; Yildirim & Yildiz, 2013a); Pectoral chest width, 37-45 cm (Sadek et al., 2006; Özdemir, 1998; Yılmaz et al., 2012; Yildirim & Yildiz, 2013a); Body length, 142-156 cm (Sadek et al., 2006; Antalyalı, 2008; Koç, 1990; Özdemir, 1998; Gücüyener &

Akçapınar, 2011; Yılmaz et al., 2012; Yildirim & Yildiz, 2013a); Neck circumference, 82 cm (Yildirim & Yildiz, 2013a); Head length, 55-61 cm (Yılmaz et al., 2012; Yildirim & Yildiz, 2013a); Cannon bone circumference, 18-20 cm (Sadek et al., 2006; Altinel & Küçük, 1992; Antalyalı, 2008; Koç, 1990; Özdemir, 1998; Schuster, 1992; Gücüyener & Akçapınar, 2011; Kaygısız et al., 2011; Yılmaz et al., 2012; Prisararu et al., 2012; Yildirim & Yildiz, 2013a); Carpal joint circumference, 31 cm (Yildirim & Yildiz, 2013a); Hock circumference, 41 cm (Yildirim & Yildiz, 2013a).

The comparison of the body size values of male Arabian javelin horses and racing horses was not determined in the literature review that was done. By comparing the body measurements of the male Arabian horses employed in this study for different purposes (Javelin and Racing), it is intended to identify any differences.

MATERIALS AND METHODS

Study population

The study used 43 Arabian male horses that raced at the racetracks in Ankara, Adana, Bursa, and Şanlıurfa, as well as 58 that belonged to the Turkish Jockey Club and competed in the javelin competitions held in Erzurum.

The horses utilized in the javelin sport today were chosen from the male Arabian horses that typically finish last or are disqualified from races for a variety of reasons.

The Arabian racing horses that were chosen for the study's measurements were the horses that participated actively in the competitions following their javelin training. Since male Arabian horses were always preferred in javelin competitions and made up the majority of the horses used in the sport (91.26%), the study focused on these animals (Yildirim & Yildiz, 2013b).

Body measurements

It was possible to get the stand in a normal position from which 13 different body parts were measured by setting the horses on concrete or another level surface. Body measurements were taken with a measuring stick (Hauptner®), including withers height, croup height, and chest

depth; with a measurement gage (Elmark®), including croup length and pectoral chest width; and with a measuring strip, including back length, body length, chest circumference, neck circumference, head length, cannon bone circumference, carpal joint circumference, and hock circumference (Yildirim & Yildiz, 2013a). The following mathematical model was used to assess the influences on the body measurements: $Y_{ijk} = \mu + a_i + b_j + (ab)_{ij} + e_{ijk}$ The terms contained in this model represent the followings; Y_{ijk} = Each parameter value discussed μ = Population average; a_i = The effect of the usage area (Javelin, Racing); b_j = The effect of the age (4, 5, 6, 7); $(ab)_{ij}$ = The effect of the interaction between age and the usage area and e_{ijk} = Random error effect matrix.

Statistical analysis

The general linear model was utilized to analyze the data using the SPSS 19.0 program. The statistical significance of the differences between the subgroup averages was assessed using the Duncan's multiple comparison test.

RESULTS AND DISCUSSIONS

The averages (in cm) for the body measurements of the male Arabian horses employed as racing and javelin horses, as well as the significant and multiple comparison test findings, are shown in Table 1.

Results of the averages (cm), significant multiple comparison tests, and body measurements with regard to age and usage area According to the study, differences were found in the body measurements of the male Arabian horses used for racing (JAVELIN-RACING) including croup length ($p < 0.01$), back length ($p < 0.001$), chest depth ($p < 0.05$), chest circumference ($p < 0.001$), pectoral chest width ($p < 0.01$), neck circumference ($p < 0.001$), and hock circumference ($p < 0.001$), but not in the other measurements taken ($p > 0.05$).

When the Arabian horses' body dimensions were compared to their ages, the withers height, croup height, and chest circumference were found to differ ($p < 0.05$), whereas no differences were detected in the other body measurements ($p > 0.05$).

Table 1. Results of the averages (cm), significant multiple comparison tests, and body measurements with regard to age and usage area

PARAMETERS		n	WH	CH	CL	BL	CD	CC	PCW	BL	NC	HL	CBC	CJC	HC
			$\bar{X} \pm S\bar{X}$	$\bar{X} \pm S\bar{X}$	$\bar{X} \pm S\bar{X}$	$\bar{X} \pm S\bar{X}$	$\bar{X} \pm S\bar{X}$	$\bar{X} \pm S\bar{X}$	$\bar{X} \pm S\bar{X}$	$\bar{X} \pm S\bar{X}$	$\bar{X} \pm S\bar{X}$	$\bar{X} \pm S\bar{X}$	$\bar{X} \pm S\bar{X}$	$\bar{X} \pm S\bar{X}$	$\bar{X} \pm S\bar{X}$
THE USAGE AREA	JAVELIN	58	154.11 ±0.52	154.32 ±0.58	47.16 ±0.43	81.92 ±0.78	66.97 ±0.92	156.84 ±0.73	37.69 ±0.38	147.46 ±0.82	83.02 ±0.95	54.92 ±0.44	19.16 ±0.20	30.50 ±0.18	40.41 ±0.40
	RACING	42	154.26 ±0.63	153.10 ±0.70	49.60 ±0.53	75.39 ±0.95	70.78 ±1.12	168.37 ±0.89	35.76 ±0.46	148.68 ±0.99	91.26 ±1.16	55.28 ±0.54	19.46 ±0.24	30.68 ±0.22	37.34 ±0.48
AGE	4	26	153.54 ±0.81b	153.98 ±0.90ab	48.54 ±0.68	78.18 ±1.22	69.28 ±1.44	160.56 ±1.14b	36.83 ±0.59	147.67 ±1.27	87.03 ±1.50	55.30 ±0.69	19.07 ±0.31	30.64 ±0.29	39.06 ±0.62
	5	32	156.20 ±0.69a	155.86 ±0.76a	48.77 ±0.57	79.70 ±1.03	67.62 ±1.21	164.78 ±0.96a	35.80 ±0.50	148.67 ±1.08	86.18 ±1.26	56.04 ±0.58	19.42 ±0.26	30.49 ±0.24	39.80 ±0.53
	6	27	154.11 ±0.71ab	153.33 ±0.79ab	48.17 ±0.59	78.50 ±1.07	68.86 ±1.26	163.25 ±1.00ab	37.08 ±0.52	148.42 ±1.12	87.03 ±1.31	55.47 ±0.61	19.33 ±0.27	30.69 ±0.25	38.33 ±0.55
	7	15	152.89 ±1.02b	151.66 ±1.13b	48.02 ±0.85	78.24 ±1.53	68.74 ±1.80	161.83 ±1.43b	37.19 ±0.74	147.54 ±1.60	88.33 ±1.88	53.57 ±0.87	19.42 ±0.38	30.51 ±0.36	38.30 ±0.78
AVERAGE			154.19 ±0.41	153.71 ±0.45	48.38 ±0.34	78.65 ±0.62	68.88 ±0.72	162.61 ±0.58	36.73 ±0.30	148.07 ±0.64	87.14 ±0.75	55.10 ±0.35	19.31 ±0.15	30.59 ±0.15	38.87 ±0.31
ANOVA-----p < F-----															
THE USAGE AREA (JAVELIN-RACING)			0.849	0.183	0.001	0.000	0.010	0.000	0.002	0.344	0.000	0.608	0.341	0.535	0.000
AGE			0.020	0.015	0.845	0.746	0.730	0.039	0.248	0.901	0.820	0.136	0.824	0.937	0.213
THE USAGE AREA (JAVELIN-RACING) X AGE			0.740	0.130	0.502	0.510	0.144	0.256	0.036	0.181	0.266	0.286	0.757	0.590	0.036

a,b - The differences among the averages in the same column with different letters are significant ($P < 0.05$), WH: Withers height, CH: Croup height, CL: Croup length, BL: Back length, CD: Chest depth, CC: Chest circumference, PCW: Pectoral chest width, BL: Body length, NC: Neck circumference, HL: Head length, CBC: Cannon bone circumference, CJC: Carpal joint circumference, HC: Hock circumference, Ort: Average

Pectoral chest width and hock circumference were not significant ($p < 0.05$) for the other body measurements, but they were significant ($p > 0.05$) for the Arabian horses' utilization area (JAVELIN-RACING) x Age Interaction.

Male Arabian horses reared for racing and the javelin had identical withers height measures ($p > 0.05$); this shows that the usage type has no impact on withers height. In addition, the Arabian horses in this study employed as racing and javelin horses have withers heights (154.26 ± 0.63 , 154.11 ± 0.52 cm, respectively) that are similar (Altinel & Küçük, 1992; Yildirim & Yildiz, 2013a) to certain Arabian horses, higher (Sadek et al., 2006; Antalyalı, 2008; Özdemir, 1998; Fuentes et al., 1989; Gücüyener & Akçapınar, 2011; Kaygısız et al., 2011; Prisacaru et al., 2012) than some of them, and lower (Koç, 1990; Schuster, 1992; Yilmaz et al., 2012) than others. Additionally, when the findings were evaluated, it was shown that the

withers height of Arabian horses at 5 years of age was significantly higher than that of Arabian horses at 4, 6, and 7 years of age ($p < 0.05$).

The values of the croup height of the javelin and racing horses are similar to those given in studies by Gücüyener and Akçapınar (2011) with Yildirim and Yildiz (2013a), higher than those recommended by other researchers (Sadek et al., 2006; Antalyalı, 2008; Özdemir, 1998), and lower than those suggested by Yilmaz et al. (2012). Male Arabian horses used for javelin and racing have similar croup lengths. However, it was found that the Arabian horses had higher croup heights at age 5 ($p < 0.05$) when measured in terms of age.

The Arabian javelin horses' croup lengths are similar to those found in studies by Yildirim and Yildiz (2013a), and croup lengths in Arabian racing horses are longer than the values given by the researchers (Yildirim & Yildiz, 2013a). Croup width should be wide since it depends on

the circumference of the muscles in this area and positively affects thrust. Also, it has been determined that croup of racing horses is longer than that of javelin horses ($p < 0.01$).

The back length of horses used for the javelin (75.39 ± 0.95 cm) is similar to that described by Yildirim and Yildiz (2013a), while being longer than Arabian horses trained as racing horses (81.92 ± 0.78 cm). Short backs are preferred in Arabian horse races because they enhance racing.

Javelin horses have chest depths that are lower (Gücüyener & Akçapınar, 2011; Yilmaz et al., 2012) than average and similar (Sadek et al., 2006; Yildirim & Yildiz, 2013a) to those seen in some studies. The chest width value seen in racing horses is higher than the values reported by a number of researchers (Sadek et al., 2006; Gücüyener & Akçapınar, 2011; Yilmaz et al., 2012; Yildirim & Yildiz, 2013a). Horses with well-developed chests and large chest cavities are preferred (Doğan et al., 2002; Akçapınar & Özbeyaz, 1999). Racing horses have a large chest depth, which may be explained by the fact that the measurement of chest depth is proportional to respiratory system. A horse's lung capacity is greater for racing than for javelin sport horses. The information acquired in this study indicates that there is a considerable difference in chest depth between horses used for the racing and javelin sports ($p < 0.05$).

While the values stated in the studies of Yildirim and Yildiz (2013a) for Arabian horses' chest circumference are not similar to those for race horses, those same researchers' measurements for horses used for the javelin are similar.

The racing horses require larger lung capacity as seen by the difference in chest circumferences between javelin and racing horses ($p < 0.001$). It is true that racing horses' chest measurements have become larger following training and competitions. Arabian horses under the age of five have greater chest circumferences than horses of other ages ($p < 0.05$).

Pectoral chest width of the javelin horses is similar to the values stated by some researchers (Özdemir, 1998; Yildirim & Yildiz, 2013a), but lower than others (Sadek et al., 2006; Yilmaz et al., 2012). Pectoral chest width of racing horses is found to be lower than some Arabian horses (Sadek et al., 2006; Özdemir, 1998; Yilmaz et al., 2012; Yildirim & Yildiz, 2013a). The fact

that the pectoral chest width of javelin horses is greater than that of racing horses may be due to the development of muscles in this region brought on by training-related abrupt actions like stopping and spinning.

The difference between racing and javelin horses in terms of the average body length of Arabian horses is not statistically significant ($p > 0.05$). According to research, the body length of racing and javelin horses is similar to native Arabian horses, higher than Arabian horses from Egypt and the Middle East, and lower than Arabian horses (Sadek et al., 2006; Antalyalı, 2008; Koç, 1990; Özdemir, 1998; Gücüyener & Akçapınar, 2011; Yilmaz et al., 2012; Prisacaru et al., 2012; Yildirim & Yildiz, 2013a). The results of the measurements show that the employment of the male Arabian horses for different purposes has no effect on their body length. According to some researches (Yildirim & Yildiz, 2013a), the neck circumference of Arabian horses is lower than that of racing horses and is similar to that of animals used for javelins. It is discovered that racing horses' neck circumference is wider than that of javelin horses ($p < 0.001$).

There is no difference between Arabian males used for racing and javelin in terms of head length ($p > 0.05$). Head length of javelin and racing horses is similar to some values stated by researchers (Yildirim & Yildiz, 2013a), but lower than others (Yilmaz et al., 2012).

Javelin and racing horses' cannon bone circumference measurements have been found to be similar to some measures reported in studies (Antalyalı, 2008; Koç, 1990; Schuster, 1992; Kaygısız et al., 2011; Yildirim & Yildiz, 2013a), however they are lower than some measures reported by other researchers (Özdemir, 1998; Gücüyener & Akçapınar, 2011; Yilmaz et al., 2012; Prisacaru et al., 2012).

Horses utilized for javelin and racing had carpal joint circumferences of 30.68 ± 0.22 cm and 30.50 ± 0.18 cm, respectively. It was determined that the difference between the identified values was not statistically significant ($p > 0.05$) and was similar to the findings of the research by Yildirim and Yildiz (2013a).

It has been discovered that the hock circumference of Arabian horses used as javelin horses is higher than that of male Arabian racing horses (37.34 ± 0.48 cm) but similar to that of

Arabian javelin horses (40.41 ± 0.40 cm). The sudden stopping and rotating activities involved in the horse-powered javelin sport may be the reason why the measurement of hock circumference in javelin horses is larger ($p < 0.001$) than that of racing horses.

While evaluating body measures of the male Arabian horses in accordance with their ages; height at withers, chest depth, body length and hock circumference are different in the horses used as javelin horses depending on age, but height at croup is different in the horses used as racing horse depending on age ($p < 0.05$).

CONCLUSIONS

According to this study, javelin horses had larger back length, front chest breadth, and hock circumference measures than racing horses. The measures for the neck circumference, chest diameter, chest depth, and croup length were found to be greater in racing horses. It has been demonstrated that differences in various body measures have happened in male Arabian horses since they have been used as racehorses and javelin horses. According to research, the usage of Arabian racehorses for javelin training or competition may have altered the bodies of the horses, which may explain discrepancies in body measures between javelin and racing horses.

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