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Identification of environmental factors affecting the racing performance of race camels in the United Arab Emirates

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Abstract: The aim of the present study was to investigate environmental factors affecting the racing performance of race camels in the United Arab Emirates (UAE). The traits evaluated were racing time and race speed. The data used in this study were obtained from UAE Camel Race Association. One hundred ninety races of varying distances with 50 camels per race were video recorded for which the first ten winners were determined. The analyses were conducted using three statistical linear models. Age, sex, breed, sex by breed and distance effects were included in the linear models. In each race, three groups were considered; fastest ten, fastest three and the fastest. Average speed of race camels in UAE was 10.6 m/s (SD=0.26; range: 9.20-11.79 m/s), with coefficient of variation of 1.99 percent. Camels with 3 years of age were significantly ($P < 0.05$) faster than the other age groups for fastest three. Except for camels with 5 years of age, females were significantly ($P < 0.05$) superior to males for the fastest ten. Both race speed and racing time were not affecting by the breed for fastest three and the fastest. The sex by breed interaction had no significant effects on both race speed and racing times.

Key words: Race camels, environmental factors, racing speed, racing time

تحديد العوامل البيئة (الغير وراثية) المؤثرة علي أداء هجن السباق في الإمارات العربة المتحدة

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ملخص : هدفت هذه الدراسة إلي دراسة وتقييم تأثير العوامل البيئة (الغير وراثية) علي أداء هجن السباق (السرعة والزمن) في الإمارات العربة المتحدة ، تم الحصول على بيانات الدراسة من أشرطة فيدو خاصة بسباقات الهجن، وتم دراسة وتقييم أكثر من ١٩٠ سباق للهجن وبمتوسط ٥٠ جمل لكل سباق، وفي كل شوط ، تمت مقارنة السرعة والزمن لأسرع عشرة جمال ثم أسرع ثلاثة جمال وأخيرا الأسرع بين كل الجمال، وكان المتوسط العام للسرعة ١٠,٦ متر/ثانية على مستوى كل الفئات، وسجلت الجمال ذات الثلاثة سنوات اعلي معدل سرعة مقارنة بالفئات العمرية الأخرى وكان الفرق معنوي، كما أظهرت الإناث تفوقا معنويا في السرعة على مستوى كل الفئات العمرية مقارنة بالذكور ، فيما بينت الدراسة عدم وجود أي تأثير معنوي للسلالة علي السرعة والزمن وكذلك عدم وجود أي تفاعل بين الجنس والسلالة.

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Introduction

Camel racing is a deep-rooted traditional sport that finds its origins in the desert culture of the Arabian Peninsula, North Africa, and the Middle East. Camels, commonly referred to as "ships of the desert," have for thousands of years played a vital role in the region, influencing every aspect of daily life. Beyond providing transportation, food, and shelter, the camel also served as a means of entertainment, celebration, and competition on festivals and special occasions. In the United Arab Emirates (UAE), camel racing has become a deeply appreciated and a valued tradition. Despite the many opportunities made available by the modern and diversified local economy, people in the UAE continue to breed, raise and train camels for racing. This practice is not only a way of expressing loyalty to the past; it also contains both feelings of triumph at having survived a difficult past and of pride in the great achievement in the present. Although camel racing looks simple, many of its aspect are quite complex. Yet, it is very entertaining and there are many rules and regulation controlling both races and participation. Races take place on an annual basis, mostly during the late October to early April racing season. The races generally take place on Thursdays, Fridays, and Saturdays throughout the winter season. Two races are the norm, with the morning race beginning at 7:30 AM and the afternoon race at 2:30 PM.

Although camel racing in UAE is highly organized and nutrition, training methods, veterinary procedures, and track conditions have been improved, no scientific study has been carried out thus far to identify the genetic and environmental factors that affect the racing performance of race camels-the initial step in any genetic improvement scheme. Similar to the horses, the racing performance of camels is affected by both genetic and environmental factors (Ekiz et al., 2005; Orhan and Kaygisiz, 2010). Sex, age, breed of camels, racing distance, time of race, and number of camels participating in race are possible environmental factors affecting speed (Mota et al., 2005). Racing performance of camels is generally measured by racing time or finish rank for given distance and age group (Thiruvenkadan et al., 2009). Thus, it was reported that race finishing time is a direct measure of speed and is regarded as the proper method of evaluating race performance of horses (Burns et al., 2004).

Determination of the role of environmental factors under UAE condition will assist trainers, professionals, and owners to optimize the performance of camels. Therefore, the objective of the present study was to identify environmental factors that affect racing performance of UAE race camels in order to contribute to a selection program aiming to improve the racing performance for this breed.

Materials and Methods

Materials

The data used in the present study were obtained from UAE Camel Race Association (CRA). As part of regulation, races should be filmed from two different views using two cameras run parallel to the inner fence of the racetrack. The photo finish video camera records the first tin winners and the winning time of the race. Finishing time data from 4000, 5000, 6000 and 8000 meters races belonging to year 2008 representing 101 race records were used in this study. One hundred ninety races of varying distances with 50 camels per race were studied.

As specified in the rules developed by CRA, races are organized according to the social categories of owners, a strategy aimed at providing greater diversity and opportunities for competing camels. Since racing camels owned by the ruling Shaikhs in the various emirates are of the best stock, they have high chances of winning every event that would be devastating to the ordinary. Thus, there are two types of races. Races are organized for camels owned by the ruling sheikhs and races are organized for camels owned by the public or members of the tribes. Camels are also classified for the races according to their age and sex, as well as the different breeds. Camels with the same sex are allowed to compete with each other and not with opposite sex. The Arabic local names for males and females are called *Je'dan* and *Abkar*,

respectively. Each of these categories is further divided into age groups. Hence, camels of similar ages compete against each other. Up to the age of six years, race camels have different Arabic local names for each year of camel's life. Starting from the age of two years, camels begin to race under a specific age group. Two-year old camel races under the category called Haqaiaq, three-year camel race under the category called Lagaya and four-year camel race under the category called Yetha'a. Finally, camels who are six years old or older race under the categories called Hool for females and Zomool for males. Also, racing camels have been divided into three categories, according to their origins. Purebred produced from Omani or Najdi origins are considered local, or mahalli breeds. But, when produced from cross between either of these origin and the Sudanese type, the product is referred to as muhajjan, or crossbred (Camel Race Association, 2002).

Statistical Analysis

Three linear models were used in the evaluation of environmental factors affecting the racing time and racing speed. In model-1, the fixed effect of age was included. Model 2 included the fixed effects of sex and breed as well the interaction between them. In model-3, race distance factor (4000, 5000, and 6000 m) was included for a four-year race camel. The following mathematical models were used in the analysis of the data:

$$Y_{ij} = \mu + A_i + e_{ij} \quad \text{(Model-1)}$$

$$Y_{ijk} = \mu + S_i + B_j + SB_{ij} + e_{ijk} \quad \text{(Model-2)}$$

$$Y_{ij} = \mu + D_i + e_{ij} \quad \text{(Model-3)}$$

Where Y_{ijk}=the speed of a camel in m/s or racing time in s , μ=the population mean, A_i=the effect of camel age in years (i=2, 3, 4, 6), S_j=the effect of sex (i = male, females), B_j=the effect of breed (j= purebred, crossbred), SB_{ij}=the interaction between sex and breed effect, D_i= the effect of race distance in meters (i= 4000, 5000, 6000) and e_{ijk}=the random residual error. For each model, Analysis of Variance (ANOVA) was conducted using GLM procedure of SAS (2003) to determine the effects included in the models.

Results and Discussion

The descriptive statistics of racing time and racing speed at the distances studied are shown in Table 1. Average speed of race camels in UAE was 10.6 m/s (SD=0.26; range: 9.2-11.79 m/s). The higher speed was observed ($P < 0.05$) at shorter distance compared with longer distances. Speed of race camels is much lower compared to the average speed of racehorses (Corrêa and Mota, 2007; Ekiz and Koçak, 2007; Schurink et al., 2009). However, horses usually race for shorter distances, i.e. 2800 m for Thoroughbred horses (Orhan and Kaygisiz, 2010) and 2150m for Arabian race horses (Schurink et al., 2009).

Table 1. Least square Means, coefficients of variation (CV), minimum maximum and values for the racing speed (m/s) and racing time (s) by distance.

Distance (m)	Mean	S.E	C.V (%)	Minimum	Maximum	Mode
Speed (m/s)						
4000	10.64[a]	0.01	1.83	9.21	11.07	10.64
5000	10.51[b]	0.02	1.85	9.67	11.79	10.55
6000	10.50[b]	0.01	1.52	9.81	10.88	10.33
8000	10.15[c]	0.04	2.12	9.75	10.40	-
Time (s)						
4000	376.08	0.25	1.92	361.3	434.50	375.60
5000	475.8	0.72	1.83	424.20	517.00	473.60
6000	571.43	0.64	1.55	551.13	611.50	563.50
8000	788.29	3.26	2.12	768.70	820.30	-

Values in columns within each subcategory with different superscripts are significantly different ($P < 0.05$).

The coefficient of variation, which demonstrates by means of an absolute measure of the variability dispersal compared with the means, was similar at all distance for both racing speed and racing time (mean = 1.99 and 2.17, respectively). The frequency of distribution of racing time for all distances showed negative coefficient of skewness (mean of -1.45), indicating the higher competition of race camels in reaching faster compared with slower. In contrast, positive values for the coefficient was observed for racing time (mean = 1.86) which indicates the greater difficulty of race camels in reaching faster finish times as compared with slower finish times.

The coefficients of kurtosis were positive at all distances for racing speed and racing time (mean = 6.17 and 3.48, respectively), indicating that the tails (especially the right one) are larger when compared to a normal distribution of the same standard deviation. A slightly negative value for the coefficients was observed at 8000 m distance for both traits (mean of -1.02).

Speed of race camels in UAE was significantly affected by age of the camel ($P < 0.05$) for the fastest three (Table 2). The highest race speed was attained by the 3-year-old camels, while the lowest racing speed was obtained by the 6-year-old camels for the fastest three. The trend of camel's age effect on racing performance observed in the present study is different from those figures reported for horses. It has been reported that racing time decreased and, therefore speed increase with age of horses (Mota and Abrahão, 2004; Ekiz et al., 2005; Schurink et al., 2009). The results of the present study for the 6-year-old camels are in line with Ekiz and Koçak (2005) who found that speed of Arabian horses tended to decline after 6 years of age.

Table 2. Least square Means, coefficients of variation (CV), minimum and maximum values for the racing speed of race camels according to age.

Age (Years)	Fastest three				The fastest			
	Mean (s)	CV (%)	Min.	Max.	Mean (s)	CV (%)	Min.	Max.
2	10.72[b]	1.76	9.79	11.03	10.76 [a]	1.70	9.94	11.04
3	10.77[a]	.085	10.61	11.07	10.81[a]	.086	10.62	11.07
4	10.62[c]	1.49	10.13	11.78	10.67[b]	1.92	10.32	11.78
6	10.22[d]	2.10	9.91	10.14	10.24[c]	2.40	9.95	10.41

Values in columns within each subcategory with different superscripts are significantly different ($P < 0.05$).

Excluding 3-year-old camels, females were significantly ($P < 0.05$) faster than males in other age groups for the fastest ten Table 3. As for the fastest three and the fastest, there were no significant differences between males and females except for camels with 3 years of age in which females were significantly ($P < 0.05$) superior to males. Since females are easy to deal with in camel racing, they usually receive more attention during training and race preparation than males. As a result, females are psychologically and physiologically prepared for racing and hence they run faster than males.

These results in the present study are in contrast with most of the figures reported for horses in which males were superior to females in all types of races, i.e. Trotters, Quarter, Thoroughbreds and purebred Arabian horses (Saastamoinen and Ojala, 1991; Villela et al., 2002; Mota et al., 2005; Ekiz and Koçak, 2005). Furthermore, Mota et al. (2005) attributed such superiority of males over females in horses to the difference of 1.5 body length between them. Moreover, Jelinek (1988) concluded that differences in racing performance between sexes are mainly due to different physiological characteristics of males and females while racing. However, Oki et al. (1994) reported that the effect of sex were not large in Japanese Thoroughbred Horses. They found that mares were faster than stallions on turf at all distances.

Table 3. Least square means of race speed and racing time by sex for each age group of race camels.

Age Group	Sex	Fastest ten		Fastest three		The fastest	
		Race Speed	Racing time	Race Speed	Racing time	Race Speed	Racing time
2	Male	10.67[a]	374.78[b]	10.69	371.66	10.80	370.23
	Female	10.63[b]	376.49[a]	10.76	373.99	10.72	372.91
	Pooled SEM	0.02	0.74	0.03	1.27	0.06	2.11
3	Male	10.66[b]	375.03[a]	10.76	371.49	10.80	370.08
	Female	10.69[a]	374.13[b]	10.78	370.96	10.82	369.64
	Pooled SEM	0.01	0.44	0.02	0.62	0.03	1.15
4	Male	10.39[b]	506[a]	10.53[b]	497.40	10.56[b]	495.78[a]
	Female	10.58[a]	484[b]	10.70[b]	478.45	10.75[a]	476.44[b]
	Pooled SEM	0.05	2.09	0.05	1.63	0.08	2.73
6	Male	9.85[b]	811.64[a]	9.94[b]	804.5[a]	9.95	803.3
	Female	10.30[a]	776.62[b]	10.37[a]	771.42 [b]	10.38	770.45
	Pooled SEM	1.05	2.41	0.02	1.69	0.04	4.36

Values in columns within each subcategory with different superscripts are significantly different ($P < 0.05$).

Except for 6-year-old camels in which purebred camels showed a significant ($P < 0.05$) lower performance than crossbred camels for the fastest ten, no significant differences between purebred and crossbred camels were detected (Table 4). It is important to point out that a better performance is to be expected for crossbred camels owing to the fact that crossbred animals have characteristics superior to both parents.

Table 4. Least square means of race speed and racing time by breed for each age group of race camels.

Age Group	Breed	Fastest ten		Fastest three		The fastest	
		Race Speed	Racing time	Race Speed	Racing time	Race Speed	Racing time
3	Purebred	10.67	374.80	10.77	371.37	10.81	370.08
	crossbred	10.70	374.18	10.78	370.97	10.83	369.54
	Pooled SEM	0.01	0.44	0.02	0.61	0.03	1.13
4	Purebred	10.48	490.89	10.62	482.35	10.64	481.10
	crossbred	10.57	497.48	10.62	492.32	10.69	490.23
	Pooled SEM	0.06	2.14	0.05	1.91	0.09	3.28
6	Purebred	10.09[b]	793.62[a]	10.17	786.85	10.18	786.00
	crossbred	10.29[a]	777.65[b]	10.34	773.63	10.36	772.20
	Pooled SEM	0.08	6.37	0.15	11.59	0.39	29.96

Values in columns within each subcategory with different superscripts are significantly different ($P < 0.05$).

Although there was no statistical evidence of sex by breed interaction effects on racing performance, crossbred males tended to perform better than other animals (Table 5). Hence, such tendency can be noticed for the category of the fastest ten. Regarding the effect of animal age on the speed at 4000 m and the effect of race distance of 3-year-old camels on speed (Table 6 and 7), no significant effects were detected between age groups and between distances. These similarities in performance might be attributed in part to the fact that more emphases are placed on race camel training rather than on genetic improvement. Thus, if selection based on genetic merit is applied to race camels, variation in racing performance will be more pronounced. It important to point out that the results in the present study are in line with Mota et al. (1998) who reported non-significant effect of age on racing performance if the analysis was made only for the winning horses.

Table 5. Least square means of race speed and racing time by sex and breed for each age group of race camels.

Age Group	Sex	Breed	Fastest ten		Fastest three		The fastest	
			Race Speed	Racing time	Race Speed	Racing time	Race Speed	Racing time
3	Male	Thoroughbred	10.64[b]	375.87[a]	10.74	372.16	10.79	370.48
	Female	Thoroughbred	10.69[a]	373.91[b]	10.79	370.59	10.82	369.55
	Male	Hybrid	10.69[a]	373.93[b]	10.78	370.73	10.81	369.75
	Female	Hybrid	10.68[a]	374.3[b]	10.77	371.19	10.83	369.53
	Pooled SEM		0.03	0.88	0.04	1.24	0.07	2.38
4	Male	Thoroughbred	10.38[b]	501.25[ac]	10.53[b]	490.73	10.57[b]	489.15
	Female	Thoroughbred	10.57[a]	481.59[b]	10.70[a]	474.62	10.72[a]	473.67
	Male	Hybrid	10.40[b]	512.94[a]	10.52[b]	506.30	10.56[b]	504.62
	Female	Hybrid	10.58[a]	487.93[bc]	10.69[a]	482.38	10.79[a]	479.44
	Pooled SEM		0.11	4.15	0.08	3.01	0.16	5.51
6	Male	Thoroughbred	9.85[b]	811.64[a]	9.94[a]	804.50[a]	-	-
	Male	Hybrid	10.31[a]	775.59[b]	10.4[b]	769.20[b]	-	-
	Female	Hybrid	10.28[a]	777.65[b]	10.3[c]	773.63[c]	-	-
	Pooled SEM		0.04	3.44	0.02	1.32		

Values in the columns within each subcategory with different superscripts are significantly different ($P < 0.05$).

Table 6. Least square Means, coefficients of variation (CV), minimum and maximum values for the racing speed of 4000 m distance according to age group.

Age group	Fastest three				The fastest			
	Mean	CV(%)	Min.	Max.	Mean	CV(%)	Min.	Max.
2	10.72	1.76	9.79	11.03	10.76	1.70	9.94	11.04
3	10.77	0.85	10.61	11.07	10.81	0.86	10.62	11.07
4	10.65	1.51	10.12	10.89	10.68	1.45	10.32	10.89
Pooled SEM	0.03				0.09			

Table 7. Least square Means, coefficients of variation (CV), minimum and maximum values for the racing speed of four-year race camels according to distance.

Distance	Fastest three				The fastest			
	Mean	CV(%)	Min.	Max.	Mean	CV(%)	Min.	Max.
4000	10.65	1.51	10.12	10.89	10.68	1.45	10.32	10.89
5000	10.63	1.94	10.34	11.78	10.71	3.02	10.38	10.78
6000	10.60	1.10	10.36	10.88	10.63	0.97	10.42	10.88
Pooled SEM	0.04				0.09			

Conclusion

The results of the present study provide insight into the environmental factors affecting racing performance of race camels in UAE. Therefore, determining these factors is a fundamental step in developing a selection program that aims to improve the racing performance of this breed. Moreover, the understanding of such factors may reduce the expenses for breeding and training, and help make respective decisions more objective.

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