Factors that affect whether Arabian horses have earnings during their first year of racing

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Abstract: This study of Arabian horses in Turkey evaluates factors that may affect the possibility of having earnings during the first year of horses' racing careers. A total of 2046 Arabian horses were included in the study population; 1020 Arabian horses (49.85%) did not earn any money during their first year of racing. To explore the shared characteristics of those that had earnings, a retrospective study was done with racing records of Arabian horses that were born between 2008 and 2011. The factors were ownership status, sex, age at first race, type of stud farm, and racing on one or both possible types of track surface. Logistic regression was used to evaluate which of these factors may have had a significant effect on first-year earnings. Results showed that horses that started their racing careers early (≤3.5 years of age) and raced on both track surface types (turf and dirt) had significantly increased odds of earning money during their first year of racing.

Key words: Arabian horses, earnings, logistic regression, racing performance

1. Introduction

Horse breeding is a sector that maintains its economic importance all over the world. Large amounts of work, time, and money are spent on horse breeding. Horses with good phenotypic and genetic characteristics are bought and sold for large amounts of money around the world. In Turkey, official horse-racing is organized by the Turkish Jockey Club (Turkish abbreviation: TJK) at nine tracks throughout the country, which have turf and dirt surfaces. While horses are mostly used in endurance racing throughout the world, in Turkey they are most commonly used in flat racing.

There have been many studies conducted on how racing performance and earnings (1) are affected by racing speed (1–3), racing order (4), and sex (5,6). More (7) showed that earnings are a contributor to wastage, which is defined as premature retirement from racing; only 71% of horses in the sample were able to continue racing after 1 year and 39.4% did not earn any money. Bourke (8) estimated that over one-third of the racehorse population is replaced every year. In Özen and Gürcan's (9) sample, only half of the horses were able to race after 16 months.

Generally, there are high wastage ratios during horses' first years of racing. For this reason, it is important to better understand the factors correlated with higher and lower earnings. Understanding these factors may help to develop preventive and protective recommendations for breeders. The aim of this study was to investigate the potential effect of several factors on the earnings of Arabian horses in Turkey during their first year of racing.

2. Materials and methods

2.1. Study design and data retrieval

Horse and racing data were retrieved from the TJK's online database, which is freely accessible (http://www.tjk.org/EN). The dataset comprised 2046 Arabian racehorses born between 2008 and 2011. The horse was the unit of analysis. Horse data included sex, age at first race, ownership status, type of stud farm, and whether the horse raced on the same track surface during its first year of racing. Detailed information for these independent variables is given in Table 1. First-year earnings status was used as the dependent variable. Horses without earnings were coded as 0 and those with earnings as 1.

2.2. Data analysis

Data were initially explored using frequency distributions. Each variable and potential two-way interaction terms were investigated for association using univariate logistic regression. Based on the results of the univariate approach, variables with an association of P < 0.25 were investigated further and added to the multivariate model (10). After determining the variables to be included in the model,

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Table 1. Description of independent variables for which the possibility of earning money during the first year of the racing career of Arabians was investigated by logistic regression analysis.

Variable name	Category	N	N%	Information
Age group	≤3.5 years	1571	76.80%	Age at first start of professional racing career
	>3.5 years	475	23.20%	
Ownership status	Sole ownership	1967	96.10%	If the horse is owned by a single person or a partnered firm/organization
	Joint ownership	79	3.90%	
Sex	Male	911	44.50%	Sex of the horse
	Female	1135	55.50%	
Type of stud farm	State	425	20.80%	Information about origin of the horse
	Private	1621	79.20%	
Racing on a single type of track surface	Yes	616	30.10%	Whether the horse raced on the same track surface (turf/dirt) during its first year of racing
	No	1430	69.90%	
Number of starts	≤6 starts	1036	50.64%	Number of starts during horse's first year of racing
	>6 starts	1010	49.36%	

all variables were entered in the full model. The Hosmer–Lemeshow goodness-of-fit test was used to test the fit of the logistic model. Data analyses were conducted using Stata 12/MP4 statistical software.

3. Results

Descriptive statistics showed that the study population consisted of 911 (44.5%) males and 1135 (55.5%) females. Horses from state stud farms accounted for 20.8% (425) of horses. There were 23.2% (475) horses that started their racing careers when they were older than 3.5 years of age. There were 616 (30.1%) horses that raced on a single type of track surface. A total of 79 (3.9%) horses were owned by a partnered firm or organization. Horses' birth years were evenly distributed across the four years of 2008–2011 at 27.12% (n = 555), 24.48% (n = 501), 23.41% (n = 479), and 24.98% (n = 511), respectively. Median number of starts for the horses during the first year of racing was 6 (minimum: 1; mode: 3; maximum: 22). In the present study, about half of the horses (1020 or 49.85%) did not earn any money during their first year of racing.

The preliminary analysis showed that ownership status had no significant effect on the probability of earning money during the first year (P = 0.584), so it was excluded from further examination. Other variables had a stronger relationship with earnings: sex (P = 0.208), racing on a single type of track (P < 0.001), age at first start (P < 0.001), and type of stud farm (P = 0.017). All two-factor combinations were examined and only one had a significant relationship with earnings: racing on the same type of track surface and age at first start (P = 0.007).

Table 2 shows the results of the multivariate logistic regression against earnings. Using Hosmer–Lemeshow goodness-of-fit statistics, the chi-square value was calculated as 4.69, with 8 degrees of freedom and P-value of 0.803. Therefore, the model was a good fit.

Results of the fitted logistic model showed that the odds of earning money during the first years of a racing career were 1.31 times (95% CI: 1.06–1.61) higher for male than female horses (P = 0.011). Horses with more than 6 starts in their first year of the career were 9.55 times (95% CI: 7.65–11.91) more likely to have earnings (P < 0.001). Horses raised in state stud farms were 1.11 times (95% CI: 0.86–1.43) more likely to earn money than horses raised in private stud farms, but it was nonsignificant (P = 0.129). Age at first start was quite significant: horses that started their careers at 3.5 years of age or younger were 2.35 times (95% CI: 1.5–3.66) more likely to earn money than horses starting later (P < 0.001). There were significant effects for the interaction of age at first start and racing on a single type of track. Horses who started later (>3.5 years) and raced on both types of track surfaces were 1.74 times more likely to have earnings as compared to horses that raced on a single type of track surface. Horses who started younger (≤3.5 years) and raced on both types of track surfaces were 2.13 times more likely to have earnings as compared to horses who started later (>3.5 years) but raced on a single type of track surface. Odds ratios for different combinations of levels for both variables can be estimated from the beta values (Table 2).

Table 2. Results of the multivariate logistic regression in which possibility of earning money during the first year of the racing career of Arabian horses was investigated.

Variable name	Category	β	S.E.	Wald	df	P	Exp(β)	95% CI for Exp(β)	
								Lower	Upper
Sex	Male	0.268	0.106	6.449	1	0.011	1.308	1.063	1.609
	Female	Reference							
Same type of track	No	0.555	0.245	5.112	1	0.024	1.742	1.077	2.817
	Yes	Reference							
Age group	≤3.5 years	0.852	0.227	14.146	1	<0.001	2.345	1.504	3.655
	>3.5 years	Reference							
Stud farm	State	0.102	0.13	0.624	1	0.129	1.108	0.859	1.428
	Private	Reference							
Number of starts	> 6 starts	2.256	0.113	399.19	1	<0.001	9.546	7.651	11.91
	≤6 starts	Reference							
Age group × racing on a single type of track surface	<3.5 years × no	−0.65	0.274	5.607	1	0.018	0.522	0.305	0.894
	>3.5 years × yes	Reference							
Constant		−1.93	0.208	86.132	1	<0.001	0.145		

4. Discussion

Success in racehorse breeding is measured by racing performance. Various traits like best racing time, annual earnings, and earnings per start have been used to evaluate racing performance (11). However, many such studies are limited because they exclude horses with short careers of only a few races. This may lead to misleading results and interpretations. To address this, we simplified earnings to a binary variable: earning money or not during the first year of racing.

The present study has showed that an early age at first start increases the odds of earning money during the first year of racing. Previous studies also reported that age was a significant factor in racing times (12), best racing times (13), and earnings (14). Moreover, other studies reported that early starts have a positive influence on racing careers (6,9,15). Age at first start can depend on many factors, including maturity, musculoskeletal development, racing calendar, and the desire of the breeder. Sobczyńska (6) reported that horses that start racing early tend to be better physically developed. This agrees with the present study, which shows a positive relationship between young age at start and earnings.

It is known that males are physically stronger and have a stronger competitive drive (16), which might lead to higher earnings. Previous studies showed significant differences between males and females in performance-related traits such as best racing times for Thoroughbred horses (13), racing times for Quarter horses (17), earnings (1), and length of racing career for Arabian horses (9). The present study agrees with this, showing that male horses are more likely to earn money during their first year of racing.

The influence of track type has also been studied. Mota et al. (18) and Moritsu et al. (13) reported that Thoroughbred horses were faster on turf than dirt tracks. Köseman and Özbeyaz (19) reported similar results for Arabian horses. This study's approach was different. Many owners test horses' performance on different surfaces, so this study focused on the effect of changing surface types rather than the effect of each surface. Results show that racing horses on both track surfaces has a positive effect on first-year earnings. This effect was especially high for horses who started racing at a young age. This correlation supports the idea that changing track surfaces has a positive effect on musculoskeletal development and hence increases the chances of winning.

Only a few studies have been done on the effect of stud farm type on racing performance. A significant effect was reported for Quarter horses (17), Romanian trotters (20), and Arabian horses (1). Özen and Gürcan (9) reported a significant effect of stud farm type on the length of racing career for Arabian horses. Although the effect of this variable in the model was nonsignificant, findings of the

present study support those previous conclusions. This study shows that horses raised in state stud farms have greater odds of having earnings during their first year of racing. This suggests that state farms offer better breeding services, such as care and feeding.

Number of starts during the first year of racing was the greatest contributor to the model. This study showed that horses with a high (>6) number of starts have a greater chance for earning money. More (7) showed that with each additional race run during the first year of racing for Thoroughbreds there was an increasing likelihood of 2.5 times that these horses were considered well-performing rather that poorly performing animals, which seems to be in concordance with the findings of this study. It was also reported that a high number of starts (>4) during the first year of racing has a significant effect on the length of racing life (7).

The main limitation of this study was not including additional possible factors. There are various factors that may affect first-year earnings. Factors evaluated in this study were based only on available data, but there are a number of additional factors that may be significant, such as exercise intensity, castration status, jockey, and trainer. Some of these data are also not suitable for logistic regression analysis. Furthermore, disease and injury data could not be evaluated due to a lack of systematic recording at horse hospitals. Undoubtedly, including some of these factors in future studies would improve our understanding of what most affects earnings.

Despite the best efforts of breeders and trainers, there are high culling ratios that significantly impact earnings in the first year of racing. This study's aim was to identify factors that may help reduce wastage and extend horses' racing careers. Further research on the many potential factors that affect earnings could lead to improved recommendations toward optimizing horses' performance and earnings.

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