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Some factors of the time of breaking and training affecting racing performance in young trotters

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Abstract. Saastamoinen, M.T. (Agricultural Research Center, Equine Research Station, SF-32100 Ypäjä, Finland). Some factors of the time of breaking and training affecting racing performance in young trotters.

An inquiry study was carried out to query the main reasons for non-starting and poor racing results, as well as to estimate the effect of some factors of the time of breaking and training on racing performance. The numbers of acceptable responses were 796 for Standardbred trotters and 857 for Finnhorses. About 72 % of the Standardbred trotters raced before the end of the five-year season, and about 42 % of the Finnhorse trotters raced before the end of their six-year season. The main reasons for non-starting and poor racing results were injuries and ailments, bad character, lack of talent and poor training. In general, young age at the beginning of breaking and training was favorably associated with racing performance. For instance, three-year-old Standardbred trotters broken at the age of 1 or 1½ years were 2.1 seconds faster ($p < 0.01$) and had a larger number of starts ($p < 0.05$) than their racemates broken at 2 or 3 years of age. The influence of class of persons responsible for breaking and training was minor. However, trotters broken and trained by professional trainers seemed to have better racing results than trotters broken and trained by breeders and owners.

Index words: horse, trotting, racehorse, environmental factors

Introduction

Environmental factors affecting the racing performance of trotters can be classified by long, middle and short term effects (KATONA 1985). Long term effects include the influences of breeder, birth year, season of birth as well as age and sex of the horse. The influence of training and racing year are middle term effects. Short term effects include factors affecting performance in a single race.

Racing performance may also be affected by several factors arising during the breaking and training periods. These include e.g. injuries, ailments and bad character.

The possible effects of training on racing performance may be due to differences in the methods employed by different persons car-

rying out breaking and training. A horse's age at the onset of breaking and training may also influence racing performance. Starting training at young age is supposed to be advantageous both to the development of young horses and their racing performance (RONEUS 1987, LINDHOLM 1988, 1990).

The purpose of this study was to query reasons for nonstarting and poor racing results of trotters. Another aim was to estimate the influence of the age at onset of breaking and training, as well as the influence of persons responsible for breaking and training, on racing performance in young trotters.

Materials and methods

A questionnaire was sent out to both owners of Standardbred trotters born in 1981 and 1982, and to those owning Finnhorses born in 1980 and 1981. The number of inquiries sent out was 1810 and 1995, to Standardbred and Finnhorse owners, respectively.

The response percentages were 46.5 for Standardbred trotters and 46.8 for Finnhorses, with no reminders sent. Thus, the total number of replies was 841 for Standardbred trotters, and 934 for Finnhorses.

The numbers of acceptable responses were 796 (361 born in 1981, 435 born in 1982) for Standardbred trotters, and 857 (389 born in 1980, 468 born in 1981) for Finnhorses. These horses were approximately 35 % of each crop born. The proportion of males (stallions or geldings) was 47 % in Standardbred trotters and 58 % in Finnhorses.

In the data the number of Standardbred trotters raced before the end of the five-year season was 589 (72 % of all horses), and the number of Finnhorse trotters raced before the end of the six-year season was 391 (42 %). For Finnish Standardbred trotters born in 1981 and 1982 the proportion of horses raced before the end of the five-year season was about 65 % (ANON. 1983, 1984, 1985, 1986, 1987). In the case of Finnhorses born in 1980 and 1981, the proportion of horses raced before the end of the six-year season was about 45 %.

Only a few Standardbred trotters started racing at two years of age, and the starting frequency of 2-year-old Standardbred trotters was distinctly smaller than that of 3-year-old Finnhorse trotters (Table 1). Percentages of horses raced at different age classes in Standardbred trotters were in agreement with the statistics on Finnish trotter population (ANON. 1983, 1984, 1985, 1986, 1987). In Finnhorses the percentages were smaller than reported for the whole population, as shown in Table 1.

The data consisted of age at onset of breaking and training, persons charged with breaking and training, as well as the annually summarised race records for 3 through 5-year-old Finnish Standardbred trotters and 4 through 6-year-old Finnhorse trotters. The data also included information on sire, sex, birth-month class (January-March, April, May, June, July, August-November) and birth year of the horse.

Age at the onset of breaking and training was determined within the accuracy of one half or one year (Table 2). The age of a horse is calculated from the first of January of the birth year (ANON. 1987b).

For the statistical analyses, the horses were classified according to their age at the onset of breaking or age at the onset of training. The class "early broken" included Standardbred trotters that started breaking at 1 or 1½ years of age and Finnhorses that started breaking at 1½ or 2 years of age. The class "late broken" included Standardbred trotters that started breaking at 2 or 3 years of age and Finnhorses that started breaking at 3 or 4 years of age.

Similarly, the class "early trained" included Standardbred trotters that started training at the age of 1½ or 2 years and Finnhorses starting training at the age of 2 or 3 years. Standardbred trotters whose training began at 3 or 4 years of age, and Finnhorses trained beginning at 4 or 5 years of age, belonged to class "late trained".

Persons in charge of breaking and training

were classified as breeders, owners and professional trainers (Table 3). The largest group responsible for breaking was breeders in both breeds.

Traits representing a horse's annual racing performance were best racing time on volt-start, number of starts, fourth root of earnings, logit transformation of first placings,

Table 1. Number and percentage of horses raced at different age classes.

Age class	Data		Anon. (1983—87)	Age class	Data		Anon. (1983—87)
	n	%	%		n	%	%
Standardbred trotters				Finnhorse trotters			
2	14	1.8	1.2	3	92	10.8	7.9
3	289	36.3	35.6	4	221	25.8	34.9
4	478	60.1	60.1	5	287	33.5	44.0
5	449	56.4	58.5	6	357	41.7	44.9

Table 2. Number and percentage of 3 to 5-yr-old Standardbred trotters and 4 to 6-yr-old Finnhorse trotters in different age classes at onset of breaking and training.

Age	Standardbred trotters						Age	Finnhorse trotters					
	3		4		5			4		5		6	
	n	%	n	%	n	%		n	%	n	%	n	%
Age at breaking							Age at breaking						
1	36	13	48	10	47	11	1½	63	29	76	27	88	25
1½	145	50	241	50	209	47	2	94	42	113	39	136	38
2	94	32	147	31	141	31	3	57	26	75	26	91	25
3	14	5	42	9	52	11	4	7	3	23	8	42	12
Age at training							Age at training						
1½	22	8	24	5	22	5	2	8	4	11	4	11	3
2	134	48	186	40	164	37	3	116	53	115	41	132	38
3	122	43	226	48	212	48	4	87	40	131	47	152	44
4	4	1	32	7	42	10	5	7	3	24	8	52	15

Table 3. Number and percentage of 3 to 5-yr-old Standardbred trotters and 4 to 6-yr-old Finnhorse trotters in different classes of instructor and trainer.
B = breeder, O = owner, PT = professional trainer.

Age	Standardbred trotters						Age	Finnhorse trotters					
	3		4		5			4		5		6	
	n	%	n	%	n	%		n	%	n	%	n	%
At breaking							At breaking						
B	109	39	184	39	169	38	B	118	54	153	54	186	53
O	86	30	144	31	146	34	O	89	40	117	41	153	43
PT	88	31	141	30	125	28	PT	13	6	15	5	15	4
At training							At training						
B	71	26	130	28	112	26	B	80	37	111	40	133	39
O	84	30	141	31	149	35	O	102	47	130	46	167	48
PT	122	44	189	41	170	39	PT	35	16	39	14	45	13

logit of first-to-third placings and logit of disqualified races.

The data were analysed by the Least Squares Analysis. The following linear models were assumed for each age class within breeds:

Model 1

$$y_{ijklmno} = \mu + a_i + b_j + c_k + d_l + f_m + s_n + e_{ijklmno}$$

$y_{ijklmno}$ is the annually summarised race record;
μ is a general mean;
a_i is fixed effect of the i^{th} class of age at onset of breaking;
b_j is fixed effect of the j^{th} class of instructor;
c_k is fixed effect of the k^{th} sex;
d_l is fixed effect of the l^{th} birth-month class;
f_m is fixed effect of the m^{th} birth year;
s_n is random effect due to the n^{th} sire, IID $(0, \sigma_s^2)$;
e_{ijklmo} is a random error effect, NID $(0, \sigma_e^2)$.

Model 2

$$y_{ijklmno} = \mu + a_i + b_j + c_k + d_l + f_m + s_n + e_{ijklmno}$$

In model 2 a-effect was the class of age at onset of training and b-effect was the class of trainer. All other elements were defined as in model 1.

Results

Reasons for non-starting and poor performance

The incidence of different reasons for non-starting and poor racing results varied between the breeds (Fig. 1 and 2). However, the main reasons for non-starting in both breeds were injuries and ailments, as well as transferring to breeding (mares). Other important reasons were lack of talent, bad character and growth abnormalities which were separated from other diseases.

About 63 % of the Standardbred trotters and 62 % of the Finnhorse trotters succeeded worse in their races than their owners had expected. The most important reasons for poor racing performance in both breeds were diseases and injuries, poor training and bad character.

Diseases and injuries, as reasons for non-starting and poor performance, were more common among trotters trained by professional trainers than among those trained by breeders and owners. They were also more frequent in males than in females.

Factors affecting racing performance

Class of age at onset of breaking. In general, young age at the beginning of both breaking and training was favorably associated with racing performance. Three-year-old Standardbred trotters that started breaking at the age of 1 or 1½ years were 2.1 seconds faster ($p < 0.01$) and also had a larger number of starts ($p < 0.05$) (2 starts more) than their racemates broken at 2 or 3 years of age (Table 4). The "early broken" Standardbred trotters had larger earnings at five years of age than their "late broken" contemporaries ($p < 0.001$).

Five-year-old Finnhorse trotters that started breaking at the age of 1½ or 2 years had larger earnings and larger number of first placings than horses broken at 2 or 3 years of age ($p < 0.01$). The "early broken" Finnhorses had a larger number of first placings ($p < 0.001$) and first-to-third placings ($p < 0.01$) at the age of six years than their "late broken" racemates.

Class of age at onset of training. Three- and four-year-old Standardbred trotters that started training at 1½ or 2 years of age were faster ($p < 0.01$ and $p < 0.05$) than their contemporaries who started at 3 or 4 years of age (Table 5). Young age at the beginning of training was also advantageous for the number of starts in 3-year-old Standardbred trotters ($p < 0.001$).

In Finnhorses, four-, five- and six-year-old trotters whose training began at 2 or 3 years of age were faster ($p < 0.01$ or 0.05) than their racemates started training at 4 or 5 years of

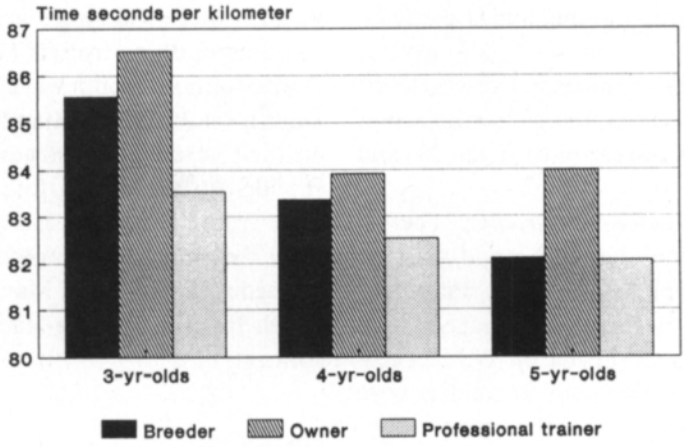

Fig. 1a

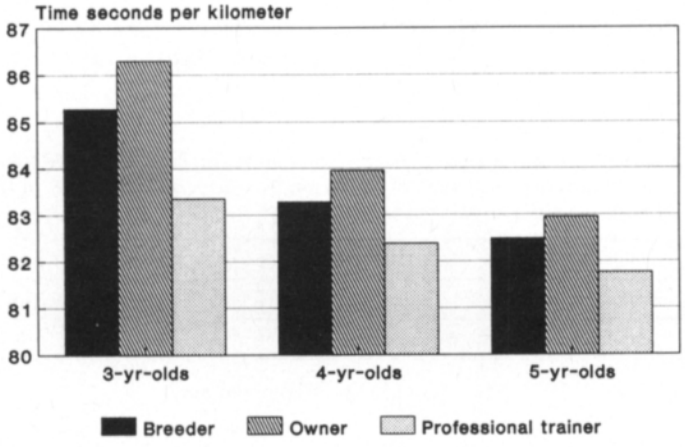

Fig. 1b

Fig. 1. Reasons for non-starting in Standardbred trotters (a) and Finnhorse trotters (b).

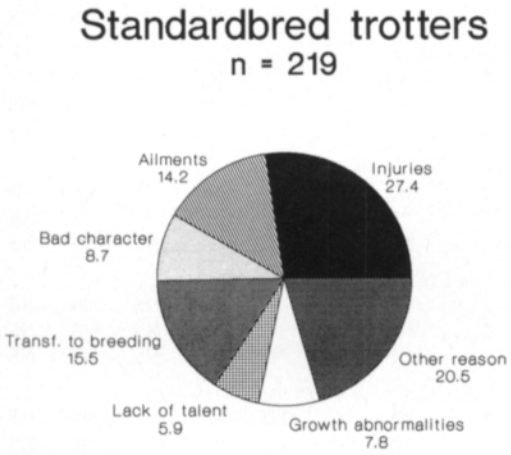

Fig. 2a

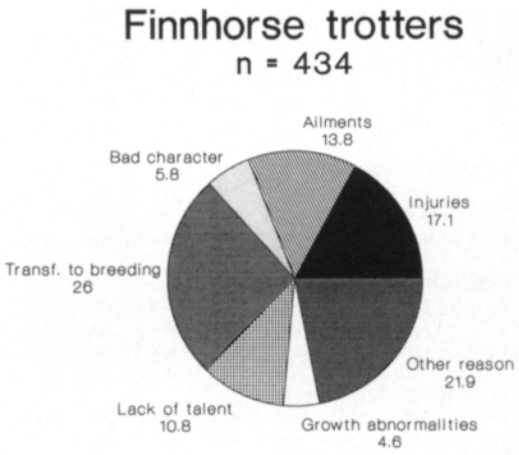

Fig. 2b

Fig. 2. Reasons for poor racing performance in Standardbred trotters (a) and Finnhorse trotters (b).

age (Table 5). Early training was also advantageous for the number of starts in four-year-olds ($p<0.01$), for earnings in five-year-olds, and for the number of first-to-third placings in four- and five-year-olds ($p<0.05$ and $p<0.01$).

Class of instructor and trainer. The influence of class of instructor and class of trainer on racing performance was statistically significant only in three- and four-year-old Standardbred trotters (Table 4). Trotters broken or trained by professional trainers were faster ($p<0.05$ to $p<0.01$) than trotters broken or trained by breeders and owners (Fig. 3).

Sex, birh-month class and birth year. In general, in both breeds and in all age classes, males were superior to females. The differences between sexes were largest in four-year-old Standardbred trotters (Table 4). The influence of birth month was statistically significant ($p<0.05$) only in Standardbred trotters. In their case, the most advantageous birth months for three- and four-year-old horses were from January to March For five-year-olds the most advantageous birth months seemed to be April and May. Differences between birth years were statistically non-significant.

Discussion

Reasons for non-starting and poor racing performance. Injuries and ailments included different diseases and accidents, and might

Table 4. Statistical significance of the effects of fixed factors on racing performance (F-test).
1 = class of age at onset of breaking, 2 = class of instructor, 3 = class of age at onset of training, 4 = class of trainer, 5 = sex, 6 = birth month class, 7 = birth year.

	F-test for													
	Standardbred trotter							Finnhorse trotter						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Trait and age								Trait and age						
Best time								Best time						
3	**	**	**	**	NS	NS	NS	4	NS	NS	**	NS	NS	NS	NS
4	NS	**	*	*	*	NS	NS	5	NS	NS	**	NS	NS	NS	NS
5	NS	NS	NS	NS	NS	*	NS	6	NS	NS	*	NS	*	NS	NS
Number of starts								Number of starts						
3	*	NS	***	NS	NS	NS	NS	4	NS	NS	**	NS	NS	NS	NS
4	NS	NS	NS	NS	***	NS	NS	5	NS	NS	NS	NS	NS	NS	NS
5	NS	NS	NS	NS	NS	NS	NS	6	NS	NS	NS	NS	*	NS	NS
(Earnings)$^{1/4}$								(Earnings)$^{1/4}$						
3	NS	*	NS	NS	NS	*	NS	4	NS	NS	NS	NS	NS	NS	NS
4	NS	NS	NS	NS	NS	**	NS	5	**	NS	**	NS	NS	NS	NS
5	***	NS	NS	NS	NS	NS	NS	6	NS	NS	NS	NS	*	NS	NS
Logit (first placings)								Logit (first placings)						
3	NS	NS	NS	NS	NS	*	NS	4	NS	NS	NS	NS	NS	NS	NS
4	NS	NS	NS	NS	*	NS	NS	5	**	NS	NS	NS	NS	NS	NS
5	NS	NS	NS	NS	**	NS	NS	6	***	NS	NS	NS	NS	NS	NS
Logit (first-to-third-placings)								Logit (first-to-third placings)						
3	NS	NS	NS	NS	NS	*	NS	4	NS	NS	*	NS	NS	NS	NS
4	NS	NS	NS	NS	**	NS	NS	5	NS	NS	*	NS	NS	NS	NS
5	NS	NS	NS	NS	NS	*	NS	6	**	NS	NS	NS	NS	NS	NS
Logit (disqualified races)								Logit (disqualified races)						
3	NS	NS	NS	NS	NS	NS	NS	4	NS	NS	NS	NS	NS	NS	NS
4	NS	NS	NS	NS	NS	NS	NS	5	NS	NS	NS	NS	NS	NS	NS
5	NS	NS	NS	NS	NS	NS	NS	6	NS	NS	NS	NS	NS	NS	NS

Levels of statitical significance: *** $p<0.001$, ** $p<0.01$, * $p<0.05$, NS non-significant

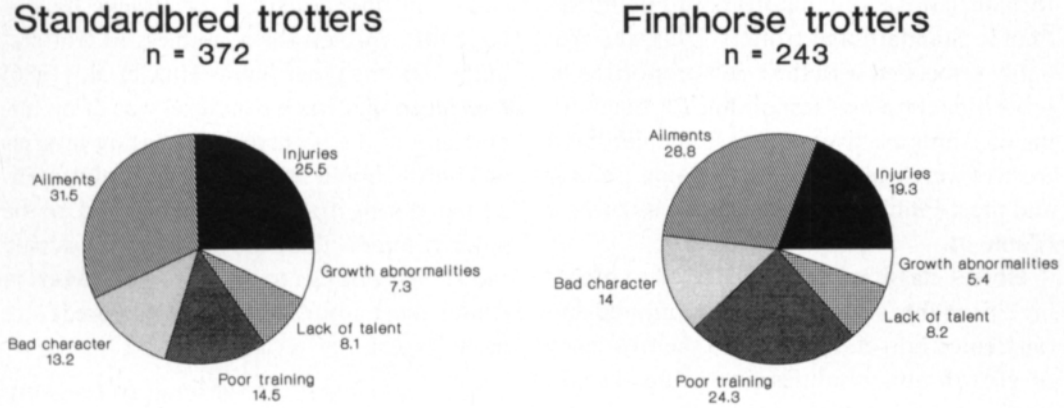

Fig. 3a

Fig. 3b

Fig. 3. Influence of class of instructor (a) and class of trainer (b) on best time in Standardbred trotters.

also include poor durability and unsoundness occurring during the training period. The higher frequency of injuries in Standardbred trotters compared to that in Finnhorses may be due to the higher training intensity and the more stressful training environment of Standardbred trotters.

Poor training as a reason for inferior per-

Table 5. Effect of class of age at onset of training on performance traits.
1 = early trained[a], 2 = late trained (see text).

	LS-mean	Class of age at onset of training		F-test		LS-mean	Class of age at onset of training		F-test
		1	2				1	2	
Standardbred trotter					Finnhorse trotter				
Best time (sec.)					Best time (sec.)				
3	84.96	0	+1.90	**	5	104.44	0	+3.32	**
4	83.25	0	+1.04	*	5	101.00	0	+2.88	**
5	82.47	0	+0.22	ns	6	98.84	0	+2.00	*
Number of starts					Number of starts				
3	7.73	0	—3.00	***	4	8.36	0	—2.80	**
4	14.16	0	—1.40	ns	5	14.10	0	—2.40	ns
5	15.85	0	+0.12	ns	6	15.00	0	—2.27	ns
(Earnings)$^{1/4}$					(Earnings)$^{1/4}$				
3	4.13	0	—0.40	ns	4	3.65	0	—0.65	ns
4	4.48	0	—0.30	ns	5	4.15	0	—0.40	**
5	4.30	0	0.00	ns	6	4.28	0	—0.25	ns
Logit (first placings)					Logit (first placings)				
3	—1.74	0	—0.08	ns	4	—1.88	0	—0.22	ns
4	—2.01	0	—0.12	ns	5	—2.15	0	—0.13	ns
5	—2.24	0	—0.10	ns	6	—2.14	0	—0.18	ns
Logit (1st to 3rd placings)					Logit (1st to 3rd placings)				
3	—0.87	0	—0.24	ns	4	—1.05	0	—0.36	*
4	—0.93	0	—0.06	ns	5	—1.02	0	—0.31	*
5	—1.08	0	0.00	ns	6	—1.11	0	—0.16	ns
Logit (disqualified races)					Logit (disqualified races)				
3	—1.46	0	+0.12	ns	4	—1.54	0	+0.20	ns
4	—1.73	0	+0.18	ns	5	—1.75	0	+0.26	ns
5	—1.81	0	0.00	ns	6	—1.71	0	+0.05	ns

formance was more important in Finnhorses than in Standardbred trotters. This was probably associated with the small proportion of professional trainers responsible for the training of Finnhorse trotters. Most Standardbred trotters were trained by professional trainers and most Finnhorses were trained by owners (Table 3).

Horses classified as "transferred to breeding" probably also included sick, injured and untalented horses. In regard to the frequency of growth abnormalities, it was not known how the incidence of these cases was diagnosed. However, growth abnormalities were more common in Standardbred trotters than in Finnhorses.

Even most trotters succeeded worse in their races than expected by their owners, the number of starts observed was larger than that presented for an average Finnish Standardbred trotter and Finnhorse trotter belonging to the same crops studied here (Anon. 1983, 1984, 1985, 1986, 1987).

The reasons for non-starting and poor performance agreed with those presented for non- and late starting in trotters in Nordic countries (Bendroth 1981, Klemetsdal et al. 1985, Andersson-Eklund 1988, Saastamoinen 1991). Thafvelin and Magnusson (1985) reported that 4-year-old trotters which never raced had worse orthopedic health compared to raced trotters, and that trotters with poor orthopedic health had a smaller number of starts compared to trotters with good orthopedic health.

The main reasons for non-starting and poor racing results in Thoroughbreds have also been reported to be injuries and a variety kinds of ailments (Darenius and Ström 1979, Jeffcott et al. 1982).

Hoppe and Philipsson (1984) reported a lower racing capacity for trotters with osteochondrosis (OCD) compared to those trotters without OCD. Morris and Seeherman (1991) reported that 84 per cent of horses with poor performance suffered from more than one health problem.

According to Fredricson et al. (1975) the condition and design of racetracks have a large influence on the soundness of trotters' limbs. On the other hand, Hill et al. (1986) concluded that track condition was of no importance in the occurrence of racing injuries to Thoroughbred horses, and that injuries incurred during training were believed to be more common than those occurring during races. According to Krook and Maylin (1989) most injuries in Thoroughbreds are pathological.

Effect of class of age at onset of breaking and training. It can be supposed that horses beginning breaking and training earlier than their racemates were more talented and mature. They might also be sounder and more resistant to injuries compared to the horses beginning late (Bendroth 1981, Darenius et al. 1983, Saastamoinen 1991), and could thus start earlier and race more frequently.

The influences of age at breaking and training may be overestimated because some horses discontinued their careers after one or two racing seasons. On the other hand, some horses whose breaking and training was started early might have been delayed in starting to race due to different reasons.

The practice of beginning breaking and training at an early age has been stated to be advantageous to the performance of the horse (Lindholm 1988). A Standardbred foal should be broken at 1½ years of age (Roneus 1987, Lindholm 1988). Training a growing horse is benefical to the development of its bones, musculature, tendons, respiratory organs and circulatory system. In addition, a negative correlation has been observed between age and rate of learning (Mader and Price 1980) which, in turn, is positively correlated with trainability (Fiske and Potter 1979).

Starting to race at an early age has been observed to favorably influence the racing results of young trotters (Physicksheard 1986a; Saastamoinen and Ojala 1988). Minkema (1975) reported that early mature horses did not win more money during their career than later mature horses.

Effect of class of instructor and trainer. Due to the small influence of class of instructor and class of trainer, it can be assumed that there were no differences in the training methods among different intsructor and trainer groups. The differences between trainer groups in best time in three- and four-year-old Standardbred trotters may be due to differences in the talent and maturity of horses; most talented and well developed horses were driven to broken and trained by professional trainers. HINTZ and Van VLECK (1978) reported a significant effect of the driver on racing results in pacers. In Finland, many trotters trained by owners are driven in races by professional trainers.

Effect of sex, birth-month class and birth year. The superiority of males to females was in agreement with many previous studies (i.a. OJALA 1982, BENDROTH et al. 1985; OJALA and HELLMAN 1987). The influence of birth month agreed with PHYSICKSHEARD (1986b) and SAASTAMOINEN and OJALA (1991).

The influence of birth year was slight probably because the number of consecutive birth years was only two.

Conclusions

Young age at the onset of breaking and training seemed to be favorably associated with the racing performance of young trotters. Horses whose breaking and training was started early might have been more mature, sounder and more resistant to injuries than other horses. The influence of class of persons responsible for breaking and training was minor, indicating slight differences in training methods. The main reasons for non-starting and poor racing performance were injuries and ailments, bad character, lack of talent and poor training.

The present study should be regarded as a pilot investigation, and its results will only reveal trends and provide some insight into the influencing factors due to the small and subjective data set. It is also possible that the data are selected because owners of horses with certain problems might have been more interested in responding to the questionnaire.

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SELOSTUS

Eräiden opetuksen ja valmennuksen aikaisten tekijöiden vaikutus nuoren ravihevosen kilpailutuloksiin

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Ravihevosten omistajille tehdyllä kyselytutkimuksella selvitettiin syitä hevosten kilpailemattomuuteen ja heikkoon kilpailumenestykseen, sekä arvioitiin eräiden opetuksen ja valmennuksen aikaisten tekijöiden vaikutusta kilpailutuloksiin. Hyväksyttävien vastausten määrä oli 796 lämminverisillä ravihevosilla ja 857 suomenhevosilla. Lämminverisistä oli kilpaillut viimeistään viisivuotiaana 72 % ja suomenhevosista viimeistään kuusivuotiaana 42 %. Tärkeimmät syyt kilpailemattomuuteen ja huonoon kilpailumenestykseen olivat loukkaantumiset ja sairastelu, huono luonne, lahjattomuus ja huono valmennus. Aikaisin opetukseen ja valmennukseen tulleet hevoset menestyivät myöhään aloittaneita ikätovereitaan paremmin. Esimerkiksi lämminveriset, joilla opetus aloitettiin 1- tai 1½-vuotiaana olivat 2.1 sekuntia nopeampia ($p<0.01$) kolmevuotiaana kuin ne, joilla opetus oli aloitettu 2- tai 3-vuotiaana. Niillä oli myös kilpailtu useammin ($p<0.05$). Opetuksen ja valmennuksen suorittaneiden henkilöluokkien (kasvattaja, omistaja, ammattivalmentaja) väliset erot hevosten kilpailumenestyksessä olivat pienet. Ammattivalmentajien opettamat ja valmentamat hevoset näyttivät kuitenkin menestyneen kasvattajien ja omistajien opettamia ja valmentamia hevosia paremmin.