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Author(s)	Watanabe, Yutaka; Shimoiizaka, Takashi; Sato, Kunitada
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An Analysis of the Racing Performances of Thoroughbreds in Japan

By

Yutaka WATANABE, Takashi SHIMOIIZAKA
and Kunitada SATO

Although the breeding of Thoroughbreds carries speculative aspects, in some sense, the production of Thoroughbreds requires a knowledge of refined technique in animal husbandry.

Not many domestic animals require selection by continuous performance tests, as do Thoroughbreds. The need of continuous testing indicates the difficulties of breeding large animals.

From time to time, the selection of mares and the mating of stock are at issue among breeders. So far in Japan there is no record for scientific analysis of the breeding of Thoroughbreds, a specific livestock. The authors have attempted some research in this area.

The Present Situation of Thoroughbred Breeding in Japan

The first Thoroughbreds were imported by Japan from America to the Imperial Stock-Farm of Shimofusa in 1877 (the 10th year of Meiji Era). They were stallions: Bradley by Norfork, Lowstone by Norfork, and Monmouth by War Dance. After this, breeding stock was imported mainly from England, Australia and America. Both production and racing were carried on.

The number of Thoroughbred mares mated in 1941 and after 1945, and the number of foals born in the following year, are shown in Table 1.

The number of Thoroughbreds mated in 1945, according to the Japan Light-Breed Horse Association Census, decreased by one-third the number mated in 1941. After 1945, the number gradually increased. In 1955, the number of foals born surpassed that of 1941, and in 1957 the number of mares mated exceeded pre-war records.

Various breeding stocks were imported recently. The cost of doing so was colossal. Especially conspicuous was the involvement of owner-breeders through large-scale capital investments. Since the market conditions were generally favorable, many homebred mares were returned to breeding stock, regardless

TABLE 1. The number of Thoroughbred mares mated in 1941 and from 1945 through 1964, with the resulting number of foals born.

Year	Number of mated Mares.	Number of foals
1941	1543	610
1945	527	221
1946	665	314
1047	693	379
1948	735	368
1949	707	373
1950	743	341
1951	758	412
1952	934	456
1953	1094	554
1954	1236	660
1955	1287	727
1956	1406	817
1957	1606	940
1958	1747	1027
1959	1918	1115
1960	2090	1237
1961	2433	1491
1962	2807	1767
1963	3170	2013
1964	3497	

of their qualities and despite their performance tests. The number of brood mares is increasing every year.

Artificial insemination is not permitted for Thoroughbred. The maximum of mating mares per stallion in a given year is about sixtyfive. Demands for mating with a popular stallion, including a proven sire, reached two to three times the maximum. Only qualified mares, having excellent previous records through examination by administrators of stallions, are permitted to be mated. Since there is a shortage of good-quality stallions, and the offspring of imported stallions are advantageous in the market, imports from foreign countries are in demand. However, the cost of first-class stallions, with excellent phenotypes and pedigrees, has risen considerably in both Europe and America. Selection,

therefore, is inevitably based only on pedigree. And some imported stallions are considered inferior to domestic ones in their abilities.

As for breeding Thoroughbreds, improvement of its level as a whole, generally, is not taken into consideration. Recently, the number of breeders who are willing to improve the quality brood mares has increased. Obtaining good quality mares in domestic production is rather difficult because of the increase in number of owner-breeders, and also because there is no public market except for yearlings. Hence, a large sum of money is spent on quick imports. Few good phenotypes are found in the sales catalogues of European countries. Therefore, selection has to be made on the basis of pedigree alone. Under these circumstances most breeders would choose a mare that has a famous first-class mare somewhere in her remote family line rather than one with less-known but good, middle-class mares in the closest ancestry. There is an advantage in this at the time of sale; the name of a famous mare as an ancestor enhances the sales value. If a mare has a famous horse as a distant ancestor and another good quality individual in her nearer ancestry, there is every chance of her being a good individual, although this may not be so in all cases. It is difficult to expect qualitative improvement from improted mares.

Inferior mares replaced by larger breeding stations are seldom eliminated completely, for they are quite expensive. They are gradually passed on to medium and small scale breeders and thus their total number does not decrease. As a result, best Thoroughbreds can be mated with only a limited number of equally good specimens, and the crossing of inferior animals is unlimited, the difference between the first rate and the second class specimens tends to become greater.

It is difficult to estimate accurately the demand for yearling Thoroughbreds. But it is feared that there may be overproduction in the near future. Moreover, international free trade in racing horses is expected and a general depression may set in. The future of the industry is not too bright.

The Hidaka district, where the stock-farm of Hokkaido University is located, is one of the main breeding districts of Thoroughbreds in this country. Last year, of the 2013 head, total domestic production, 1188 were produced in this region. An accurate estimation of sales is not possible; but it can be said without exaggeration that the yearly profit of such sales is enormous. It is an important industry in the district.

Analysis of Racing Performance

1. Analysis by Prize Money.

In breeding any species of domestic animals, an accurate estimation of its

performance is of paramount importance. As a rule, the performance of domestic animals is represented by their physical characteristics, translatable into economic value, but not entirely so in the case of Thoroughbreds. Their grading is determined by a relative standard : by the order of finishes in racing. No absolute standards, such as the records of racing times for example, are taken into consideration.

On top of all that, the total prize money earned is taken as the basis of classification of racing and as an index of the increase of the weights to be carried.

Thoroghbreds are expensive and specialized merchandise. Breeders try to produce as many horses as possible, which are capable of winning many races especially those with prizes of high monetary value. Owners, of course, also desire to possess as many of these horses as possible.

For this reason, the racing performance of a horse is conveniently measured by the amount of prize money it wins.

The records of 571 three-year-old colts (with 40 sires) which were entered into races between 1960 and 1962, from the publication of Japan Racing Association were converted into logarithmic notations.

Calculating heritability on the basis of the variance and covariance components proposed by C. R. HENDERSON's method, we obtained a value of 0.49.

$$y_{ijk} = \mu + a_i + s_j + e_{ijk}$$

μ is the fixed underlying population mean,
a_i is the effect due to the i^{th} year,
s_j is the effect due to the j^{th} sire, and
e_{ijk} is a random error associated with the ijk^{th} record.

	μ	σ_a^2	σ_s^2	σ_e^2	S. S.
Total	571	571	571	571	19808.85
Year	571	571	26.64	3	19662.59
Sire	571	249.31	571	40	19658.23
CF.	571	191.81	22.70	1	19658.62

$\sigma_a^2 = 0.009$
$\sigma_s^2 = 0.035$
$\sigma_e^2 = 0.227$

$$h^2 = \frac{4\sigma_s^2}{\sigma_a^2 + \sigma_s^2 + \sigma_e^2} = 0.49.$$

2. Analysis by Racing Speed.

On the other hand, it may be considered more adequate to employ the racing speed as a standard of measuring the horse's potential ability to outrun

other horses in a race. Of course, the speed is, in the final analysis, an important factor in the determination of the order of finishes. In actual races, however, speed in, and by itself, does not constitute too significant factor. The physical condition of the horse, the race-course, the rider, the weather, and so many other factors too often influence the rate of speed, so much so that it is impossible to control all these conditions.

This is clearly shown in the varying results obtained by one and the same horse in several runnings under seemingly equal conditions. Speed, therefore, is questionable as an expression of the horse's ability. However, after equalizing the conditions as much as possible under which the racing speed was measured as an indicator of the animal's ability, and calculating heritability by the method proposed by LE ROY and LÖRTSCHER (1955), we obtained a value of 0.41.

Cause	D.F.	M.S.	Expected variance component
Between sire	46	41.157	$\sigma^2+3.96\sigma_d^2+39.35\sigma_s^2$
Between daughter within sire	630	11.256	$\sigma^2+2.68\sigma_d^2$
Performance	1196	2.424	σ^2

$$\sigma^2 = 2.42$$
$$\sigma_d^2 = 3.29$$
$$\sigma_s^2 = 0.65$$

$$h^2 = \frac{4\sigma_s^2}{\sigma^2+\sigma_d^2+\sigma_s^2} = 0.41$$

It is necessary to observe adequately the figures representing the whole group of home-bred Thoroughbreds. As has been mentioned above, an attempt was made to equalize the external conditions as much as possible. The 1873 racing-speed records were collected and examined for the three-year-old fillies (including 677 daughters of 47 sires) which raced a distance of 1800 M. at the race-courses of Tokyo, Nakayama, Hanshin, Kyoto, and Fukushima, while ground conditions were good, in the years 1960–1963. All of these courses are under the management of the Japan Racing Association. The result showed hereditability to be considerable. The figure might be higher if all extrinsic conditions were eliminated.

ARTZ (1961) used the recorded time for the female horses in Germany and obtained a value of 0.19 by the same method of calculation. He stresses the effectiveness of family selection.

HÁMORI and HALÁSZ (1959) observed the improvement of times for all the winners in the classic races of various countries. They state that the

speed for the Thoroughbreds has reached the maximum by mating within this breed. It is possible that the discrepancies in these reports are due in part to the different stages of improvement in different countries, but are due mainly to the fact that they employed only the times of the winners (in races). These were all highly selected individuals. The capacity of the total groups in those countries is not known.

SUMMARY

In estimating the heritability of the racing performance, the authors have obtained a value of 0.49 when based on the ability of winning prizes, and 0.41 when based on racing speed. The racing speed is influenced by many external factors. If these factors were eliminated, the rate of heritability would be higher.

This standard of heritability suggests that the effectivity of mass selection has been maintained, in disregard of selection by continuous performance tests. It is understandable that the breeders should rush for proven sires, or superior stallions of the phenotype, in market breeding. On the other hand, as each animal is expensive, adequate selection is extremely difficult in spite of all the systems of performance tests. Complete culling out of inferior mares might jeopardize the very basis of enterprise for small and medium scale breeders, and therefore it must be approached with caution. Herein lies the delicate problem of Thoroughbred breeding.

It is, however, quite clear that an imminent crisis is involved and something has to be done about it to remedy the present situation. The most urgent need at this moment may be to return nothing but phenotypically desirable animals into the breeding stock and gradually eliminate the inferior individuals. At the same time, we have to wipe out the superstition that importing internationally famous stallions from abroad is the panacea of the breeding business. Only those animals which will definitely contribute to the improvement of the quality of the species should be imported.

We should aim at raising the standard for all the members of the group, balancing the supply with the demand, and eventually increasing the number of exports to other countries.

References

ARTZ, W., 1961. Ein Beitrag zur Auswertung der Leistungsprüfungen in der Vollblutzucht unter besonderer Berücksichtigung der Rennleistungen einzelner Hengstnachkommenschaften. Giessener Schriftenreihe Tierzucht und Haustiergenetik, Bd. 2.

HAMORI, D. und HALASZ, G., 1959. Der Einfluss der Selektion auf die Entwicklung der Schnelligkeit der Pferdes. Zeitshrift für Tierzüchtung und Züchtungsbiologie, 73, 47–59.

HENDERSON C. R., 1953. Estimation of variance and covariance components. Biometrics, 9, 226–252.

LEROY, H. L. und LÖRTSCHER, H., 1955. Die wichtigsten Methoden der Heritabilitätsbestimmung. Zeitshrift für Tierzüchtung und Züchtungsbiolgie, 66, 17–37.

STEELE, D. G. and PIRRI, J. (Jr.), 1952. The Heritability of Racing Capacity. The Blood-Horse, Vol. LXIII, No. 22, 976–977, 990.

The Japanese Racing Calendar. 1960–1963

Japanese Stud Book. Vol. 1–5