EFTBA Veterinary Newsletter 24

Wm. Hutchinson and Staring Tom 1819

Racing Times
-
facts, figures and opinions

July 2017

. *New genomic methods allow very progressive methods and possibilities*

. *Their application therefore must be reflected more carefully than ever*

. *The example of measuring racing time as a breeding tool illustrates possibilities and limits convincingly*

Welcome to EFTBA's veterinary newsletter

Dear EFTBA Members,

I am very pleased to introduce you to the 24th edition of our Veterinary newsletter and the first during my chairmanship. Looking back at previous editions I would like to compliment Dr Hanspeter Meier on his sterling work in keeping us abreast of all cutting edge veterinary issues which guide us towards different topics aimed to challenge and improve our approach of farm management, prevention of injuries and raising young stock.

In this edition we get an insight into harnessing the genetic toolbox for the benefit of the racing thoroughbred and an introduction to research on time performance.

I would also like to mention that as an organisation EFTBA is taking an active role in BREXIT which will remain a priority in the coming months. This included meetings with the EU commissioner Phil Hogan and other key officials. We are also contributing towards an industry wide study on the green impact of horse breeding. This study is being conducted by the FAO in Brussels and will be helpful in our efforts to be included in CAP 2020. I will keep you all briefed of any progress.

Finally I would like to thank Hanspeter for his commitment and hard work in producing such high quality publications on a regular basis and encourage members to take the time to read all articles so that we all can improve our knowledge in all areas of advanced veterinary sciences and technologies.

With kind regards

Joe Hernon

Joe Hernon

Chairman. EFTBA

"Many thanks to Mrs. Eva-Maria Bucher-Haefner, Moyglare Stud Farm, for her valued sponsorship of this newsletter."

Editorial

After having looked at traditional breeding methods and our policy & best practice of DNA performance profiling in the last two newsletters, some practical aspects of breeding may be of interest for us as well. As already mentioned in NL 22, the new genomic methods open hitherto unbelievable possibilities. Therefore some reflections on our intentions are due, as more efficient methods and technical progress ask for a great sense of responsibility and duty. To practice this attitude and intention, we critically review former methods of genetic research by means of the example of timing race-performance.

Dr Hanspeter Meier

EFTBA veterinary advisor & Newsletter editor

Moyglare Stud Farms' ***Brief Truce*** (Ascot 1992) with Stan Cosgrove MRCVS, Mick Kinane & Dermot Weld St.James's Palace Stakes (Jegen 2005)

Introduction

In our review of traditional breeding methods (issue 22, January), we already became aware that the opinion of geneticists about our methods isn't very favorable. Langlois (1996) e.g. wrote: "… that *horse breeding is a very old-fashioned industry and that dreams count for more than reality, as long as one searches for a formula for some mythical mating"*.

Let us be realistic then and have a look at the work of geneticists in the field of breeding TBs. We do this in the sight of veterinarians and refer to the article **"Harnessing the genetic toolbox for the benefit of the racing Thoroughbred"** by Peter Webbon (2012). Here he confirms that Thoroughbred breeders are perceived by some as resistant to change, but - in his opinion - their apparent intransigence is often based on a genuine concern for the integrity of the breed. By taking control of the application of the advances in genetics, the Thoroughbred industry potentially has the opportunity to improve the health and performance of Thoroughbreds. If, however, the science is applied in an uncoordinated manner, driven by commercial interests with no underlying concern for the horses themselves, there is a very real risk that breeders, the Thoroughbred breed and individual horses will all suffer as a consequence (Webbon, 2012).

In the point of view of vets, the improvement of health generally does have priority, as soundness is the most important prerequisite for performance, durability and sustainability.

But did ever one of all the criticizing geneticists consider this fact? – No, they only did investigations on performance parameters as e.g. earnings, handicap weights, ranks (wins and placings), winning distances, black type figures, average earnings indices and racing times. Therefore let us look closer at one of these examples, at timing – advantageously a measurable parameter, at least.

If you can not measure it, you can not improve it.

Lord Kelvin (1824-1907)

Research on time performance

In the world of human sport, measuring time is one of the most common methods and foremost in the mind of the public also. In an interview with Bode Miller in the Thoroughbred Daily News this spring, it therefore wasn't surprising to read his question "Why is racing the only sport in which the athletes have not gotten dramatically faster over the years?" (Finley, 2017).

Obviously, the gold-medal winning Olympic ski racer wants to be a horse trainer. But he does not want to be a conventional one, he hopes to revolutionize training and believes that horsemen are too tradition-bound (Finley, 2017).

Isn't that another good reason for us to search the literature on the subject of time performance?

The probably best known article in this field is the "**Estimation of genetic trend in racing performance of Thoroughbred horses"** (Gaffney & Cunningham, 1988), published in the highly respected publication *Nature*. These scientists tested the genetic trend in performance over the period 1952-77 for 31'263 racehorses and their 2'087 sires with modest means, carefully and comprehensively.

Reason and objective to perform the study was the observation that winning times of classic races (in GB) didn't improve in recent decades. An exhaustion of additive genetic in performance in the face of string selection was considered as a possible explanation for their assumption (Fig. 1).

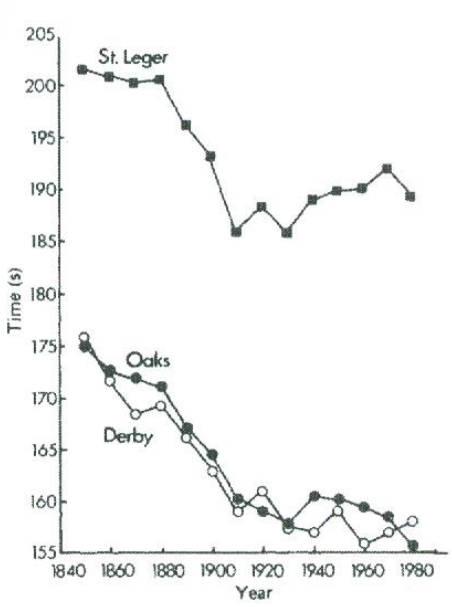


Fig. 1 Trends in winning times of the three principal classic races. Ten-year average winning times are plotted. The Oaks and Derby are 1.5 mile races for three-year-old fillies and colts respectively. The St. Leger is a 1.75 mile race open to both sexes. Times were omitted for a few years when the races were run away from their usual venues. For years in which races were run over lengths different from the standard, winning times were adjusted for length of race and for change of pace associated with length (Gaffney and Cunningham, 1988).

To test their hypothesis they estimated the genetic trend in performance using TIMEFORM handicap ratings. They reported a strong genetic component for this measure of racing performance and a steady genetic gain of 1% per year - paradoxically in contrast to the assumed lack of a significant improvement of winning times. Despite intense directional selection and generally high heritabilities of various measures of racing performance, winning times had been especially static for distance races. They concluded that the explanation for the lack of progress in winning times was not due to insufficient genetic variance or to a lack of genetic gain in the thoroughbred population as a whole. But they suggested that a physiological limit might have been reached.

Much to our pleasure, the publication of Gaffney and Cunningham (1988) did immediately find great interest among geneticists and W.G.Hill (1988) did refer to the question **"Why aren't horses faster?"** He made a comparison to human sports and said that we are used to new records set in men and women's track events. For an example, he mentioned the time taken for men to run 1'500 metres. In the time from 1936 to 1984, the time declined by 15 seconds or 7%. In his opinion, these improvements couldn't be attributed to genetic change, but to better training, health, tracks and wider screening of the population.

Moreover, he also translated the TIMEFORM units into lengths (2.5 metres) and calculated an improvement of 0.94 units per year (as suggested by Gaffney and Cunningham) for the 1.5-mile Derby, equivalent to 0.7 lengths per year (or 17 lengths over 25 years). This would be equivalent to an increase in speed of about 0.1 per cent per year, clearly more than has been achieved. Hill (1988) therefore thought that breeders need to explain selection limits - in his opinion apparent ones. Has useful variation been lost and none generated? If yes, why? What is the point of selection at all?

Shortly afterwards, Eckhardt and coworkers (1988) wondered also **"Are racehorses becoming faster?"** and made reference to Hills' comment. These experts suggested that today's horses are faster and still improving, if only marginally. They remembered that between 1840 and 1980, English Thoroughbreds reduced their winning times for the St Leger, Oaks and Derby races by about 12, 20 and 18 seconds, respectively. The resultant per generation improvements in winning times, assuming an average generation interval of approx.10 years, are 0.4 to 0.8 % per generation. The Derby was won in 1988 by *Kahyasi*, whose time of 2:33.84 bettered by 0.06 seconds the record time set in 1987 by *Reference Point*: a one-year reduction of 0.04 per cent (again 0.4 % per generation). Such improvements are modest when compared with the 1 to 3 % gain per year estimated for traits of economic importance in other species of livestock. Nevertheless the horses are running faster and several factors might account for the lower apparent gain in response to selection in comparison with other categories of livestock. First, compared with factors such as weight gain, carcass composition, milk yield or fleece thickness selected for in pigs, cattle or sheep, race performance in horses involves such diverse components as muscle mass, relative lengths of limb segments, joint strength and stability, and aerobic capacity. Gains in some of these might even be antagonistic to progress in others. Second, improvements in many domesticated breeds have emphasized characteristics very different from those presumably favoured in wild populations; under such circumstances, the initial gains from artificial selection can be quite rapid. In contrast, improvement in the running speed of horses extends a trend that goes back at least 50 million years to the Eocene; **it is likely that current gains are occurring along the distant reaches of an asymptomatic curve, where continued selection might be expected to produce relatively less net change.** Horse breeders can take comfort from the realization that, however slight their gains might seem per generation, on the average they are hundreds of thousands of times more rapid than examples of vertebrate evolution documented from the fossil record (Eckhardt et al, 1988).

In 1996, Langlois published a comprehensive review with the title **"A consideration of the genetic aspects of some current practices in Thoroughbred horse breeding"**, where he also made reference to the controversies as above. He considered those findings as an apparent contradiction between the selection for a heritable trait and the failure to translate this into faster track performance.

As an explanation for this paradox, he correctly noticed, that Thoroughbreds do not race against the clock but against each other. For this reason, in European countries, professionals place very little importance on speed achievements when selecting animals. And he also cited two studies in the Spanish Thoroughbred population that showed that **racing speed is not the best way to grasp Thoroughbred performance, its repeatability and heritability being virtually zero**. (Chico and Langlois, 1990; Chico, 1994). In his conclusion, it appeared, that in

the state of research findings in 1996, racing performance in Thoroughbred horses is moderately heritable, independently of performance against the clock. It is not surprising that, despite selection, time performance is improving very little, because no one is trying to improve it. This in no way implies that there is no real progress in Thoroughbred populations, consistent with the heritability ratings and the intensity of selection (Langlois, 1996).

10 years later, the veterinarian Gardner (2006) also dealt with the subject of racing performance: "**Historical progression of racing performance in Thoroughbreds and man"** was the title of his article. He also referred to the contributions of Gaffney & Cunningham, Hill and Eckhardt et al. (1988) and analysed the English Classics (Oaks since 1852, Derby since 1846, the 1000 Guineas since 1955, the 2000 Guineas since 1952 and the St. Leger since 1954), the American Triple Crown (Kentucky Derby since 1875, Preakness Stakes since 1873, Belmont Stakes since 1867), also the Arc de Triomphe (since 1950) and the Melbourne Cup (since 1861).

For all races there was a clear trend for winning times to reduce over time.

He further reminded us of figures from the USA in 2006, when *Barbaro* won the Kentucky Derby in 2.01.36 min. 110 years earlier the same race was won by *Ben Brush* in 2.07. min. Therefore the winning time for the Kentucky Derby has reduced by only 6-8 seconds overall, representing a marginal improvement of 4% since the turn of the 20th Century. The current record for the Kentucky Derby, still standing, was set by *Secretariat* in 1973 in a time of 1.59.00 min.

For the Epsom Derby, the improvement was slightly greater with a reduction of 25 seconds between 1846 and 2006 (*Pyrrhus the First*, 2.55 min to *Sir Percy*, 2.35.23 min), but representing an improvement of only 11% in 160 years.

In comparison, for man, the statute mile record – arguably the historical benchmark track and field event – stands at 3.43.00 min (Hicham El Gerrouj in 1999). The first recorded and officially timed mile was won by Charles Westhall in 1852 in a time of 4.28 min. Thus, the mens mile record has reduced by 45 secs: an improvement of 17% over 147 years. In man, the percentage change in the modern era is on average 10.4%, more than two-fold greater than in the racehorse (Gardner, 2006).

Discussing his results, Gardner (2006) also mentioned **the possible influence of many confounding factors**. In his opinion, first of all, it is pertinent that whereas human athletes attempt to achieve the best possible times in almost every race, the jockeys, trainers and owners of racehorses are more concerned about winning per se, regardless of time; thus **race tactics can influence the winning time in horse races more so than human athletic contests**. Other external variables can also affect winning times in horse races such as position in the stalls, track conditions, racing surfaces, jockey skill etc.

Finally, for man, the role of sports psychology and knowledge of the rewards that accompany winning is unique; it therefore seems likely that human winning times do improve more regularly than horse winning times. There is also a psychological incentive for human athletes to not only win races but to win them in record-breaking times. The horse knows no such incentives and the winning time is a complex of its innate desire to run, modified by a range of human and environmental inputs including the jockey, position in the starting gate, the 'going', the tactics, the weight carried, etc. For all these reasons, **winning time in the horse may not therefore be regarded as the best measure of performance** (Gardner, 2006).

Well, he didn't like the going,
and I'm not going to like what's coming!

(Winch)

Shortly afterwards, Pfau and coworkers (2009) published their investigation **"Modern Riding Style Improves Horse Racing Times"**, once again not in a journal of our trade but in the respected publication *Science*. This subject obviously seems to find very broad interest. In their opinion, major horse race times and records improved by 5 to 7% around 1900 when jockeys adopted a crouched posture (Fig. 2) – contrary to the seat of Wm. Hutchinson on *Staring Tom* on the front page.

The explanation for this is due to the fact that jockeys started to isolate themselves from the movement of the horse. This isolation means that the horse only supports the jockey's body weight

but does not have to move the jockey through each cyclical stride path. - At least as long as the jockey does refrain from escapades while, for instance, using the whip,

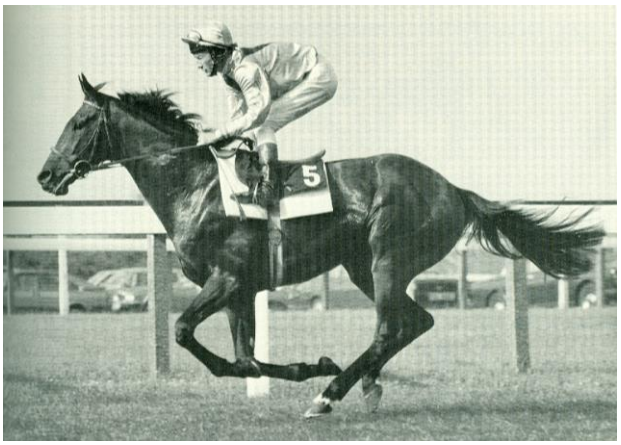


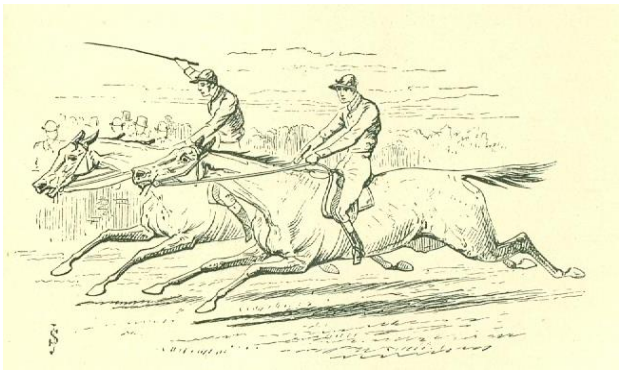
Fig. 2 Lester Piggott on *Miramar Reef*

As an apparent result of this change, there was a 5-7% reduction in the times taken to run races. This was a very significant drop: in the following almost 100 years of racing at the Epsom Derby the time only dropped by a further 2% (Pfau et al., 2009).

The question, whether racing success is inherited or not, is of course also of great interest for those people who train them. Therefore, in 2015, Velie published the article **"In the genes – is racing success inherited?**" in the magazine *European Trainer*. There, he made reference to an investigation of the heritability of racing success in Hong Kong and 'winning time' was also one of the examined traits there. The heritabilities for the time it takes a horse to finish a race varied by distance and ranged from 0 to 0.16, while the heritability of race win time ranged from 0.06 to 0.52 (equivalent to from low to high heritability). It is possible that because analyses only accounted for the official distance of each race and not the actual distance each horse has run (with horses that are caught out wide covering more ground than those that stay next to the inside rail) or the tempo of the race; these estimates therefore may be biased downwards. However, previous estimates of heritability for win time have ranged from 0.05 to 0.28 with most placing win time as lowly heritable when environmental variation is accurately adjusted for. The heritability of win time at 1'600 metres (heritability = 0.52) was slightly higher than estimates in other racing populations. Velie (2015) considers this as an interesting point of discussion; he certainly is right as races in Hong Kong are run under extraordinarily comparable conditions.

Running times and the whip

The subjects of running times and the use of the whip already have been an issue of discussion in the 19th century, even illustrated in the book 'Racing and Steeple-Chasing' by the Earl of Suffolk and Berkshire and co-workers (1887).
In the chapter 'Riding the Race' they wrote: *"The rider should, as the phase runs, 'go with his horse' when the animal makes his stride, and, he should resist the temptation to take up the whip, by the premature use of which so many races are lost."*



'He took up his whip and stopped his horse'
(Earl of Suffolk and Berkshire et al.,1887)

Was he right, the honourable Earl, 134 years ago? – Oh yes, just see **"An Investigation of Racing Performance and Whip Use by Jockeys in Thoroughbred Races"** made by the Australians Evans and McGreevy (2011). They studied the relationship between performance and the use of whips in racing, assuming that whipping would be associated with superior performance.
They based this hypothesis upon the Australian Racing Board rules that only horses that are in contention can be whipped. They expected than that those superior performances would be explained by an effect of whipping on horse velocities in the final 400 m of the race.
Measurements of whip strikes and sectional times during each of the final three 200 metre (m) sections of five races were analysed.
Jockeys in more advanced placings at the final 400 and 200 m positions in the races whipped their horses more frequently. **Horses, on average, achieved highest speeds in the 600 to 400 m section when there was no whip use**, and the increased whip use was most frequent in the final two 200 m sections when horses were fatigued. This increased whip use was not associated with significant variation in velocity as a predictor of superior placing at the finish.

In the same year, Sharman and Wilson (2015) finally stated **"Racehorses are getting faster"**. With this opinion, they referred to earlier investigations and criticized that previous studies had been limited, focusing only on the winning times of a few elite races run over middle and long distances, and failing to account for potentially confounding factors. By now, Sharman and Wilson (2015) used a much larger dataset, covering the full range of race distances and accounting for variation in factors such as ground softness. Fair enough – thanks to the great technical progress, today we have much better possibilities for analysing sets of big data.

Their results showed that average racehorse speed has improved historically (since 1850) and continues to increase since 1997. However, it was - as expected - a nuanced picture. Historical improvement has not been linear and rapid improvement occurred from the late-1800s to 1910, followed by comparative stasis to 1975. Examining model predictions for the 1997-2012 data in more details showed that while winners of elite races continued to improve, this was almost wholly driven by sprint races with winning speed increasing by an average 0.11% per year since 1997.

Herewith, Sharman and Wilson (2015) showed that **improvement is, in fact, ongoing for the population as a whole**, but driven largely by increasing speed in sprint races. In contrast, speed over middle and long distances, at least at the elite level, appears to be reaching an asymptote. Whether this reflects a selection limit to speed over middle and long distances or a shift in breeding practices to target sprint performances remains to be determined.

Further, care should be taken not to attribute changes in speed to breeding alone. The very rapid improvement in the early 1900s was attributed to the introduction (in 1897) and universal adoption (by 1910) of an altered riding style. Further changes in riding style may well have facilitated comparatively rapid improvement between the mid-1970s and the mid-1990s as a posture pioneered by the jockey Lester Piggott was adopted (Fig. 2) (Pfau et al., 2009; Sharman and Wilson, 2015).

Beside this, in the time between 1997 and 2012, average weight carried increased. – But because more weight should reduce speed, this could potentially be masking underlying genetic improvement. To determine whether improvement in speed is underpinned by a genetically based selection response, Sharman and Wilson (2015) mean that a more nuanced quantitative genetic analysis is required.

Believe him who speaks from experience

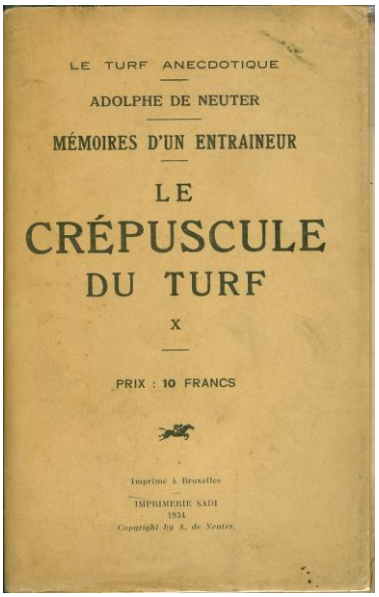
After having consulted the most important investigations on timing by geneticists of our time, we traditionalists may finally wonder what the attitude to this subject has been in the past. Let's have a look at three examples from Great Britain, Germany and Belgium:

In this book "How to Train The Race Horse", **Lieut.Col. Warburton** (1892) wrote in the chapter 'Trials': *"There is another form of trial which is more highly esteemed in America than in England, where it is considered no test at all. I think that in most cases where there is a wide diversity of opinion between the experts of two countries as to the merit of any procedure, it will probably be found that both are in the main right, or at least have sound reasons to justify them, and that the divergence of opinion proceeds from conditions existing in one country, and not found in the other.* ***I have never had any doubt in my own mind that time is not a reliable test of a horse's merits in England****. There the courses and training grounds are so varied as to shape, length, undulation and hardness, that any trainer who depended on a time test would find himself sadly disappointed. Unquestionably the best horse has the best chance on courses with few, if any, turns, and an inferior one will equalize matters on a short round course, say of a mile, which must be nearly all turn, and which prevails in America. So also, the truly formed horse will have an advantage over a course that has up and down hill and flat in certain or uncertain proportions; while a sound-footed horse will have an advantage over one with thin shelly feet on hard ground.*

But if time is very little of a guide in England, I have found it in other countries somewhat similarly situated as regards training grounds and racecourses to America, a very useful auxiliary – ***a good servant, but a bad master****.*

Burchard von Oettingen (1895) gave his opinion on measuring time in his book „Das Vollblutpferd in seiner Bedeutung für die Halbblutzucht": ***„To introduce time as measure for perfomances in races is a misguided idea"*** *(*Die Zeit als Massstab der Leistungen in Rennen einzuführen ist eine verfehlte Idee). Von Oettingen was königlich preussischer Oberlandstallmeister, after having qualified in mathematics (!) and served as Rittmeister in the Prussian army.

Adolphe de Neuter was a trainer both in Belgium and different European countries and published in 1934 the booklet "Le Crépuscule Du Turf – Mémoires d'un Entraineur" (The Dawn of the Turf). In regard to measuring time (Celle du chronomètre) he referred first to this procedure in the USA, where it can be practical, principally. All the racecourses there have the same elliptic shape and are constructed with the same dirt. But in England one logically ignores measuring time because of the diversity of the racecourses, wherefore comparisons would lead to most absurd conclusions.



When you are face to face with a difficulty, you are up against a discovery.
Lord Kelvin (1824-1907)

References

Chico M.D., Langlois B. (1990) : Estimation des composants de la variance des résultats en course des pur sang en Espagne. 41th EAAP Annual Meeting (horse comm.), Toulouse, France

Chico M.D. (1994): Genetic analysis of thoroughbred racing performance in Spain. Ann Zootech 43, 393-397

Eckhardt R.B., Eckhardt D.A:, Eckhardt J.T. (1988): Are racehorses becoming faster? Scientific Correspondence, Nature Vol. 335 27, October, p. 773

Evans D., McGreevy P. (2011) An Investigation of Racing Performance and Whip Use by Jockeys in Thoroughbred Races. PLoS ONE 6(1): e15622.

Finley B. (2017): Bode Miller hopes to Revolutionize Training. Thoroughbred Daily News, April 30

Gaffney B. & Cunningham E.P. (1988): Estimation of genetic trend in racing performance of thoroughbred horses. Nature 332, (21 April), 722-723 doi:10.1038/332722a0

Gardner D.S. (2006): Historical progression of racing performance in thoroughbreds and man. Equine vet. J. 38(6), November, 581-583

Hill W.G. (1988): Why aren't horses faster ? Nature Vol. 332, (21 April), 678 doi:10.1038/332678a0

Jegen P. et al. (2005): Die Moyglare Story - Von Rennpferden und ihren Menschen. Verlag Neue Zürcher Zeitung, Zürich

Langlois B. (1996): A consideration of the genetic aspects of some current practices in Thoroughbred horse breeding. Ann Zootech (1996) 45, 41-51

Pfau T., Spence A., Starke S., Ferrari M., Wilson A. (2009): Modern Riding Style Improves Horse Racing Times. *Science* 17 Jul, Vol. 325, Issue 5938, pp. 289 doi: 10.1126/science.1174605

Sharman P., Wilson A.J. (2015): Racehorses are getting faster, Biol. Lett. 11:20150310 http://dx.doi.org/10.1098/rsbl.2015.0310

Suffolk and Berkshire Earl of and Craven W.G. with a Contribution by the Hon.F.Lawley (1887): Racing. Arthur Coventry and Alfred E.T.Watson: Steeplechasing. The Badminton Library, 2nd Edition, Longmans, Green, and Co. London, 330-332

Velie B. (2015): In the genes – is racing success inherited? European Trainer, 48, January to March 2015, 57-59

Warburton R.E. (1892): How to Train The Race Horse. Sampson Low, Marston & Company Ltd., London.

Webbon P. (2011): Harnessing the genetic toolbox for the benefit of the racing Thoroughbred. Review Article: HBLB's advances in equine veterinary science and practice. Eq. vet. J. 44, 8-12

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