Thoroughbred growth and future racing performance

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Predicting performance potential in young horses

The racing success of a Thoroughbred horse is determined by a multitude of factors, many of which are impossible to evaluate. Thoroughbreds destined for the racetrack are often sold at weanling or yearling sales where buyers must rely on subjective methods, rather than performance history, to select future athletes. Despite careful analysis of pedigree and conformation by breeders, trainers, bloodstock agents, and owners, there have been no fail-proof methods for predicting potential success of young horses.

The genetic make-up, or genotype, contributes to a horse's racing ability by influencing conformation, ultimate size, speed potential, and mental attributes including the "will to win." Environmental factors such as nutrition, exercise and conditioning are difficult to quantify, management during growth and development, as well as trainer variation, all influence the horse's potential for success.

Previous studies at Kentucky Equine Research (KER) have shown that heavier and taller yearlings command higher prices at public auction, however, heavier, faster-growing foals also have a greater incidence of skeletal disease. So how does growth affect athletic performance? Recently, KER answered this question by analyzing the growth and racing performance records of nearly 4,000 American Thoroughbreds to determine if certain growth characteristics affect the odds of success as a race horse. These horses had been routinely weighed and measured as foals and yearlings while being raised on studs in Kentucky (n=3,382) and Virginia (n=352). Preliminary findings suggest some significant trends between growth and racing success.

What is success?

There are many parameters by which a horse can be deemed successful. Earnings are certainly a measure of success, but similar earnings can be made in one stakes race or 50 provincial races. While a large number of starts indicates soundness, it does not necessarily indicate elite performance. Furthermore, residual value after a successful racing career is often significant, and it is common to see sound three-year-olds retired to the breeding shed after a successful year on the track. In order to evaluate all of these criteria, the KER study collected numerous performance measurements including total years raced, two-year-old starts, wins, earnings, and so on. To account for genetic variation, the sire index (SI) for each foal's sire was also included in the analysis.

The study used percentile and quartile measurements of withers height and body weight which allowed comparison between all horses regardless of age or gender. Percentiles rank the relative position of an individual in a population by indicating what percent of the reference population that individual will equal or exceed for each measurement. For instance, if a 12-month-old yearling colt is in the 55th percentile for weight and 63rd

percentile for height it is heavier than 55% and taller than 63% of all 12-month-old yearling colts in the population. The horses in this study were compared to a reference population of 7000 horses raised in Kentucky.

Eighty percent of the horses in the study started in a race, and 71% of those won at least one race. The majority of starters had racing careers of one or two years while 14% of fillies and 26% of colts raced for four or more years. Racing performance as measured by number of starts, two-year-old starts, winners/foals, stakes winners, Graded stakes winners, Group 1 winners and lifetime earnings in the study population was superior to the breed average which was a reflection of the quality of studs which participated.

Size and racing performance

Horses that started as two-year-olds were shorter and weighed less as foals and yearlings than those that did not, regardless of birth month. However, fewer May-born yearlings started as two-year olds compared with earlier-born yearlings. It is generally accepted that faster-maturing, heavier horses are more likely to be raced as two-year-olds, but these results suggest just the opposite; smaller horses are more likely to run early. Furthermore, smaller horses had more career starts, suggesting that smaller-sized horses are sounder.

Conversely, stakes winners, Graded stakes winners, Group 1 winners, and millionaires were heavier and taller than average as yearlings. Interestingly, the 21millionaires in the study were on average taller than 79% of the population as yearlings.

These results indicate different growth characteristics for different performance outcomes. If one wants an early-starting horse that races for longer, then a smaller horse is more desirable. If, however, one desires a stakes winner and high earner, then bigger is better, although there is a greater risk of the horse not starting at all. Furthermore, a greater percentage of two-year-old starters were born in March and April and a greater percentage of stakes winners were born in March.

Quartiles and racing performance

To further evaluate the relationship between size and racing performance the yearlings were divided into four groups (quartiles) based on weight and height so that the lightest or shortest yearlings were in the lowest quartile, and the heaviest and tallest in the highest quartile.

Approximately 80% of yearlings in each weight quartile started in a race. Yearlings in the lowest weight quartile (those that weighed less than 75% of the population) had lower earnings, fewer stakes winners, and a lower sire index than the rest of the population (see Figures 1 and 2). However, yearlings below the 50^{th} weight and height percentiles were more likely to start as two-year-olds and had more career starts than those above the 50^{th} percentile.

Yearlings that weighed less than half the population had lower sire indexes than those in the heavier quartiles indicating that successful sires tend to produce larger yearlings.

Interestingly, foals in the second quartile (between the 25th and 50th weight percentiles) had as many stakes wins and greater earnings than the larger yearlings even though they were by sires with significantly lower sire indexes. This suggests that these moderately lighter yearlings out performed their pedigrees.

Conclusions

These data provide insight into managing horses for different strategies. Smaller horses are more likely to start as two-year-olds and have more career starts; however, elite performers (Graded stakes winners, Group 1 winners, and millionaires) tend to be taller and heavier. However, this does not mean that small horses can not become elite athletes, since 40% of the millionaires in this study weighed below the population average as yearlings.

Data from this study suggest that as a general rule, tall but not extremely heavy, young growing horses are more likely to become successful athletes. It is therefore recommended to weigh and measure horses during growth and development to ensure the skeleton maintains a steady rate of growth, while preventing the animal from becoming too heavy.

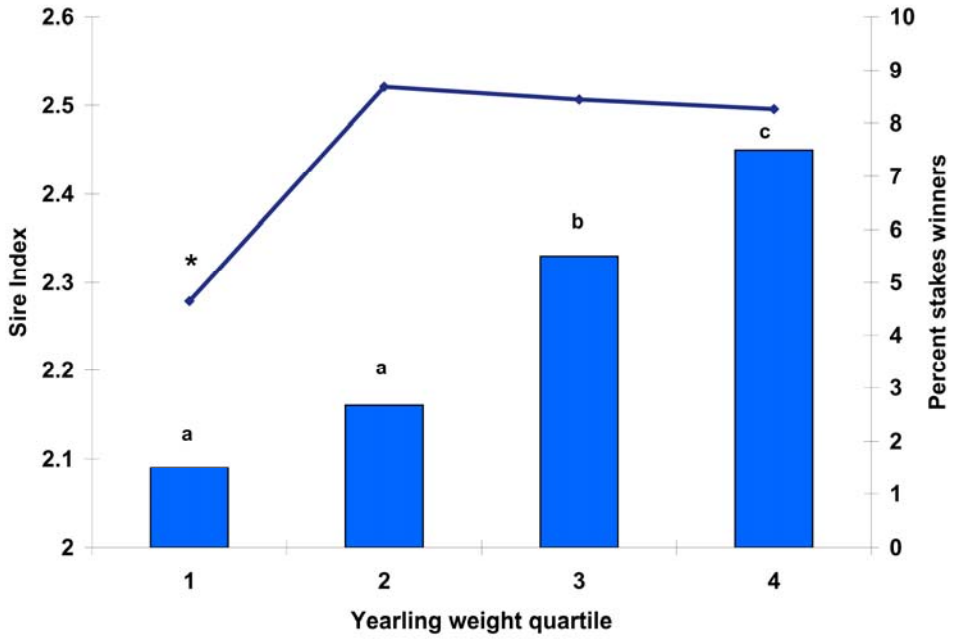

Figure 1. Sire index (■) and percent stakes winners (-♦-) in each yearling weight percentile (* $p<0.01$) (a, b, etc.; different letters within a factor indicate significant differences).

Figure 2

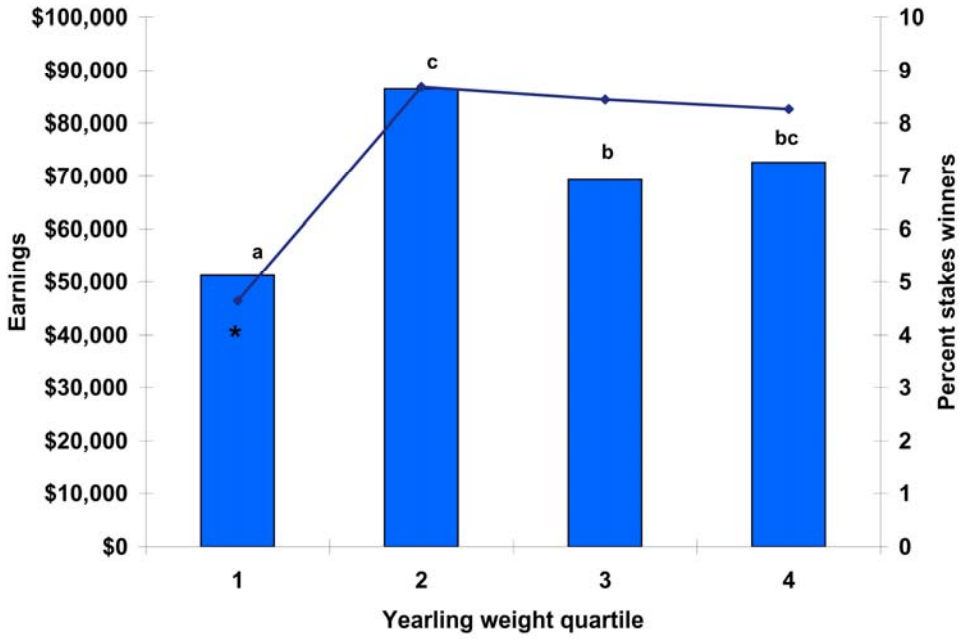

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Figure 2. Average earnings (■) and percent stakes winners (-♦-) in each yearling weight percentile (* $p<0.01$) (a, b, etc.; different letters within a factor indicate significant differences).