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# The Relationship of Selected Two-Dimensional Echocardiographic Measurements to the Racing Performance of 5,431 Yearlings and 2,003 Two-Year-Old Thoroughbred Racehorses

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*Special Acknowledgement:*
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# APPENDIX A

## Multiple Measurements of the Same Horse on Different Days

***Growth Within Individuals.*** There were 990 unique horses 12—27 months old that were measured on at least 2 separate dates. This group was used to study growth rates within individuals. The upward trend in cardiac measurements as age increased was obvious, but no neat, unbroken trend existed throughout 12 through 27 months of age for this group. The following matrices summarize changes in cardiac measurements among horses measured multiple times. The following information was included in the matrices, which appeared in the following order on each page:

- **Months of Age Between Measurements.** As an example, the horses measured at both 14 and 17 months of age averaged 2.94 months apart between measurements.
- **Number of Horses Measured Between Each Age**. Shows the number of horses measured between any 2 months of age from 12 through 27 months.
- **Percent Change in [LVD] Between Measurements.** Shows the average percent change in the selected variable (LVD in this example) between any 2 months of age.
- **Average Change in [LVD] Between Measurements.** Shows the average change (in raw measurement units) in the selected variable between any 2 months of age.
- **Median Change in [LVD] Between Measurements.** Shows the median change (in raw measurement units) in the selected variable between any 2 months of age.

***Multiple Measurements of the Same Horse within the Same Month.*** The average percent change in cardiac measurements for horses measured twice within the same month of age was summarized in the following table for horses 14-17 months of age as another way to assess measurement variation. These were the only individual months of age with at least 5 unique horses (*n*) represented (matrices on the following pages provide a complete summary for all months of age). The average percent change in LVD, LVS, and SW is listed in the following table.

The change in these measurements falls within the range of expected measurement error described in Table 1 of the main paper. Most change was positive, indicating that growth may have occurred in addition to measurement variation. Growth curves (Appendix B) project monthly growth in these measurements of 1.3%-1.5% during these ages. Measurement variation was also influenced by other factors, e.g., some horses were re-measured because the ultrasound technician wasn't satisfied with the initial measurement, likely due to the horse's behavior (i.e., suspected illness or elevated heart rate after start of exam).

**Table.** Multiple Measurements of the Same Horses Measured on Separate Days within Same Month of Age
Average Percent Change in Measurements between Dates–Combined Sexes

| Month Of Age | *n* | Avg. Days between measurements | Avg. pct. change in measurements LVD | LVS | SW |
|---|---|---|---|---|---|
| 14 | 7 | 6.1 | 1.08 | 6.34 | 2.28 |
| 15 | 7 | 4.9 | 1.68 | 8.89 | 1.58 |
| 16 | 9 | 7.0 | 0.75 | 4.50 | -0.76 |
| 17 | 6 | 5.2 | 2.38 | -0.18 | 2.64 |

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## Horses Measured Multiple Times on Different Dates
## Variable: LVD
## Combined Sexes

**Average Months of Age Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.30 | 1.41 | 1.90 | 3.02 | 3.96 | 4.74 | 6.05 | 7.04 | 7.66 | 9.14 | | | | 12.99 | | |
| 13 | | 0.23 | 1.45 | 2.00 | 3.12 | 4.13 | 4.82 | 5.98 | 6.49 | 7.50 | 8.84 | 9.40 | | | | |
| 14 | | | 0.20 | 1.28 | 1.81 | 2.94 | 3.82 | 4.72 | 6.02 | 6.95 | 7.72 | 9.08 | 9.36 | 10.45 | 12.05 | |
| 15 | | | | 0.16 | 1.06 | 2.09 | 3.05 | 3.92 | 4.82 | 5.96 | 6.94 | 7.76 | 9.00 | | 11.28 | |
| 16 | | | | | 0.23 | 1.25 | 2.02 | 2.99 | 4.09 | 5.16 | 5.91 | 7.03 | 7.68 | 9.14 | 9.65 | |
| 17 | | | | | | 0.17 | 1.08 | 2.00 | 2.95 | 3.99 | 4.97 | 5.91 | 6.91 | 7.63 | 8.77 | 9.72 |
| 18 | | | | | | | 0.28 | 0.91 | 2.02 | 2.96 | 4.13 | 5.01 | 6.10 | 7.12 | 7.96 | 9.06 |
| 19 | | | | | | | | 0.36 | 1.04 | 2.37 | 2.96 | 4.35 | 5.22 | 6.12 | 7.04 | |
| 20 | | | | | | | | | | 1.71 | 2.37 | 2.94 | 3.95 | | 6.35 | 6.84 |
| 21 | | | | | | | | | | | 0.78 | 2.32 | 2.94 | 3.48 | 4.34 | |
| 22 | | | | | | | | | | | | 1.07 | 2.14 | 3.11 | 3.67 | |
| 23 | | | | | | | | | | | | 0.39 | 1.12 | 2.33 | 3.28 | |
| 24 | | | | | | | | | | | | | | | 2.20 | 2.99 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 0.07 | 0.76 |
| 27 | | | | | | | | | | | | | | | | |

**Number of Comparisons Made Between Each Age**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 3 | 4 | 9 | 20 | 11 | 10 | 4 | 1 | 2 | 3 | 0 | 0 | 0 | 1 | 0 | 0 |
| 13 | | 2 | 5 | 17 | 25 | 12 | 16 | 4 | 2 | 1 | 1 | 2 | 0 | 0 | 0 | 0 |
| 14 | | | 7 | 13 | 21 | 25 | 10 | 12 | 15 | 12 | 13 | 6 | 3 | 1 | 2 | 0 |
| 15 | | | | 7 | 15 | 21 | 20 | 16 | 12 | 27 | 25 | 20 | 6 | 0 | 1 | 0 |
| 16 | | | | | 9 | 13 | 23 | 24 | 23 | 12 | 54 | 39 | 11 | 2 | 3 | 0 |
| 17 | | | | | | 6 | 11 | 16 | 9 | 21 | 20 | 44 | 26 | 6 | 5 | 2 |
| 18 | | | | | | | 2 | 6 | 11 | 14 | 18 | 17 | 24 | 16 | 6 | 3 |
| 19 | | | | | | | | 1 | 4 | 9 | 9 | 16 | 8 | 7 | 6 | 0 |
| 20 | | | | | | | | | 0 | 1 | 9 | 23 | 5 | 0 | 2 | 1 |
| 21 | | | | | | | | | | 0 | 3 | 8 | 11 | 2 | 1 | 0 |
| 22 | | | | | | | | | | | 0 | 5 | 3 | 6 | 2 | 0 |
| 23 | | | | | | | | | | | | 2 | 3 | 7 | 7 | 0 |
| 24 | | | | | | | | | | | | | 0 | 0 | 1 | 3 |
| 25 | | | | | | | | | | | | | | 0 | 0 | 0 |
| 26 | | | | | | | | | | | | | | | 1 | 1 |
| 27 | | | | | | | | | | | | | | | | 0 |

**Average Percent Change in LVD Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.81% | 5.15% | 10.12% | 11.22% | 11.37% | 10.11% | 35.33% | 27.28% | 9.95% | 18.29% | | | | 44.15% | | |
| 13 | | -1.28% | 1.41% | 11.38% | 10.24% | 14.49% | 19.29% | 17.74% | 17.62% | -6.52% | 2.18% | 21.85% | | | | |
| 14 | | | 1.08% | 4.80% | 7.92% | 6.17% | 8.34% | 14.85% | 16.14% | 18.39% | 11.59% | 13.07% | 6.38% | 9.31% | 9.85% | |
| 15 | | | | 1.68% | 3.56% | 7.99% | 5.11% | 7.56% | 8.57% | 10.82% | 11.68% | 8.21% | 11.32% | | 32.77% | |
| 16 | | | | | 0.75% | 1.88% | 1.83% | 5.01% | 5.77% | 11.21% | 8.87% | 12.34% | 10.39% | 7.45% | 3.03% | |
| 17 | | | | | | 2.38% | 3.56% | 3.10% | 9.58% | 8.23% | 9.63% | 9.31% | 9.26% | 8.12% | 13.79% | 10.55% |
| 18 | | | | | | | -5.43% | 6.98% | 2.03% | 7.70% | 4.05% | 8.07% | 11.77% | 8.95% | 4.90% | 6.59% |
| 19 | | | | | | | | 0.29% | 11.17% | 5.06% | 8.31% | 3.73% | 8.16% | 9.49% | 10.41% | |
| 20 | | | | | | | | | | 7.42% | 4.69% | 5.67% | 5.64% | | -0.97% | 0.63% |
| 21 | | | | | | | | | | | -0.48% | 7.08% | 5.60% | 9.06% | 0.21% | |
| 22 | | | | | | | | | | | | 8.03% | 1.72% | 3.64% | 4.65% | |
| 23 | | | | | | | | | | | | -1.45% | 2.28% | 1.23% | 5.97% | |
| 24 | | | | | | | | | | | | | | | 8.02% | 3.75% |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 5.67% | -0.12% |
| 27 | | | | | | | | | | | | | | | | |

**Average Change in LVD Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 97 | 616 | 1,170 | 1,222 | 1,349 | 1,134 | 3,773 | 3,365 | 1,264 | 2,225 | | | | 4,012 | | |
| 13 | | -166 | 51 | 1,278 | 1,144 | 1,700 | 2,152 | 1,986 | 1,928 | -883 | 302 | 2,500 | | | | |
| 14 | | | 154 | 574 | 965 | 718 | 961 | 1,755 | 1,937 | 1,960 | 1,317 | 1,582 | 715 | 1,300 | 1,267 | |
| 15 | | | | 223 | 399 | 962 | 620 | 846 | 1,001 | 1,244 | 1,350 | 1,029 | 1,157 | | 3,480 | |
| 16 | | | | | 44 | 220 | 226 | 598 | 715 | 1,306 | 1,027 | 1,435 | 1,180 | 904 | 293 | |
| 17 | | | | | | 294 | 449 | 377 | 1,087 | 950 | 1,043 | 1,036 | 1,096 | 911 | 1,485 | 1,209 |
| 18 | | | | | | | -783 | 904 | 268 | 883 | 526 | 984 | 1,351 | 1,016 | 615 | 817 |
| 19 | | | | | | | | 42 | 1,251 | 668 | 908 | 362 | 1,023 | 1,206 | 1,176 | |
| 20 | | | | | | | | | | 983 | 562 | 705 | 681 | | -150 | 80 |
| 21 | | | | | | | | | | | -69 | 896 | 733 | 1,184 | 33 | |
| 22 | | | | | | | | | | | | 955 | 233 | 403 | 574 | |
| 23 | | | | | | | | | | | | -346 | 324 | 89 | 723 | |
| 24 | | | | | | | | | | | | | | | 1,067 | 468 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 717 | -17 |
| 27 | | | | | | | | | | | | | | | | |

**Median Change in LVD Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 42 | 600 | 1,367 | 1,217 | 900 | 1,633 | 3,284 | 3,365 | 1,264 | 2,333 | | | | 4,012 | | |
| 13 | | -166 | 400 | 1,334 | 846 | 1,885 | 2,046 | 2,042 | 1,928 | -883 | 302 | 2,500 | | | | |
| 14 | | | 0 | 358 | 1,123 | 744 | 633 | 1,703 | 2,142 | 2,645 | 1,267 | 1,806 | 570 | 1,300 | 1,267 | |
| 15 | | | | 35 | 275 | 773 | 546 | 758 | 1,142 | 1,167 | 1,367 | 1,037 | 1,279 | | 3,480 | |
| 16 | | | | | -58 | 167 | 300 | 413 | 1,000 | 1,321 | 1,042 | 1,567 | 1,133 | 904 | 500 | |
| 17 | | | | | | 289 | 358 | 413 | 967 | 1,067 | 1,078 | 1,067 | 916 | 1,018 | 1,475 | 1,209 |
| 18 | | | | | | | -783 | 975 | 225 | 1,042 | 333 | 767 | 1,347 | 592 | 567 | 267 |
| 19 | | | | | | | | 42 | 1,483 | 908 | 1,233 | 266 | 977 | 1,308 | 1,225 | |
| 20 | | | | | | | | | | 983 | 55 | 800 | 1,296 | | -150 | 80 |
| 21 | | | | | | | | | | | 100 | 579 | 700 | 1,184 | 33 | |
| 22 | | | | | | | | | | | | 633 | 0 | 321 | 574 | |
| 23 | | | | | | | | | | | | -346 | 967 | -67 | 300 | |
| 24 | | | | | | | | | | | | | | | 1,067 | 370 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 717 | -17 |
| 27 | | | | | | | | | | | | | | | | |

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**Horses Measured Multiple Times on Different Dates**
**Variable: LVD**
**Colts**

Average Months of Age Between Measurements

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.43 | 1.41 | 1.69 | 2.86 | 3.87 | 4.63 | 6.03 | | 7.66 | 8.84 | | | | 12.99 | | |
| 13 | | 0.23 | 1.51 | 1.99 | 3.18 | 3.92 | 4.82 | 6.03 | 6.90 | 7.50 | | 9.40 | | | | |
| 14 | | | 0.18 | 1.48 | 1.82 | 3.04 | 3.77 | 4.71 | 6.12 | 6.87 | 7.80 | 9.17 | 9.30 | 10.45 | 11.51 | |
| 15 | | | | 0.09 | 0.75 | 2.08 | 3.08 | 3.88 | 4.99 | 6.01 | 6.90 | 7.75 | 9.10 | | | |
| 16 | | | | | 0.18 | 1.14 | 2.04 | 3.02 | 4.03 | 5.12 | 5.90 | 6.97 | 7.83 | 9.21 | 9.81 | |
| 17 | | | | | | 0.18 | 0.99 | 2.01 | 2.75 | 4.01 | 4.93 | 5.85 | 6.90 | 7.47 | 8.93 | |
| 18 | | | | | | | | 0.70 | 2.18 | 3.02 | 4.14 | 4.92 | 6.09 | 7.05 | 7.96 | 9.14 |
| 19 | | | | | | | | 0.36 | 0.85 | 2.48 | 3.23 | 4.27 | 5.41 | 5.96 | 7.27 | |
| 20 | | | | | | | | | | 1.71 | 2.22 | 2.82 | 3.90 | | | |
| 21 | | | | | | | | | | | 0.78 | 2.21 | 2.95 | 3.48 | 4.34 | |
| 22 | | | | | | | | | | | | 1.12 | | | 3.35 | |
| 23 | | | | | | | | | | | | | 1.12 | 2.37 | 3.40 | |
| 24 | | | | | | | | | | | | | | | 2.20 | 3.11 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | 0.76 |
| 27 | | | | | | | | | | | | | | | | |

Number of Comparisons Made Between Each Age

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 1 | 3 | 5 | 13 | 8 | 4 | 2 | 0 | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 13 | | 2 | 4 | 14 | 17 | 6 | 12 | 3 | 1 | 1 | 0 | 2 | 0 | 0 | 0 | 0 |
| 14 | | | 3 | 7 | 13 | 17 | 6 | 11 | 10 | 9 | 6 | 4 | 2 | 1 | 1 | 0 |
| 15 | | | | 6 | 3 | 10 | 15 | 10 | 8 | 14 | 15 | 12 | 3 | 0 | 0 | 0 |
| 16 | | | | | 5 | 11 | 15 | 13 | 17 | 9 | 34 | 24 | 7 | 1 | 2 | 0 |
| 17 | | | | | | 3 | 6 | 13 | 4 | 18 | 10 | 28 | 21 | 4 | 2 | 0 |
| 18 | | | | | | | 0 | 4 | 6 | 8 | 14 | 10 | 15 | 11 | 6 | 2 |
| 19 | | | | | | | | 1 | 3 | 5 | 4 | 12 | 5 | 5 | 2 | 0 |
| 20 | | | | | | | | | 0 | 1 | 6 | 12 | 4 | 0 | 0 | 0 |
| 21 | | | | | | | | | | 0 | 3 | 6 | 5 | 2 | 1 | 0 |
| 22 | | | | | | | | | | | 0 | 4 | 0 | 0 | 1 | 0 |
| 23 | | | | | | | | | | | | 0 | 3 | 4 | 4 | 0 |
| 24 | | | | | | | | | | | | | 0 | 0 | 1 | 2 |
| 25 | | | | | | | | | | | | | | 0 | 0 | 0 |
| 26 | | | | | | | | | | | | | | | 0 | 1 |
| 27 | | | | | | | | | | | | | | | | 0 |

Average Percent Change in LVD Between Measurements

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | -1.59% | 3.16% | 8.87% | 10.26% | 13.87% | 5.54% | 22.06% | | 9.95% | 10.28% | | | | 44.15% | | |
| 13 | | -1.28% | -0.91% | 10.73% | 10.24% | 16.85% | 21.01% | 20.74% | 21.63% | -6.52% | | 21.85% | | | | |
| 14 | | | 3.16% | 2.58% | 9.99% | 6.54% | 5.36% | 15.94% | 13.68% | 19.35% | 15.13% | 11.69% | 6.67% | 9.31% | 1.94% | |
| 15 | | | | 0.77% | 6.22% | 11.82% | 6.38% | 8.11% | 10.37% | 7.79% | 12.19% | 9.63% | 9.82% | | | |
| 16 | | | | | -0.96% | 4.08% | 1.67% | 4.68% | 5.77% | 13.21% | 9.00% | 10.85% | 8.71% | -1.10% | 2.86% | |
| 17 | | | | | | 1.36% | 3.80% | 3.44% | 10.95% | 7.34% | 6.34% | 8.89% | 9.37% | 4.18% | 20.00% | |
| 18 | | | | | | | | 4.69% | 1.25% | 8.22% | 5.06% | 4.93% | 10.95% | 9.39% | 4.90% | 0.75% |
| 19 | | | | | | | | 0.29% | 11.19% | 5.84% | 2.92% | 4.33% | 12.30% | 7.87% | 13.51% | |
| 20 | | | | | | | | | | 7.42% | 7.23% | 7.88% | 6.42% | | | |
| 21 | | | | | | | | | | | -0.48% | 9.16% | 7.43% | 9.06% | 0.21% | |
| 22 | | | | | | | | | | | | 9.35% | | | 0.38% | |
| 23 | | | | | | | | | | | | | 2.28% | -4.02% | 6.30% | |
| 24 | | | | | | | | | | | | | | | 8.02% | 4.39% |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | -0.12% |
| 27 | | | | | | | | | | | | | | | | |

Average Change in LVD Between Measurements

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | -183 | 377 | 1,071 | 1,151 | 1,665 | 634 | 2,734 | | 1,264 | 1,442 | | | | 4,012 | | |
| 13 | | -166 | -236 | 1,235 | 1,169 | 2,070 | 2,312 | 2,308 | 2,255 | -883 | | 2,500 | | | | |
| 14 | | | 433 | 317 | 1,230 | 751 | 649 | 1,888 | 1,619 | 2,046 | 1,831 | 1,530 | 788 | 1,300 | 267 | |
| 15 | | | | 99 | 747 | 1,435 | 774 | 927 | 1,182 | 935 | 1,438 | 1,223 | 986 | | | |
| 16 | | | | | -185 | 465 | 207 | 552 | 719 | 1,521 | 1,038 | 1,314 | 1,035 | -133 | 190 | |
| 17 | | | | | | 189 | 513 | 443 | 1,260 | 846 | 692 | 1,027 | 1,156 | 475 | 2,275 | |
| 18 | | | | | | | | 681 | 157 | 933 | 656 | 655 | 1,345 | 1,030 | 615 | 108 |
| 19 | | | | | | | | 42 | 1,268 | 803 | 305 | 450 | 1,525 | 1,002 | 1,662 | |
| 20 | | | | | | | | | | 983 | 867 | 995 | 778 | | | |
| 21 | | | | | | | | | | | -69 | 1,156 | 1,034 | 1,184 | 33 | |
| 22 | | | | | | | | | | | | 1,121 | | | 55 | |
| 23 | | | | | | | | | | | | | 324 | -615 | 742 | |
| 24 | | | | | | | | | | | | | | | 1,067 | 569 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | -17 |
| 27 | | | | | | | | | | | | | | | | |

Median Change in LVD Between Measurements

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | -183 | 533 | 1,042 | 1,117 | 1,334 | 942 | 2,734 | | 1,264 | 1,442 | | | | 4,012 | | |
| 13 | | -166 | -243 | 1,242 | 933 | 2,167 | 2,233 | 2,450 | 2,255 | -883 | | 2,500 | | | | |
| 14 | | | 100 | 267 | 1,300 | 766 | 259 | 1,705 | 1,300 | 2,667 | 1,950 | 1,806 | 788 | 1,300 | 267 | |
| 15 | | | | 18 | 775 | 1,071 | 666 | 825 | 1,142 | 958 | 1,367 | 1,217 | 1,008 | | | |
| 16 | | | | | -433 | 267 | 217 | 425 | 1,000 | 1,567 | 1,083 | 1,423 | 1,050 | -133 | 190 | |
| 17 | | | | | | 0 | 363 | 358 | 1,100 | 1,063 | 67 | 1,067 | 1,100 | 704 | 2,275 | |
| 18 | | | | | | | | 719 | 77 | 1,042 | 433 | 700 | 1,360 | 583 | 567 | 108 |
| 19 | | | | | | | | 42 | 1,767 | 908 | -55 | 300 | 1,608 | 1,167 | 1,662 | |
| 20 | | | | | | | | | | 983 | 1,283 | 1,093 | 1,386 | | | |
| 21 | | | | | | | | | | | 100 | 828 | 1,233 | 1,184 | 33 | |
| 22 | | | | | | | | | | | | 1,096 | | | 55 | |
| 23 | | | | | | | | | | | | | 967 | -146 | 17 | |
| 24 | | | | | | | | | | | | | | | 1,067 | 569 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | -17 |
| 27 | | | | | | | | | | | | | | | | |

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## Horses Measured Multiple Times on Different Dates
## Variable: LVD
## Fillies

**Average Months of Age Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.23 | 1.41 | 2.15 | 3.31 | 4.22 | 4.81 | 6.07 | 7.04 | | 9.29 | | | | | | |
| 13 | | | 1.18 | 2.06 | 3.00 | 4.34 | 4.82 | 5.82 | 6.08 | | 8.84 | | | | | |
| 14 | | | 0.22 | 1.06 | 1.81 | 2.72 | 3.89 | 4.83 | 5.81 | 7.17 | 7.65 | 8.89 | 9.47 | | 12.59 | |
| 15 | | | | 0.59 | 1.14 | 2.10 | 2.97 | 3.99 | 4.47 | 5.91 | 7.01 | 7.77 | 8.90 | | 11.28 | |
| 16 | | | | | 0.29 | 1.84 | 1.97 | 2.96 | 4.26 | 5.29 | 5.92 | 7.11 | 7.41 | 9.07 | 9.34 | |
| 17 | | | | | | 0.16 | 1.20 | 1.93 | 3.10 | 3.84 | 5.00 | 6.01 | 6.94 | 7.94 | 8.67 | 9.72 |
| 18 | | | | | | | 0.28 | 1.33 | 1.83 | 2.88 | 4.12 | 5.16 | 6.12 | 7.27 | | 8.91 |
| 19 | | | | | | | | | 1.61 | 2.23 | 2.75 | 4.56 | 4.91 | 6.51 | 6.92 | |
| 20 | | | | | | | | | | | 2.68 | 3.07 | 4.11 | | 6.35 | 6.84 |
| 21 | | | | | | | | | | | | 2.65 | 2.93 | | | |
| 22 | | | | | | | | | | | | 0.89 | 2.14 | 3.11 | 3.98 | |
| 23 | | | | | | | | | | | | 0.39 | | 2.28 | 3.12 | |
| 24 | | | | | | | | | | | | | | | | 2.76 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 0.07 | |
| 27 | | | | | | | | | | | | | | | | |

**Number of Comparisons Made Between Each Age**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 2 | 1 | 4 | 7 | 3 | 6 | 2 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13 | | 0 | 1 | 3 | 8 | 6 | 4 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 14 | | | 4 | 6 | 8 | 8 | 4 | 1 | 5 | 3 | 7 | 2 | 1 | 0 | 1 | 0 |
| 15 | | | | 1 | 12 | 11 | 5 | 6 | 4 | 13 | 10 | 8 | 3 | 0 | 1 | 0 |
| 16 | | | | | 4 | 2 | 8 | 11 | 6 | 3 | 20 | 15 | 4 | 1 | 1 | 0 |
| 17 | | | | | | 3 | 5 | 3 | 5 | 3 | 10 | 16 | 5 | 2 | 3 | 2 |
| 18 | | | | | | | 2 | 2 | 5 | 6 | 4 | 7 | 9 | 5 | 0 | 1 |
| 19 | | | | | | | | 0 | 1 | 4 | 5 | 4 | 3 | 2 | 4 | 0 |
| 20 | | | | | | | | | 0 | 0 | 3 | 11 | 1 | 0 | 2 | 1 |
| 21 | | | | | | | | | | 0 | 0 | 2 | 6 | 0 | 0 | 0 |
| 22 | | | | | | | | | | | 0 | 1 | 3 | 6 | 1 | 0 |
| 23 | | | | | | | | | | | | 2 | 0 | 3 | 3 | 0 |
| 24 | | | | | | | | | | | | | 0 | 0 | 0 | 1 |
| 25 | | | | | | | | | | | | | | 0 | 0 | 0 |
| 26 | | | | | | | | | | | | | | | 1 | 0 |
| 27 | | | | | | | | | | | | | | | | 0 |

**Average Percent Change in LVD Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 2.01% | 11.14% | 11.67% | 12.99% | 4.70% | 13.15% | 48.59% | 27.28% | | 22.30% | | | | | | |
| 13 | | | 10.68% | 14.40% | 10.26% | 12.14% | 14.15% | 8.74% | 13.62% | | 2.18% | | | | | |
| 14 | | | -0.49% | 7.39% | 4.55% | 5.39% | 12.81% | 2.84% | 21.08% | 15.49% | 8.57% | 15.85% | 5.80% | | 17.75% | |
| 15 | | | | 7.18% | 2.89% | 4.52% | 1.30% | 6.64% | 4.98% | 14.08% | 10.92% | 6.08% | 12.82% | | 32.77% | |
| 16 | | | | | 2.88% | -10.18% | 2.14% | 5.39% | 5.77% | 5.21% | 8.64% | 14.73% | 13.35% | 16.01% | 3.38% | |
| 17 | | | | | | 3.40% | 3.28% | 1.61% | 8.47% | 13.60% | 12.92% | 10.04% | 8.81% | 16.01% | 9.66% | 10.55% |
| 18 | | | | | | | -5.43% | 11.55% | 2.95% | 7.00% | 0.52% | 12.55% | 13.14% | 7.99% | | 18.26% |
| 19 | | | | | | | | | 11.11% | 4.08% | 12.62% | 1.91% | 1.27% | 13.55% | 8.85% | |
| 20 | | | | | | | | | | | -0.40% | 3.25% | 2.50% | | -0.97% | 0.63% |
| 21 | | | | | | | | | | | | 0.84% | 4.07% | | | |
| 22 | | | | | | | | | | | | 2.76% | 1.72% | 3.64% | 8.91% | |
| 23 | | | | | | | | | | | | -1.45% | | 8.24% | 5.53% | |
| 24 | | | | | | | | | | | | | | | | 2.47% |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 5.67% | |
| 27 | | | | | | | | | | | | | | | | |

**Average Change in LVD Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 238 | 1,333 | 1,294 | 1,354 | 508 | 1,467 | 4,812 | 3,365 | | 2,617 | | | | | | |
| 13 | | | 1,200 | 1,478 | 1,089 | 1,331 | 1,673 | 1,017 | 1,600 | | 302 | | | | | |
| 14 | | | -55 | 874 | 534 | 648 | 1,429 | 300 | 2,572 | 1,701 | 876 | 1,688 | 570 | | 2,266 | |
| 15 | | | | 967 | 312 | 531 | 157 | 711 | 639 | 1,577 | 1,217 | 739 | 1,328 | | 3,480 | |
| 16 | | | | | 331 | -1,124 | 262 | 653 | 702 | 658 | 1,008 | 1,628 | 1,433 | 1,942 | 500 | |
| 17 | | | | | | 398 | 372 | 88 | 948 | 1,575 | 1,394 | 1,051 | 846 | 1,784 | 958 | 1,209 |
| 18 | | | | | | | -783 | 1,350 | 401 | 816 | 71 | 1,453 | 1,361 | 986 | | 2,234 |
| 19 | | | | | | | | | 1,200 | 498 | 1,390 | 100 | 187 | 1,717 | 933 | |
| 20 | | | | | | | | | | | -50 | 388 | 292 | | -150 | 80 |
| 21 | | | | | | | | | | | | 117 | 482 | | | |
| 22 | | | | | | | | | | | | 292 | 233 | 403 | 1,093 | |
| 23 | | | | | | | | | | | | -346 | | 1,028 | 697 | |
| 24 | | | | | | | | | | | | | | | | 267 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 717 | |
| 27 | | | | | | | | | | | | | | | | |

**Median Change in LVD Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 238 | 1,333 | 1,442 | 1,316 | 608 | 1,633 | 4,812 | 3,365 | | 2,617 | | | | | | |
| 13 | | | 1,200 | 1,853 | 669 | 1,425 | 1,550 | 1,017 | 1,600 | | 302 | | | | | |
| 14 | | | 0 | 900 | 748 | 539 | 1,367 | 300 | 2,600 | 1,510 | 175 | 1,688 | 570 | | 2,266 | |
| 15 | | | | 967 | 221 | 600 | 100 | 679 | 745 | 1,965 | 1,515 | 254 | 1,550 | | 3,480 | |
| 16 | | | | | 213 | -1,124 | 379 | 400 | 700 | 1,200 | 1,013 | 1,567 | 1,400 | 1,942 | 500 | |
| 17 | | | | | | 411 | 358 | 553 | 167 | 1,067 | 1,431 | 1,117 | 732 | 1,784 | 283 | 1,209 |
| 18 | | | | | | | -783 | 1,350 | 467 | 905 | -208 | 1,950 | 1,333 | 807 | | 2,234 |
| 19 | | | | | | | | | 1,200 | 671 | 1,466 | 50 | 560 | 1,717 | 671 | |
| 20 | | | | | | | | | | | -67 | 535 | 292 | | -150 | 80 |
| 21 | | | | | | | | | | | | 117 | 425 | | | |
| 22 | | | | | | | | | | | | 292 | 0 | 321 | 1,093 | |
| 23 | | | | | | | | | | | | -346 | | 117 | 600 | |
| 24 | | | | | | | | | | | | | | | | 267 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 717 | |
| 27 | | | | | | | | | | | | | | | | |

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**Horses Measured Multiple Times on Different Dates**
**Variable: LVS**
**Combined Sexes**

**Average Months of Age Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.30 | 1.41 | 1.90 | 3.02 | 3.96 | 4.74 | 6.05 | 7.04 | 7.66 | 9.14 | | | | 12.99 | | |
| 13 | | 0.23 | 1.45 | 2.00 | 3.12 | 4.13 | 4.82 | 5.98 | 6.49 | 7.50 | 8.84 | 9.40 | | | | |
| 14 | | | 0.20 | 1.28 | 1.81 | 2.94 | 3.82 | 4.72 | 6.02 | 6.95 | 7.72 | 9.08 | 9.36 | 10.45 | 12.05 | |
| 15 | | | | 0.16 | 1.06 | 2.09 | 3.05 | 3.92 | 4.82 | 5.96 | 6.94 | 7.76 | 9.00 | | 11.28 | |
| 16 | | | | | 0.23 | 1.25 | 2.02 | 2.99 | 4.09 | 5.16 | 5.91 | 7.03 | 7.68 | 9.14 | 9.65 | |
| 17 | | | | | | 0.17 | 1.08 | 2.00 | 2.95 | 3.99 | 4.97 | 5.91 | 6.91 | 7.63 | 8.77 | 9.72 |
| 18 | | | | | | | 0.28 | 0.91 | 2.02 | 2.96 | 4.13 | 5.01 | 6.10 | 7.12 | 7.96 | 9.06 |
| 19 | | | | | | | | 0.36 | 1.04 | 2.37 | 2.96 | 4.35 | 5.22 | 6.12 | 7.04 | |
| 20 | | | | | | | | | | 1.71 | 2.37 | 2.94 | 3.95 | | 6.35 | 6.84 |
| 21 | | | | | | | | | | | 0.78 | 2.32 | 2.94 | 3.48 | 4.34 | |
| 22 | | | | | | | | | | | | 1.07 | 2.14 | 3.11 | 3.67 | |
| 23 | | | | | | | | | | | | 0.39 | 1.12 | 2.33 | 3.28 | |
| 24 | | | | | | | | | | | | | | | 2.20 | 2.99 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 0.07 | 0.76 |
| 27 | | | | | | | | | | | | | | | | |

**Number of Comparisons Made Between Each Age**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 3 | 4 | 9 | 20 | 11 | 10 | 4 | 1 | 2 | 3 | 0 | 0 | 0 | 1 | 0 | 0 |
| 13 | | 2 | 5 | 17 | 25 | 12 | 16 | 4 | 2 | 1 | 1 | 2 | 0 | 0 | 0 | 0 |
| 14 | | | 7 | 13 | 21 | 25 | 10 | 12 | 15 | 12 | 13 | 6 | 3 | 1 | 2 | 0 |
| 15 | | | | 7 | 15 | 21 | 20 | 16 | 12 | 27 | 25 | 20 | 6 | 0 | 1 | 0 |
| 16 | | | | | 9 | 13 | 23 | 24 | 23 | 12 | 54 | 39 | 1 1 | 2 | 3 | 0 |
| 17 | | | | | | 6 | 11 | 16 | 9 | 21 | 20 | 44 | 26 | 6 | 5 | 2 |
| 18 | | | | | | | 2 | 6 | 11 | 14 | 18 | 17 | 24 | 16 | 6 | 3 |
| 19 | | | | | | | | 1 | 4 | 9 | 9 | 16 | 8 | 7 | 6 | 0 |
| 20 | | | | | | | | | 0 | 1 | 9 | 23 | 5 | 0 | 2 | 1 |
| 21 | | | | | | | | | | 0 | 3 | 8 | 11 | 2 | 1 | 0 |
| 22 | | | | | | | | | | | 0 | 5 | 3 | 6 | 2 | 0 |
| 23 | | | | | | | | | | | | 2 | 3 | 7 | 7 | 0 |
| 24 | | | | | | | | | | | | | 0 | 0 | 1 | 3 |
| 25 | | | | | | | | | | | | | | 0 | 0 | 0 |
| 26 | | | | | | | | | | | | | | | 1 | 1 |
| 27 | | | | | | | | | | | | | | | | 0 |

**Average Percent Change in LVS Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | -5.02% | 3.71% | 5.36% | 13.18% | 11.69% | 7.33% | 37.92% | 27.88% | 11.79% | 12.79% | | | | 46.50% | | |
| 13 | | -3.82% | -2.26% | 10.38% | 9.31% | 9.23% | 17.77% | 18.70% | 49.37% | -0.16% | -2.85% | 34.25% | | | | |
| 14 | | | 6.34% | 2.24% | 4.37% | 6.07% | 9.27% | 8.85% | 14.69% | 14.84% | 15.54% | 15.00% | 6.98% | 0.70% | 14.88% | |
| 15 | | | | 8.89% | 2.05% | 7.77% | 4.57% | 4.64% | 8.29% | 9.97% | 9.69% | 8.20% | 6.41% | | 32.01% | |
| 16 | | | | | 4.50% | 3.46% | 4.66% | 3.68% | 6.93% | 14.43% | 9.54% | 12.15% | 10.22% | 7.87% | 7.09% | |
| 17 | | | | | | -0.18% | 0.20% | 2.53% | 8.25% | 6.36% | 4.33% | 9.47% | 7.55% | 4.57% | 15.89% | 12.05% |
| 18 | | | | | | | -3.55% | 3.71% | 3.06% | 6.14% | 4.51% | 5.96% | 8.30% | 6.59% | 4.80% | -0.38% |
| 19 | | | | | | | | -2.74% | 6.46% | 4.28% | 4.61% | 1.83% | 6.36% | 3.21% | 8.04% | |
| 20 | | | | | | | | | | 13.17% | 3.97% | 4.40% | 1.58% | | -4.27% | -2.15% |
| 21 | | | | | | | | | | | 3.97% | 5.81% | 6.22% | 2.32% | 2.11% | |
| 22 | | | | | | | | | | | | 2.64% | 7.13% | 1.28% | 13.65% | |
| 23 | | | | | | | | | | | | -7.75% | 4.33% | 1.66% | 7.98% | |
| 24 | | | | | | | | | | | | | | | 10.88% | 2.42% |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 15.47% | 0.29% |
| 27 | | | | | | | | | | | | | | | | |

**Average Change in LVS Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | -181 | 146 | 195 | 445 | 454 | 275 | 1,285 | 1,130 | 490 | 491 | | | | 1,330 | | |
| 13 | | -164 | -200 | 378 | 348 | 377 | 653 | 689 | 1,582 | -7 | -130 | 1,220 | | | | |
| 14 | | | 254 | 74 | 159 | 212 | 343 | 361 | 563 | 475 | 511 | 582 | 248 | 32 | 617 | |
| 15 | | | | 256 | 66 | 276 | 171 | 152 | 314 | 355 | 375 | 332 | 211 | | 957 | |
| 16 | | | | | 145 | 93 | 164 | 137 | 254 | 574 | 340 | 429 | 340 | 301 | 211 | |
| 17 | | | | | | 0 | -2 | 87 | 301 | 221 | 169 | 328 | 258 | 106 | 513 | 477 |
| 18 | | | | | | | -162 | 158 | 108 | 226 | 184 | 232 | 316 | 236 | 215 | -17 |
| 19 | | | | | | | | -133 | 239 | 184 | 144 | 40 | 230 | 134 | 325 | |
| 20 | | | | | | | | | | 579 | 171 | 161 | 45 | | -203 | -84 |
| 21 | | | | | | | | | | | 160 | 196 | 256 | 66 | 107 | |
| 22 | | | | | | | | | | | | 84 | 296 | 39 | 435 | |
| 23 | | | | | | | | | | | | -367 | 193 | 57 | 332 | |
| 24 | | | | | | | | | | | | | | | 450 | 80 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 623 | 13 |
| 27 | | | | | | | | | | | | | | | | |

**Median Change in LVS Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | -316 | 149 | 156 | 574 | 487 | 240 | 1,117 | 1,130 | 490 | 408 | | | | 1,330 | | |
| 13 | | -164 | -80 | 350 | 390 | 415 | 732 | 687 | 1,582 | -7 | -130 | 1,220 | | | | |
| 14 | | | 133 | 53 | 110 | 188 | 315 | 355 | 600 | 593 | 322 | 604 | 145 | 32 | 617 | |
| 15 | | | | 17 | 47 | 240 | 188 | 143 | 359 | 338 | 322 | 280 | 302 | | 957 | |
| 16 | | | | | 136 | 233 | 217 | 166 | 317 | 723 | 394 | 373 | 275 | 301 | 200 | |
| 17 | | | | | | -10 | 30 | 29 | 318 | 227 | 207 | 382 | 138 | 264 | 417 | 477 |
| 18 | | | | | | | -162 | 71 | 20 | 204 | 245 | 287 | 280 | 319 | 106 | -23 |
| 19 | | | | | | | | -133 | 29 4 | 174 | 330 | 10 | 164 | 154 | 415 | |
| 20 | | | | | | | | | | 579 | 50 | 112 | 220 | | -203 | -84 |
| 21 | | | | | | | | | | | 160 | 134 | 317 | 66 | 107 | |
| 22 | | | | | | | | | | | | -100 | 217 | -31 | 435 | |
| 23 | | | | | | | | | | | | -367 | 410 | 102 | 387 | |
| 24 | | | | | | | | | | | | | | | 450 | 127 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 623 | 13 |
| 27 | | | | | | | | | | | | | | | | |

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## Horses Measured Multiple Times on Different Dates
## Variable: LVS
## Colts

### Average Months of Age Between Measurements

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.43 | 1.41 | 1.69 | 2.86 | 3.87 | 4.63 | 6.03 | | 7.66 | 8.84 | | | | 12.99 | | |
| 13 | | 0.23 | 1.51 | 1.99 | 3.18 | 3.92 | 4.82 | 6.03 | 6.90 | 7.50 | | 9.40 | | | | |
| 14 | | | 0.18 | 1.48 | 1.82 | 3.04 | 3.77 | 4.71 | 6.12 | 6.87 | 7.80 | 9.17 | 9.30 | 10.45 | 11.51 | |
| 15 | | | | 0.09 | 0.75 | 2.08 | 3.08 | 3.88 | 4.99 | 6.01 | 6.90 | 7.75 | 9.10 | | | |
| 16 | | | | | 0.18 | 1.14 | 2.04 | 3.02 | 4.03 | 5.12 | 5.90 | 6.97 | 7.83 | 9.21 | 9.81 | |
| 17 | | | | | | 0.18 | 0.99 | 2.01 | 2.75 | 4.01 | 4.93 | 5.85 | 6.90 | 7.47 | 8.93 | |
| 18 | | | | | | | | 0.70 | 2.18 | 3.02 | 4.14 | 4.92 | 6.09 | 7.05 | 7.96 | 9.14 |
| 19 | | | | | | | | 0.36 | 0.85 | 2.48 | 3.23 | 4.27 | 5.41 | 5.96 | 7.27 | |
| 20 | | | | | | | | | | 1.71 | 2.22 | 2.82 | 3.90 | | | |
| 21 | | | | | | | | | | | 0.78 | 2.21 | 2.95 | 3.48 | 4.34 | |
| 22 | | | | | | | | | | | | 1.12 | | | 3.35 | |
| 23 | | | | | | | | | | | | | 1.12 | 2.37 | 3.40 | |
| 24 | | | | | | | | | | | | | | | 2.20 | 3.11 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | 0.76 |
| 27 | | | | | | | | | | | | | | | | |

### Number of Comparisons Made Between Each Age

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 1 | 3 | 5 | 13 | 8 | 4 | 2 | 0 | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 13 | | 2 | 4 | 14 | 17 | 6 | 12 | 3 | 1 | 1 | 0 | 2 | 0 | 0 | 0 | 0 |
| 14 | | | 3 | 7 | 13 | 17 | 6 | 11 | 10 | 9 | 6 | 4 | 2 | 1 | 1 | 0 |
| 15 | | | | 6 | 3 | 10 | 15 | 10 | 8 | 14 | 15 | 12 | 3 | 0 | 0 | 0 |
| 16 | | | | | 5 | 11 | 15 | 13 | 17 | 9 | 34 | 24 | 7 | 1 | 2 | 0 |
| 17 | | | | | | 3 | 6 | 13 | 4 | 18 | 10 | 28 | 21 | 4 | 2 | 0 |
| 18 | | | | | | | 0 | 4 | 6 | 8 | 14 | 10 | 15 | 11 | 6 | 2 |
| 19 | | | | | | | | 1 | 3 | 5 | 4 | 12 | 5 | 5 | 2 | 0 |
| 20 | | | | | | | | | 0 | 1 | 6 | 12 | 4 | 0 | 0 | 0 |
| 21 | | | | | | | | | | 0 | 3 | 6 | 5 | 2 | 1 | 0 |
| 22 | | | | | | | | | | | 0 | 4 | 0 | 0 | 1 | 0 |
| 23 | | | | | | | | | | | | 0 | 3 | 4 | 4 | 0 |
| 24 | | | | | | | | | | | | | 0 | 0 | 1 | 2 |
| 25 | | | | | | | | | | | | | | 0 | 0 | 0 |
| 26 | | | | | | | | | | | | | | | 0 | 1 |
| 27 | | | | | | | | | | | | | | | | 0 |

### Average Percent Change in LVS Between Measurements

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | -11.97% | 1.62% | 8.94% | 14.96% | 14.16% | -0.66% | 22.98% | | 11.79% | 8.79% | | | | 46.50% | | |
| 13 | | -3.82% | -7.67% | 9.44% | 9.31% | 13.18% | 18.37% | 22.02% | 57.45% | -0.16% | | 34.25% | | | | |
| 14 | | | 9.45% | 1.63% | 3.59% | 5.20% | 5.89% | 9.29% | 14.96% | 17.11% | 20.34% | 16.15% | 1.87% | 0.70% | 6.29% | |
| 15 | | | | 10.40% | 2.82% | 12.62% | 6.65% | 2.83% | 10.68% | 8.03% | 8.13% | 9.87% | 4.00% | | | |
| 16 | | | | | 0.46% | 5.94% | 6.21% | 4.29% | 4.56% | 15.96% | 8.03% | 12.52% | 6.75% | -2.04% | 8.59% | |
| 17 | | | | | | -0.11% | 0.09% | 4.17% | 5.39% | 5.04% | 2.84% | 8.13% | 6.73% | -0.09% | 24.00% | |
| 18 | | | | | | | | 4.89% | 1.33% | 8.05% | 4.64% | 4.84% | 8.60% | 6.37% | 4.80% | -0.33% |
| 19 | | | | | | | | -2.74% | 7.18% | 8.29% | -1.71% | 0.54% | 12.95% | 1.08% | 5.53% | |
| 20 | | | | | | | | | | 13.17% | 2.97% | 6.69% | 2.53% | | | |
| 21 | | | | | | | | | | | 3.97% | 7.90% | 6.71% | 2.32% | 2.11% | |
| 22 | | | | | | | | | | | | 3.97% | | | 0.30% | |
| 23 | | | | | | | | | | | | | 4.33% | -1.48% | 7.19% | |
| 24 | | | | | | | | | | | | | | | 10.88% | 0.58% |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | 0.29% |
| 27 | | | | | | | | | | | | | | | | |

### Average Change in LVS Between Measurements

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | -444 | 66 | 345 | 510 | 557 | -14 | 922 | | 490 | 408 | | | | 1,330 | | |
| 13 | | -164 | -426 | 357 | 363 | 558 | 674 | 800 | 1,693 | -7 | | 1,220 | | | | |
| 14 | | | 386 | 63 | 135 | 184 | 239 | 380 | 545 | 556 | 675 | 655 | 79 | 32 | 280 | |
| 15 | | | | 300 | 78 | 476 | 250 | 86 | 396 | 308 | 333 | 408 | 111 | | | |
| 16 | | | | | 17 | 171 | 225 | 175 | 183 | 633 | 282 | 472 | 229 | -83 | 217 | |
| 17 | | | | | | -7 | 22 | 151 | 217 | 168 | 118 | 285 | 244 | -82 | 812 | |
| 18 | | | | | | | | 207 | 36 | 312 | 191 | 193 | 338 | 215 | 215 | -13 |
| 19 | | | | | | | | -133 | 273 | 360 | -97 | -10 | 513 | 47 | 222 | |
| 20 | | | | | | | | | | 579 | 129 | 254 | 78 | | | |
| 21 | | | | | | | | | | | 160 | 267 | 282 | 66 | 107 | |
| 22 | | | | | | | | | | | | 130 | | | 13 | |
| 23 | | | | | | | | | | | | | 193 | -82 | 313 | |
| 24 | | | | | | | | | | | | | | | 450 | 10 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | 13 |
| 27 | | | | | | | | | | | | | | | | |

### Median Change in LVS Between Measurements

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | -444 | 137 | 290 | 664 | 582 | 80 | 922 | | 490 | 408 | | | | 1,330 | | |
| 13 | | -164 | -483 | 341 | 390 | 513 | 765 | 847 | 1,693 | -7 | | 1,220 | | | | |
| 14 | | | 150 | 53 | 160 | 123 | 142 | 490 | 423 | 662 | 653 | 625 | 79 | 32 | 280 | |
| 15 | | | | 87 | -60 | 488 | 330 | 24 | 359 | 315 | 322 | 402 | 233 | | | |
| 16 | | | | | 136 | 305 | 227 | 203 | 273 | 813 | 365 | 444 | 275 | -83 | 217 | |
| 17 | | | | | | 0 | 78 | 63 | 157 | 182 | 107 | 392 | 160 | 64 | 812 | |
| 18 | | | | | | | | 71 | 6 | 409 | 245 | 266 | 360 | 346 | 106 | -13 |
| 19 | | | | | | | | -133 | 450 | 476 | 52 | -7 | 744 | 153 | 222 | |
| 20 | | | | | | | | | | 579 | 115 | 172 | 357 | | | |
| 21 | | | | | | | | | | | 160 | 285 | 630 | 66 | 107 | |
| 22 | | | | | | | | | | | | 0 | | | 13 | |
| 23 | | | | | | | | | | | | | 410 | 145 | 214 | |
| 24 | | | | | | | | | | | | | | | 450 | 10 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | 13 |
| 27 | | | | | | | | | | | | | | | | |

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**Horses Measured Multiple Times on Different Dates**
**Variable: LVS**
**Fillies**

**Average Months of Age Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.23 | 1.41 | 2.15 | 3.31 | 4.22 | 4.81 | 6.07 | 7.04 | | 9.29 | | | | | | |
| 13 | | | 1.18 | 2.06 | 3.00 | 4.34 | 4.82 | 5.82 | 6.08 | | 8.84 | | | | | |
| 14 | | | 0.22 | 1.06 | 1.81 | 2.72 | 3.89 | 4.83 | 5.81 | 7.17 | 7.65 | 8.89 | 9.47 | | 12.59 | |
| 15 | | | | 0.59 | 1.14 | 2.10 | 2.97 | 3.99 | 4.47 | 5.91 | 7.01 | 7.77 | 8.90 | | 11.28 | |
| 16 | | | | | 0.29 | 1.84 | 1.97 | 2.96 | 4.26 | 5.29 | 5.92 | 7.11 | 7.41 | 9.07 | 9.34 | |
| 17 | | | | | | 0.16 | 1.20 | 1.93 | 3.10 | 3.84 | 5.00 | 6.01 | 6.94 | 7.94 | 8.67 | 9.72 |
| 18 | | | | | | | 0.28 | 1.33 | 1.83 | 2.88 | 4.12 | 5.16 | 6.12 | 7.27 | | 8.91 |
| 19 | | | | | | | | | 1.61 | 2.23 | 2.75 | 4.56 | 4.91 | 6.51 | 6.92 | |
| 20 | | | | | | | | | | | 2.68 | 3.07 | 4.11 | | 6.35 | 6.84 |
| 21 | | | | | | | | | | | | 2.65 | 2.93 | | | |
| 22 | | | | | | | | | | | | 0.89 | 2.14 | 3.11 | 3.98 | |
| 23 | | | | | | | | | | | | 0.39 | | 2.28 | 3.12 | |
| 24 | | | | | | | | | | | | | | | | 2.76 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 0.07 | |
| 27 | | | | | | | | | | | | | | | | |

**Number of Comparisons Made Between Each Age**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 2 | 1 | 4 | 7 | 3 | 6 | 2 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13 | | 0 | 1 | 3 | 8 | 6 | 4 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 14 | | | 4 | 6 | 8 | 8 | 4 | 1 | 5 | 3 | 7 | 2 | 1 | 0 | 1 | 0 |
| 15 | | | | 1 | 12 | 11 | 5 | 6 | 4 | 13 | 10 | 8 | 3 | 0 | 1 | 0 |
| 16 | | | | | 4 | 2 | 8 | 11 | 6 | 3 | 20 | 15 | 4 | 1 | 1 | 0 |
| 17 | | | | | | 3 | 5 | 3 | 5 | 3 | 10 | 16 | 5 | 2 | 3 | 2 |
| 18 | | | | | | | 2 | 2 | 5 | 6 | 4 | 7 | 9 | 5 | 0 | 1 |
| 19 | | | | | | | | 0 | 1 | 4 | 5 | 4 | 3 | 2 | 4 | 0 |
| 20 | | | | | | | | | 0 | 0 | 3 | 11 | 1 | 0 | 2 | 1 |
| 21 | | | | | | | | | | 0 | 0 | 2 | 6 | 0 | 0 | 0 |
| 22 | | | | | | | | | | | 0 | 1 | 3 | 6 | 1 | 0 |
| 23 | | | | | | | | | | | | 2 | 0 | 3 | 3 | 0 |
| 24 | | | | | | | | | | | | | 0 | 0 | 0 | 1 |
| 25 | | | | | | | | | | | | | | 0 | 0 | 0 |
| 26 | | | | | | | | | | | | | | | 1 | 0 |
| 27 | | | | | | | | | | | | | | | | 0 |

**Average Percent Change in LVS Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | -1.54% | 9.97% | 0.89% | 9.88% | 5.08% | 12.66% | 52.85% | 27.88% | | 14.79% | | | | | | |
| 13 | | | 19.39% | 14.76% | 9.31% | 5.28% | 15.96% | 8.73% | 41.29% | | -2.85% | | | | | |
| 14 | | | 4.00% | 2.95% | 5.63% | 7.92% | 14.34% | 4.02% | 14.14% | 8.00% | 11.42% | 12.68% | 17.22% | | 23.47% | |
| 15 | | | | -0.16% | 1.85% | 3.36% | -1.67% | 7.65% | 3.49% | 12.06% | 12.05% | 5.69% | 8.81% | | 32.01% | |
| 16 | | | | | 9.56% | -10.13% | 1.76% | 2.96% | 13.65% | 9.83% | 12.10% | 11.55% | 16.31% | 17.77% | 4.11% | |
| 17 | | | | | | -0.25% | 0.33% | -4.58% | 10.54% | 14.34% | 5.83% | 11.83% | 11.00% | 13.88% | 10.48% | 12.05% |
| 18 | | | | | | | -3.55% | 1.37% | 5.14% | 3.60% | 4.03% | 7.56% | 7.81% | 7.08% | | -0.50% |
| 19 | | | | | | | | | 4.29% | -0.75% | 9.67% | 5.68% | -4.61% | 8.52% | 9.29% | |
| 20 | | | | | | | | | | | 5.97% | 1.90% | -2.18% | | -4.27% | -2.15% |
| 21 | | | | | | | | | | | | -0.45% | 5.82% | | | |
| 22 | | | | | | | | | | | | -2.68% | 7.13% | 1.28% | 27.00% | |
| 23 | | | | | | | | | | | | -7.75% | | 5.86% | 9.04% | |
| 24 | | | | | | | | | | | | | | | | 6.10% |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 15.47% | |
| 27 | | | | | | | | | | | | | | | | |

**Average Change in LVS Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | -50 | 385 | 8 | 326 | 181 | 468 | 1,649 | 1,130 | | 533 | | | | | | |
| 13 | | | 700 | 478 | 316 | 197 | 592 | 357 | 1,470 | | -130 | | | | | |
| 14 | | | 155 | 87 | 199 | 271 | 499 | 150 | 599 | 231 | 369 | 437 | 585 | | 954 | |
| 15 | | | | -7 | 63 | 95 | -64 | 261 | 150 | 406 | 437 | 217 | 310 | | 957 | |
| 16 | | | | | 304 | -337 | 51 | 94 | 457 | 397 | 439 | 361 | 534 | 685 | 200 | |
| 17 | | | | | | 7 | -30 | -188 | 368 | 543 | 220 | 403 | 319 | 483 | 314 | 477 |
| 18 | | | | | | | -162 | 60 | 195 | 111 | 157 | 288 | 279 | 282 | | -23 |
| 19 | | | | | | | | | 137 | -35 | 337 | 187 | -241 | 352 | 377 | |
| 20 | | | | | | | | | | | 257 | 60 | -86 | | -203 | -84 |
| 21 | | | | | | | | | | | | -16 | 234 | | | |
| 22 | | | | | | | | | | | | -100 | 296 | 39 | 856 | |
| 23 | | | | | | | | | | | | -367 | | 243 | 356 | |
| 24 | | | | | | | | | | | | | | | | 220 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 623 | |
| 27 | | | | | | | | | | | | | | | | |

**Median Change in LVS Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | -50 | 385 | -23 | 211 | 177 | 527 | 1,649 | 1,130 | | 533 | | | | | | |
| 13 | | | 700 | 558 | 284 | 190 | 580 | 357 | 1,470 | | -130 | | | | | |
| 14 | | | 90 | -7 | 96 | 442 | 445 | 150 | 600 | 227 | 197 | 437 | 585 | | 954 | |
| 15 | | | | -7 | 52 | 127 | -4 | 333 | 181 | 338 | 335 | 161 | 370 | | 957 | |
| 16 | | | | | 303 | -337 | 115 | 127 | 427 | 424 | 410 | 196 | 489 | 685 | 200 | |
| 17 | | | | | | -20 | -23 | -77 | 377 | 629 | 343 | 372 | 117 | 483 | 217 | 477 |
| 18 | | | | | | | -162 | 60 | 173 | -5 | 158 | 290 | 235 | 291 | | -23 |
| 19 | | | | | | | | | 137 | -91 | 363 | 140 | -457 | 352 | 442 | |
| 20 | | | | | | | | | | | 50 | -33 | -86 | | -203 | -84 |
| 21 | | | | | | | | | | | | -16 | 225 | | | |
| 22 | | | | | | | | | | | | -100 | 217 | -31 | 856 | |
| 23 | | | | | | | | | | | | -367 | | -50 | 450 | |
| 24 | | | | | | | | | | | | | | | | 220 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 623 | |
| 27 | | | | | | | | | | | | | | | | |

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**Horses Measured Multiple Times on Different Dates**
**Variable: SW**
**Combined Sexes**

**Average Months of Age Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.30 | 1.41 | 1.90 | 3.02 | 3.96 | 4.74 | 6.05 | 7.04 | 7.66 | 9.14 | | | | 12.99 | | |
| 13 | | 0.23 | 1.45 | 2.00 | 3.12 | 4.13 | 4.82 | 5.98 | 6.49 | 7.50 | 8.84 | 9.40 | | | | |
| 14 | | | 0.20 | 1.28 | 1.81 | 2.94 | 3.82 | 4.72 | 6.02 | 6.95 | 7.72 | 9.08 | 9.36 | 10.45 | 12.05 | |
| 15 | | | | 0.16 | 1.06 | 2.09 | 3.05 | 3.92 | 4.82 | 5.96 | 6.94 | 7.76 | 9.00 | | 11.28 | |
| 16 | | | | | 0.23 | 1.25 | 2.02 | 2.99 | 4.09 | 5.16 | 5.91 | 7.03 | 7.68 | 9.14 | 9.65 | |
| 17 | | | | | | 0.17 | 1.08 | 2.00 | 2.95 | 3.99 | 4.97 | 5.91 | 6.91 | 7.63 | 8.77 | 9.72 |
| 18 | | | | | | | 0.28 | 0.91 | 2.02 | 2.96 | 4.13 | 5.01 | 6.10 | 7.12 | 7.96 | 9.06 |
| 19 | | | | | | | | 0.36 | 1.04 | 2.37 | 2.96 | 4.35 | 5.22 | 6.12 | 7.04 | |
| 20 | | | | | | | | | | 1.71 | 2.37 | 2.94 | 3.95 | | 6.35 | 6.84 |
| 21 | | | | | | | | | | | 0.78 | 2.32 | 2.94 | 3.48 | 4.34 | |
| 22 | | | | | | | | | | | | 1.07 | 2.14 | 3.11 | 3.67 | |
| 23 | | | | | | | | | | | | 0.39 | 1.12 | 2.33 | 3.28 | |
| 24 | | | | | | | | | | | | | | | 2.20 | 2.99 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 0.07 | 0.76 |
| 27 | | | | | | | | | | | | | | | | |

**Number of Comparisons Made Between Each Age**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 3 | 4 | 9 | 20 | 11 | 10 | 4 | 1 | 2 | 3 | 0 | 0 | 0 | 1 | 0 | 0 |
| 13 | | 2 | 5 | 17 | 25 | 12 | 16 | 4 | 2 | 1 | 1 | 2 | 0 | 0 | 0 | 0 |
| 14 | | | 7 | 13 | 21 | 25 | 10 | 12 | 15 | 12 | 13 | 6 | 3 | 1 | 2 | 0 |
| 15 | | | | 7 | 15 | 21 | 20 | 16 | 12 | 27 | 25 | 20 | 6 | 0 | 1 | 0 |
| 16 | | | | | 9 | 13 | 23 | 24 | 23 | 12 | 54 | 39 | 11 | 2 | 3 | 0 |
| 17 | | | | | | 6 | 11 | 16 | 9 | 21 | 20 | 44 | 26 | 6 | 5 | 2 |
| 18 | | | | | | | 2 | 6 | 11 | 14 | 18 | 17 | 24 | 16 | 6 | 3 |
| 19 | | | | | | | | 1 | 4 | 9 | 9 | 16 | 8 | 7 | 6 | 0 |
| 20 | | | | | | | | | 0 | 1 | 9 | 23 | 5 | 0 | 2 | 1 |
| 21 | | | | | | | | | | 0 | 3 | 8 | 11 | 2 | 1 | 0 |
| 22 | | | | | | | | | | | 0 | 5 | 3 | 6 | 2 | 0 |
| 23 | | | | | | | | | | | | 2 | 3 | 7 | 7 | 0 |
| 24 | | | | | | | | | | | | | 0 | 0 | 1 | 3 |
| 25 | | | | | | | | | | | | | | 0 | 0 | 0 |
| 26 | | | | | | | | | | | | | | | 1 | 1 |
| 27 | | | | | | | | | | | | | | | | 0 |

**Average Percent Change in SW Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 4.16% | 2.43% | 7.17% | 7.10% | 10.39% | 7.42% | 18.43% | 18.37% | 3.59% | 8.12% | | | | 17.78% | | |
| 13 | | 2.84% | 2.98% | 7.69% | 8.90% | 9.03% | 12.72% | 5.43% | 9.13% | 0.00% | 3.70% | 17.02% | | | | |
| 14 | | | 2.28% | 2.22% | 3.98% | 6.16% | 5.71% | 11.31% | 10.76% | 15.88% | 11.84% | 10.29% | 8.79% | 1.79% | 1.81% | |
| 15 | | | | 1.58% | 3.93% | 5.21% | 4.84% | 8.58% | 8.18% | 9.65% | 9.67% | 7.89% | 5.11% | | 23.91% | |
| 16 | | | | | -0.76% | 5.38% | 3.47% | 5.69% | 3.41% | 13.07% | 6.59% | 11.66% | 7.46% | 0.98% | 1.71% | |
| 17 | | | | | | 2.64% | 2.14% | 4.83% | 6.86% | 4.55% | 8.25% | 6.03% | 9.58% | 5.97% | 12.20% | 3.07% |
| 18 | | | | | | | -5.09% | 6.24% | 3.04% | 6.95% | -0.15% | 5.53% | 8.23% | 10.09% | 3.00% | 1.46% |
| 19 | | | | | | | | 1.89% | 3.11% | 5.63% | 6.33% | 1.00% | 4.40% | 9.88% | 5.49% | |
| 20 | | | | | | | | | | 3.70% | 5.59% | 3.79% | 3.08% | | 2.15% | 0.00% |
| 21 | | | | | | | | | | | 2.08% | 6.57% | 1.37% | 4.67% | 0.95% | |
| 22 | | | | | | | | | | | | 7.01% | 7.68% | 6.48% | 9.62% | |
| 23 | | | | | | | | | | | | 0.69% | 9.44% | 1.44% | 5.54% | |
| 24 | | | | | | | | | | | | | | | 10.84% | 5.01% |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 0.67% | -1.72% |
| 27 | | | | | | | | | | | | | | | | |

**Average Change in SW Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 2.11 | 1.00 | 3.48 | 3.34 | 5.20 | 3.72 | 8.56 | 9.00 | 1.83 | 4.36 | | | | 8.00 | | |
| 13 | | 1.50 | 1.38 | 3.38 | 4.18 | 4.53 | 6.08 | 2.67 | 4.50 | 0.00 | 2.00 | 8.00 | | | | |
| 14 | | | 1.27 | 1.12 | 2.01 | 2.95 | 2.88 | 5.74 | 5.33 | 7.44 | 5.56 | 5.11 | 4.14 | 1.00 | 1.01 | |
| 15 | | | | 0.76 | 1.96 | 2.66 | 2.39 | 4.09 | 4.03 | 4.47 | 4.60 | 3.85 | 2.11 | | 11.00 | |
| 16 | | | | | -0.50 | 2.39 | 1.74 | 2.66 | 1.63 | 6.20 | 3.09 | 5.58 | 3.45 | 0.50 | -0.11 | |
| 17 | | | | | | 1.33 | 1.09 | 2.21 | 3.24 | 1.93 | 3.76 | 2.73 | 4.63 | 2.56 | 5.53 | 1.50 |
| 18 | | | | | | | -2.67 | 3.11 | 1.53 | 3.17 | -0.17 | 2.75 | 4.01 | 5.02 | 1.56 | 0.67 |
| 19 | | | | | | | | 1.00 | 1.50 | 2.89 | 3.01 | 0.42 | 1.96 | 4.91 | 2.65 | |
| 20 | | | | | | | | | | 2.00 | 2.93 | 1.88 | 1.47 | | 0.96 | 0.00 |
| 21 | | | | | | | | | | | 1.00 | 3.40 | 0.64 | 2.50 | 0.58 | |
| 22 | | | | | | | | | | | | 3.40 | 3.34 | 3.17 | 5.00 | |
| 23 | | | | | | | | | | | | 0.27 | 4.89 | 0.57 | 2.67 | |
| 24 | | | | | | | | | | | | | | | 5.67 | 2.45 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 0.35 | -1.00 |
| 27 | | | | | | | | | | | | | | | | |

**Median Change in SW Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 2.25 | 0.50 | 3.00 | 3.50 | 4.66 | 4.33 | 7.50 | 9.00 | 1.83 | 5.00 | | | | 8.00 | | |
| 13 | | 1.50 | 2.91 | 2.00 | 4.00 | 6.00 | 6.17 | 2.50 | 4.50 | 0.00 | 2.00 | 8.00 | | | | |
| 14 | | | 0.00 | 0.33 | 2.33 | 3.00 | 2.50 | 7.50 | 6.00 | 6.83 | 6.00 | 5.17 | 3.67 | 1.00 | 1.01 | |
| 15 | | | | 0.00 | 2.00 | 3.00 | 1.50 | 4.00 | 4.17 | 4.00 | 4.00 | 3.50 | 3.50 | | 11.00 | |
| 16 | | | | | 0.00 | 1.67 | 1.66 | 2.83 | 2.00 | 5.50 | 3.50 | 5.00 | 4.00 | 0.50 | -3.00 | |
| 17 | | | | | | 1.00 | 1.00 | 2.67 | 4.00 | 2.00 | 4.00 | 2.84 | 4.17 | 4.50 | 3.67 | 1.50 |
| 18 | | | | | | | -2.67 | 5.00 | 1.00 | 2.50 | 0.17 | 2.33 | 3.00 | 4.50 | 1.84 | -0.33 |
| 19 | | | | | | | | 1.00 | 1.50 | 3.00 | 3.00 | 0.50 | 3.00 | 5.34 | 5.00 | |
| 20 | | | | | | | | | | 2.00 | 1.00 | 2.00 | 2.00 | | 0.96 | 0.00 |
| 21 | | | | | | | | | | | 0.00 | 2.50 | 0.00 | 2.50 | 0.58 | |
| 22 | | | | | | | | | | | | 4.00 | 8.67 | 2.00 | 5.00 | |
| 23 | | | | | | | | | | | | 0.27 | 5.67 | -0.34 | 1.00 | |
| 24 | | | | | | | | | | | | | | | 5.67 | 2.67 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 0.35 | -1.00 |
| 27 | | | | | | | | | | | | | | | | |

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## Horses Measured Multiple Times on Different Dates
## Variable: SW
## Colts

**Average Months of Age Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.43 | 1.41 | 1.69 | 2.86 | 3.87 | 4.63 | 6.03 | | 7.66 | 8.84 | | | | 12.99 | | |
| 13 | | 0.23 | 1.51 | 1.99 | 3.18 | 3.92 | 4.82 | 6.03 | 6.90 | 7.50 | | 9.40 | | | | |
| 14 | | | 0.18 | 1.48 | 1.82 | 3.04 | 3.77 | 4.71 | 6.12 | 6.87 | 7.80 | 9.17 | 9.30 | 10.45 | 11.51 | |
| 15 | | | | 0.09 | 0.75 | 2.08 | 3.08 | 3.88 | 4.99 | 6.01 | 6.90 | 7.75 | 9.10 | | | |
| 16 | | | | | 0.18 | 1.14 | 2.04 | 3.02 | 4.03 | 5.12 | 5.90 | 6.97 | 7.83 | 9.21 | 9.81 | |
| 17 | | | | | | 0.18 | 0.99 | 2.01 | 2.75 | 4.01 | 4.93 | 5.85 | 6.90 | 7.47 | 8.93 | |
| 18 | | | | | | | | 0.70 | 2.18 | 3.02 | 4.14 | 4.92 | 6.09 | 7.05 | 7.96 | 9.14 |
| 19 | | | | | | | | 0.36 | 0.85 | 2.48 | 3.23 | 4.27 | 5.41 | 5.96 | 7.27 | |
| 20 | | | | | | | | | | 1.71 | 2.22 | 2.82 | 3.90 | | | |
| 21 | | | | | | | | | | | 0.78 | 2.21 | 2.95 | 3.48 | 4.34 | |
| 22 | | | | | | | | | | | | 1.12 | | | 3.35 | |
| 23 | | | | | | | | | | | | | 1.12 | 2.37 | 3.40 | |
| 24 | | | | | | | | | | | | | | | 2.20 | 3.11 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | 0.76 |
| 27 | | | | | | | | | | | | | | | | |

**Number of Comparisons Made Between Each Age**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 1 | 3 | 5 | 13 | 8 | 4 | 2 | 0 | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 13 | | 2 | 4 | 14 | 17 | 6 | 12 | 3 | 1 | 1 | 0 | 2 | 0 | 0 | 0 | 0 |
| 14 | | | 3 | 7 | 13 | 17 | 6 | 11 | 10 | 9 | 6 | 4 | 2 | 1 | 1 | 0 |
| 15 | | | | 6 | 3 | 10 | 15 | 10 | 8 | 14 | 15 | 12 | 3 | 0 | 0 | 0 |
| 16 | | | | | 5 | 11 | 15 | 13 | 17 | 9 | 34 | 24 | 7 | 1 | 2 | 0 |
| 17 | | | | | | 3 | 6 | 13 | 4 | 18 | 10 | 28 | 21 | 4 | 2 | 0 |
| 18 | | | | | | | 0 | 4 | 6 | 8 | 14 | 10 | 15 | 11 | 6 | 2 |
| 19 | | | | | | | | 1 | 3 | 5 | 4 | 12 | 5 | 5 | 2 | 0 |
| 20 | | | | | | | | | 0 | 1 | 6 | 12 | 4 | 0 | 0 | 0 |
| 21 | | | | | | | | | | 0 | 3 | 6 | 5 | 2 | 1 | 0 |
| 22 | | | | | | | | | | | 0 | 4 | 0 | 0 | 1 | 0 |
| 23 | | | | | | | | | | | | 0 | 3 | 4 | 4 | 0 |
| 24 | | | | | | | | | | | | | 0 | 0 | 1 | 2 |
| 25 | | | | | | | | | | | | | | 0 | 0 | 0 |
| 26 | | | | | | | | | | | | | | | 0 | 1 |
| 27 | | | | | | | | | | | | | | | | 0 |

**Average Percent Change in SW Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 4.41% | 2.58% | 4.03% | 8.06% | 11.57% | 4.53% | 15.00% | | 3.59% | 10.45% | | | | 17.78% | | |
| 13 | | 2.84% | 1.46% | 7.87% | 8.56% | 8.42% | 13.64% | 5.96% | 5.77% | 0.00% | | 17.02% | | | | |
| 14 | | | 4.20% | 2.24% | 4.86% | 6.45% | 6.71% | 12.28% | 10.17% | 17.99% | 17.84% | 9.34% | 9.44% | 1.79% | -4.78% | |
| 15 | | | | 1.85% | 5.49% | 5.70% | 5.51% | 9.30% | 8.65% | 6.94% | 9.30% | 9.05% | 6.06% | | | |
| 16 | | | | | -2.65% | 6.84% | 2.74% | 4.61% | 1.94% | 14.29% | 7.35% | 10.71% | 6.57% | -5.45% | 5.11% | |
| 17 | | | | | | 2.40% | 3.40% | 4.84% | 5.21% | 4.01% | 6.82% | 5.09% | 9.31% | 2.25% | 17.90% | |
| 18 | | | | | | | | 3.09% | 2.04% | 4.60% | 0.69% | 3.22% | 7.30% | 11.59% | 3.00% | -2.45% |
| 19 | | | | | | | | 1.89% | 2.01% | 5.22% | 5.28% | 1.93% | 7.98% | 9.06% | 11.85% | |
| 20 | | | | | | | | | | 3.70% | 7.48% | 4.49% | 1.62% | | | |
| 21 | | | | | | | | | | | 2.08% | 7.11% | 1.47% | 4.67% | 0.95% | |
| 22 | | | | | | | | | | | | 8.77% | | | 9.62% | |
| 23 | | | | | | | | | | | | | 9.44% | -2.90% | 9.44% | |
| 24 | | | | | | | | | | | | | | | 10.84% | 6.81% |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | -1.72% |
| 27 | | | | | | | | | | | | | | | | |

**Average Change in SW Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 2.25 | 1.00 | 2.13 | 3.83 | 5.91 | 2.33 | 7.50 | | 1.83 | 5.75 | | | | 8.00 | | |
| 13 | | 1.50 | 0.73 | 3.47 | 4.04 | 4.39 | 6.42 | 2.89 | 3.00 | 0.00 | | 8.00 | | | | |
| 14 | | | 2.30 | 1.12 | 2.52 | 3.00 | 3.29 | 6.23 | 4.90 | 8.41 | 8.67 | 4.92 | 4.71 | 1.00 | -2.66 | |
| 15 | | | | 0.89 | 2.89 | 3.07 | 2.72 | 4.47 | 4.13 | 3.39 | 4.50 | 4.36 | 2.55 | | | |
| 16 | | | | | -1.50 | 3.06 | 1.38 | 2.17 | 0.88 | 6.82 | 3.40 | 5.21 | 3.04 | -3.00 | 1.33 | |
| 17 | | | | | | 1.33 | 1.78 | 2.28 | 2.50 | 1.66 | 3.28 | 2.36 | 4.64 | 0.58 | 7.67 | |
| 18 | | | | | | | | 1.67 | 1.00 | 2.17 | 0.29 | 1.67 | 3.75 | 5.76 | 1.56 | -1.50 |
| 19 | | | | | | | | 1.00 | 1.00 | 2.80 | 2.44 | 1.00 | 4.00 | 4.40 | 6.00 | |
| 20 | | | | | | | | | | 2.00 | 3.89 | 2.28 | 0.83 | | | |
| 21 | | | | | | | | | | | 1.00 | 3.70 | 0.87 | 2.50 | 0.58 | |
| 22 | | | | | | | | | | | | 4.25 | | | 5.00 | |
| 23 | | | | | | | | | | | | | 4.89 | -1.67 | 4.50 | |
| 24 | | | | | | | | | | | | | | | 5.67 | 3.34 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | -1.00 |
| 27 | | | | | | | | | | | | | | | | |

**Median Change in SW Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 2.25 | 0.00 | 2.00 | 4.00 | 7.00 | 2.50 | 7.50 | | 1.83 | 5.75 | | | | 8.00 | | |
| 13 | | 1.50 | 1.46 | 2.50 | 4.00 | 5.67 | 6.33 | 3.00 | 3.00 | 0.00 | | 8.00 | | | | |
| 14 | | | 0.00 | 0.34 | 2.00 | 3.00 | 1.50 | 9.00 | 4.50 | 7.00 | 8.50 | 5.17 | 4.71 | 1.00 | -2.66 | |
| 15 | | | | 0.00 | 3.00 | 3.00 | 2.00 | 4.00 | 4.00 | 3.00 | 4.00 | 4.50 | 5.00 | | | |
| 16 | | | | | -2.00 | 3.00 | 0.00 | 2.66 | 1.33 | 6.00 | 4.50 | 5.00 | 4.00 | -3.00 | 1.33 | |
| 17 | | | | | | 0.00 | 1.50 | 2.34 | 2.50 | 2.00 | 3.50 | 2.83 | 4.00 | 3.50 | 7.67 | |
| 18 | | | | | | | | 2.50 | 0.50 | 2.50 | 0.67 | 1.17 | 3.00 | 5.00 | 1.84 | -1.50 |
| 19 | | | | | | | | 1.00 | 0.00 | 3.00 | 2.00 | 0.50 | 3.00 | 3.00 | 6.00 | |
| 20 | | | | | | | | | | 2.00 | 3.84 | 2.00 | 0.67 | | | |
| 21 | | | | | | | | | | | 0.00 | 3.00 | 0.00 | 2.50 | 0.58 | |
| 22 | | | | | | | | | | | | 5.17 | | | 5.00 | |
| 23 | | | | | | | | | | | | | 5.67 | -0.67 | 1.67 | |
| 24 | | | | | | | | | | | | | | | 5.67 | 3.34 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | -1.00 |
| 27 | | | | | | | | | | | | | | | | |

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## Horses Measured Multiple Times on Different Dates
## Variable: SW
## Fillies

**Average Months of Age Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.23 | 1.41 | 2.15 | 3.31 | 4.22 | 4.81 | 6.07 | 7.04 | | 9.29 | | | | | | |
| 13 | | | 1.18 | 2.06 | 3.00 | 4.34 | 4.82 | 5.82 | 6.08 | | 8.84 | | | | | |
| 14 | | | 0.22 | 1.06 | 1.81 | 2.72 | 3.89 | 4.83 | 5.81 | 7.17 | 7.65 | 8.89 | 9.47 | | 12.59 | |
| 15 | | | | 0.59 | 1.14 | 2.10 | 2.97 | 3.99 | 4.47 | 5.91 | 7.01 | 7.77 | 8.90 | | 11.28 | |
| 16 | | | | | 0.29 | 1.84 | 1.97 | 2.96 | 4.26 | 5.29 | 5.92 | 7.11 | 7.41 | 9.07 | 9.34 | |
| 17 | | | | | | 0.16 | 1.20 | 1.93 | 3.10 | 3.84 | 5.00 | 6.01 | 6.94 | 7.94 | 8.67 | 9.72 |
| 18 | | | | | | | 0.28 | 1.33 | 1.83 | 2.88 | 4.12 | 5.16 | 6.12 | 7.27 | | 8.91 |
| 19 | | | | | | | | | 1.61 | 2.23 | 2.75 | 4.56 | 4.91 | 6.51 | 6.92 | |
| 20 | | | | | | | | | | | 2.68 | 3.07 | 4.11 | | 6.35 | 6.84 |
| 21 | | | | | | | | | | | | 2.65 | 2.93 | | | |
| 22 | | | | | | | | | | | | 0.89 | 2.14 | 3.11 | 3.98 | |
| 23 | | | | | | | | | | | | 0.39 | | 2.28 | 3.12 | |
| 24 | | | | | | | | | | | | | | | | 2.76 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 0.07 | |
| 27 | | | | | | | | | | | | | | | | |

**Number of Comparisons Made Between Each Age**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 2 | 1 | 4 | 7 | 3 | 6 | 2 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13 | | 0 | 1 | 3 | 8 | 6 | 4 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 14 | | | 4 | 6 | 8 | 8 | 4 | 1 | 5 | 3 | 7 | 2 | 1 | 0 | 1 | 0 |
| 15 | | | | 1 | 12 | 11 | 5 | 6 | 4 | 13 | 10 | 8 | 3 | 0 | 1 | 0 |
| 16 | | | | | 4 | 2 | 8 | 11 | 6 | 3 | 20 | 15 | 4 | 1 | 1 | 0 |
| 17 | | | | | | 3 | 5 | 3 | 5 | 3 | 10 | 16 | 5 | 2 | 3 | 2 |
| 18 | | | | | | | 2 | 2 | 5 | 6 | 4 | 7 | 9 | 5 | 0 | 1 |
| 19 | | | | | | | | 0 | 1 | 4 | 5 | 4 | 3 | 2 | 4 | 0 |
| 20 | | | | | | | | | 0 | 0 | 3 | 11 | 1 | 0 | 2 | 1 |
| 21 | | | | | | | | | | 0 | 0 | 2 | 6 | 0 | 0 | 0 |
| 22 | | | | | | | | | | | 0 | 1 | 3 | 6 | 1 | 0 |
| 23 | | | | | | | | | | | | 2 | 0 | 3 | 3 | 0 |
| 24 | | | | | | | | | | | | | 0 | 0 | 0 | 1 |
| 25 | | | | | | | | | | | | | | 0 | 0 | 0 |
| 26 | | | | | | | | | | | | | | | 1 | 0 |
| 27 | | | | | | | | | | | | | | | | 0 |

**Average Percent Change in SW Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 4.04% | 2.00% | 11.10% | 5.32% | 7.24% | 9.35% | 21.85% | 18.37% | | 6.95% | | | | | | |
| 13 | | | 9.09% | 6.88% | 9.62% | 9.64% | 9.95% | 3.85% | 12.50% | | 3.70% | | | | | |
| 14 | | | 0.84% | 2.19% | 2.55% | 5.56% | 4.20% | 0.69% | 11.93% | 9.56% | 6.69% | 12.17% | 7.50% | | 8.39% | |
| 15 | | | | 0.00% | 3.53% | 4.76% | 2.84% | 7.38% | 7.25% | 12.57% | 10.23% | 6.14% | 4.15% | | 23.91% | |
| 16 | | | | | 1.59% | -2.69% | 4.82% | 6.97% | 7.55% | 9.40% | 5.29% | 13.18% | 9.00% | 7.41% | -5.08% | |
| 17 | | | | | | 2.88% | 0.63% | 4.79% | 8.18% | 7.78% | 9.67% | 7.66% | 10.73% | 13.40% | 8.40% | 3.07% |
| 18 | | | | | | | -5.09% | 12.55% | 4.24% | 10.08% | -3.09% | 8.83% | 9.78% | 6.78% | | 9.26% |
| 19 | | | | | | | | | 6.38% | 6.14% | 7.16% | -1.77% | -1.58% | 11.94% | 2.31% | |
| 20 | | | | | | | | | | | 1.82% | 3.03% | 8.89% | | 2.15% | 0.00% |
| 21 | | | | | | | | | | | | 4.96% | 1.29% | | | |
| 22 | | | | | | | | | | | | 0.00% | 7.68% | 6.48% | 9.62% | |
| 23 | | | | | | | | | | | | 0.69% | | 7.21% | 0.33% | |
| 24 | | | | | | | | | | | | | | | | 1.42% |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 0.67% | |
| 27 | | | | | | | | | | | | | | | | |

**Average Change in SW Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 2.04 | 1.00 | 5.17 | 2.43 | 3.33 | 4.65 | 9.63 | 9.00 | | 3.67 | | | | | | |
| 13 | | | 4.00 | 3.00 | 4.46 | 4.68 | 5.06 | 2.00 | 6.00 | | 2.00 | | | | | |
| 14 | | | 0.50 | 1.11 | 1.19 | 2.83 | 2.25 | 0.33 | 6.20 | 4.56 | 2.90 | 5.50 | 3.00 | | 4.67 | |
| 15 | | | | 0.00 | 1.72 | 2.29 | 1.40 | 3.46 | 3.83 | 5.64 | 4.75 | 3.08 | 1.67 | | 11.00 | |
| 16 | | | | | 0.75 | -1.27 | 2.42 | 3.24 | 3.74 | 4.33 | 2.57 | 6.17 | 4.17 | 4.00 | -3.00 | |
| 17 | | | | | | 1.33 | 0.27 | 1.89 | 3.83 | 3.55 | 4.23 | 3.37 | 4.60 | 6.50 | 4.11 | 1.50 |
| 18 | | | | | | | -2.67 | 6.00 | 2.17 | 4.50 | -1.75 | 4.29 | 4.44 | 3.40 | | 5.00 |
| 19 | | | | | | | | | 3.00 | 3.00 | 3.47 | -1.33 | -1.44 | 6.17 | 0.98 | |
| 20 | | | | | | | | | | | 1.00 | 1.45 | 4.00 | | 0.96 | 0.00 |
| 21 | | | | | | | | | | | | 2.50 | 0.44 | | | |
| 22 | | | | | | | | | | | | 0.00 | 3.34 | 3.17 | 5.00 | |
| 23 | | | | | | | | | | | | 0.27 | | 3.56 | 0.22 | |
| 24 | | | | | | | | | | | | | | | | 0.67 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 0.35 | |
| 27 | | | | | | | | | | | | | | | | |

**Median Change in SW Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 2.04 | 1.00 | 5.00 | 2.66 | 3.00 | 5.00 | 9.63 | 9.00 | | 3.67 | | | | | | |
| 13 | | | 4.00 | 2.00 | 3.50 | 6.33 | 4.42 | 2.00 | 6.00 | | 2.00 | | | | | |
| 14 | | | 0.50 | 0.17 | 2.67 | 3.17 | 2.50 | 0.33 | 6.00 | 5.67 | 2.00 | 5.50 | 3.00 | | 4.67 | |
| 15 | | | | 0.00 | 1.84 | 3.00 | 1.00 | 4.20 | 4.67 | 5.00 | 4.50 | 2.50 | 2.00 | | 11.00 | |
| 16 | | | | | 0.50 | -1.27 | 3.50 | 3.00 | 4.50 | 5.00 | 2.17 | 5.00 | 4.00 | 4.00 | -3.00 | |
| 17 | | | | | | 2.00 | 1.00 | 3.00 | 4.00 | 3.66 | 5.17 | 2.84 | 5.00 | 6.50 | 3.67 | 1.50 |
| 18 | | | | | | | -2.67 | 6.00 | 2.17 | 4.00 | -1.83 | 3.67 | 3.00 | 3.00 | | 5.00 |
| 19 | | | | | | | | | 3.00 | 2.00 | 3.00 | 1.00 | -2.00 | 6.17 | 2.46 | |
| 20 | | | | | | | | | | | 0.00 | 1.00 | 4.00 | | 0.96 | 0.00 |
| 21 | | | | | | | | | | | | 2.50 | -0.17 | | | |
| 22 | | | | | | | | | | | | 0.00 | 8.67 | 2.00 | 5.00 | |
| 23 | | | | | | | | | | | | 0.27 | | -0.33 | -0.33 | |
| 24 | | | | | | | | | | | | | | | | 0.67 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 0.35 | |
| 27 | | | | | | | | | | | | | | | | |

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## Horses Measured Multiple Times on Different Dates
## Variable: PS
## Combined Sexes

**Average Months of Age Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.30 | 1.41 | 1.90 | 3.02 | 3.96 | 4.74 | 6.05 | 7.04 | 7.66 | 9.14 | | | | 12.99 | | |
| 13 | | 0.23 | 1.45 | 2.00 | 3.12 | 4.13 | 4.82 | 5.98 | 6.49 | 7.50 | 8.84 | 9.40 | | | | |
| 14 | | | 0.20 | 1.28 | 1.81 | 2.94 | 3.82 | 4.72 | 6.02 | 6.95 | 7.72 | 9.08 | 9.36 | 10.45 | 12.05 | |
| 15 | | | | 0.16 | 1.06 | 2.09 | 3.05 | 3.92 | 4.82 | 5.96 | 6.94 | 7.76 | 9.00 | | 11.28 | |
| 16 | | | | | 0.23 | 1.25 | 2.02 | 2.99 | 4.09 | 5.16 | 5.91 | 7.03 | 7.68 | 9.14 | 9.65 | |
| 17 | | | | | | 0.17 | 1.08 | 2.00 | 2.95 | 3.99 | 4.97 | 5.91 | 6.91 | 7.63 | 8.77 | 9.72 |
| 18 | | | | | | | 0.28 | 0.91 | 2.02 | 2.96 | 4.13 | 5.01 | 6.10 | 7.12 | 7.96 | 9.06 |
| 19 | | | | | | | | 0.36 | 1.04 | 2.37 | 2.96 | 4.35 | 5.22 | 6.12 | 7.04 | |
| 20 | | | | | | | | | | 1.71 | 2.37 | 2.94 | 3.95 | | 6.35 | 6.84 |
| 21 | | | | | | | | | | | 0.78 | 2.32 | 2.94 | 3.48 | 4.34 | |
| 22 | | | | | | | | | | | | 1.07 | 2.14 | 3.11 | 3.67 | |
| 23 | | | | | | | | | | | | 0.39 | 1.12 | 2.33 | 3.28 | |
| 24 | | | | | | | | | | | | | | | 2.20 | 2.99 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 0.07 | 0.76 |
| 27 | | | | | | | | | | | | | | | | |

**Number of Comparisons Made Between Each Age**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 3 | 4 | 9 | 20 | 11 | 10 | 4 | 1 | 2 | 3 | 0 | 0 | 0 | 1 | 0 | 0 |
| 13 | | 2 | 5 | 17 | 25 | 12 | 16 | 4 | 2 | 1 | 1 | 2 | 0 | 0 | 0 | 0 |
| 14 | | | 7 | 13 | 21 | 25 | 10 | 12 | 15 | 12 | 13 | 6 | 3 | 1 | 2 | 0 |
| 15 | | | | 7 | 15 | 21 | 20 | 16 | 12 | 27 | 25 | 20 | 6 | 0 | 1 | 0 |
| 16 | | | | | 9 | 13 | 23 | 24 | 23 | 12 | 54 | 39 | 11 | 2 | 3 | 0 |
| 17 | | | | | | 6 | 11 | 16 | 9 | 21 | 20 | 44 | 26 | 6 | 5 | 2 |
| 18 | | | | | | | 2 | 6 | 11 | 14 | 18 | 17 | 24 | 16 | 6 | 3 |
| 19 | | | | | | | | 1 | 4 | 9 | 9 | 16 | 8 | 7 | 6 | 0 |
| 20 | | | | | | | | | 0 | 1 | 9 | 23 | 5 | 0 | 2 | 1 |
| 21 | | | | | | | | | | 0 | 3 | 8 | 11 | 2 | 1 | 0 |
| 22 | | | | | | | | | | | 0 | 5 | 3 | 6 | 2 | 0 |
| 23 | | | | | | | | | | | | 2 | 3 | 7 | 7 | 0 |
| 24 | | | | | | | | | | | | | 0 | 0 | 1 | 3 |
| 25 | | | | | | | | | | | | | | 0 | 0 | 0 |
| 26 | | | | | | | | | | | | | | | 1 | 1 |
| 27 | | | | | | | | | | | | | | | | 0 |

**Average Percent Change in PS Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 2.85% | 0.68% | 2.70% | -0.51% | -0.01% | 1.25% | -0.81% | -0.23% | -0.81% | 2.41% | | | | -0.75% | | |
| 13 | | 1.25% | 2.15% | 0.65% | 0.53% | 2.63% | 0.77% | -0.35% | -11.10% | -2.90% | 2.42% | -4.84% | | | | |
| 14 | | | -2.34% | 1.43% | 1.92% | 0.34% | -0.27% | 2.92% | 0.91% | 1.99% | -0.90% | -0.77% | -0.46% | 3.86% | -2.16% | |
| 15 | | | | -2.39% | 0.73% | 0.31% | 0.37% | 1.39% | 0.23% | 0.62% | 1.11% | 0.12% | 2.45% | | 0.22% | |
| 16 | | | | | -1.50% | -0.03% | -1.08% | 0.95% | -0.23% | -1.41% | -0.10% | 0.43% | 0.30% | -0.11% | -1.51% | |
| 17 | | | | | | 1.35% | 1.92% | 0.55% | 0.92% | 0.89% | 2.40% | 0.02% | 1.04% | 1.86% | -0.67% | -0.79% |
| 18 | | | | | | | -1.03% | 1.61% | -0.17% | 0.77% | -0.13% | 0.98% | 1.66% | 1.31% | -0.04% | 3.62% |
| 19 | | | | | | | | 1.52% | 2.01% | 0.41% | 2.12% | 0.87% | 1.26% | 2.99% | 0.95% | |
| 20 | | | | | | | | | | -2.66% | 0.51% | 0.83% | 2.03% | | 1.64% | 1.22% |
| 21 | | | | | | | | | | | -1.71% | 0.76% | -0.19% | 3.13% | -0.92% | |
| 22 | | | | | | | | | | | | 2.96% | -2.21% | 1.39% | -2.88% | |
| 23 | | | | | | | | | | | | 3.01% | -0.88% | -0.17% | -0.87% | |
| 24 | | | | | | | | | | | | | | | -1.19% | 0.60% |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | -4.34% | -0.19% |
| 27 | | | | | | | | | | | | | | | | |

**Average Change in PS Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 1.92 | 0.46 | 1.65 | -0.43 | -0.04 | 0.80 | -0.58 | -0.16 | -0.54 | 1.57 | | | | -0.51 | | |
| 13 | | 0.85 | 1.43 | 0.35 | 0.28 | 1.65 | 0.45 | -0.24 | -7.85 | -2.03 | 1.62 | -3.26 | | | | |
| 14 | | | -1.61 | 0.90 | 1.17 | 0.16 | -0.22 | 1.87 | 0.54 | 1.15 | -0.76 | -0.53 | -0.28 | 2.59 | -1.46 | |
| 15 | | | | -1.79 | 0.48 | 0.14 | 0.23 | 0.92 | 0.12 | 0.33 | 0.66 | 0.04 | 1.50 | | 0.16 | |
| 16 | | | | | -1.08 | -0.13 | -0.80 | 0.52 | -0.22 | -1.00 | -0.12 | 0.22 | 0.17 | -0.08 | -1.07 | |
| 17 | | | | | | 0.88 | 1.19 | 0.27 | 0.51 | 0.56 | 1.56 | -0.02 | 0.64 | 1.16 | -0.48 | -0.52 |
| 18 | | | | | | | -0.71 | 0.99 | -0.18 | 0.44 | -0.12 | 0.62 | 1.07 | 0.77 | -0.03 | 2.25 |
| 19 | | | | | | | | 1.01 | 1.35 | 0.26 | 1.30 | 0.58 | 0.77 | 1.94 | 0.59 | |
| 20 | | | | | | | | | | -1.78 | 0.26 | 0.51 | 1.37 | | 1.09 | 0.85 |
| 21 | | | | | | | | | | | -1.24 | 0.46 | -0.15 | 2.08 | -0.62 | |
| 22 | | | | | | | | | | | | 1.87 | -1.54 | 0.84 | -2.13 | |
| 23 | | | | | | | | | | | | 2.05 | -0.61 | -0.14 | -0.62 | |
| 24 | | | | | | | | | | | | | | | -0.82 | 0.40 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | -2.95 | -0.13 |
| 27 | | | | | | | | | | | | | | | | |

**Median Change in PS Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 2.96 | 0.47 | 0.57 | -0.04 | -0.11 | 0.58 | -0.25 | -0.16 | -0.54 | 0.45 | | | | -0.51 | | |
| 13 | | 0.85 | 1.35 | 0.92 | 0.31 | 1.39 | 1.12 | -0.09 | -7.85 | -2.03 | 1.62 | -3.26 | | | | |
| 14 | | | -0.81 | 0.61 | 1.59 | 0.09 | -0.25 | 1.51 | 0.97 | 0.99 | -1.05 | -0.76 | 0.27 | 2.59 | -1.46 | |
| 15 | | | | -0.71 | 0.14 | 0.36 | -0.24 | 1.07 | 0.10 | 0.27 | 0.06 | -0.27 | 0.73 | | 0.16 | |
| 16 | | | | | -0.69 | 0.05 | -0.95 | 0.12 | -0.32 | -1.58 | -0.23 | 0.21 | 0.13 | -0.08 | -0.67 | |
| 17 | | | | | | 0.40 | 1.40 | 0.13 | 0.44 | 0.58 | 1.85 | 0.06 | 0.16 | 1.28 | -0.33 | -0.52 |
| 18 | | | | | | | -0.71 | -0.37 | -0.05 | 0.19 | 0.33 | 0.01 | 1.19 | 0.14 | -0.25 | 0.36 |
| 19 | | | | | | | | 1.01 | 1.50 | -0.56 | 1.21 | 0.57 | 0.53 | 1.75 | 0.97 | |
| 20 | | | | | | | | | | -1.78 | 1.21 | -0.09 | 1.54 | | 1.09 | 0.85 |
| 21 | | | | | | | | | | | -0.97 | 0.69 | -0.64 | 2.08 | -0.62 | |
| 22 | | | | | | | | | | | | 1.87 | -1.50 | 0.31 | -2.13 | |
| 23 | | | | | | | | | | | | 2.05 | -0.50 | 0.22 | -0.37 | |
| 24 | | | | | | | | | | | | | | | -0.82 | -0.14 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | -2.95 | -0.13 |
| 27 | | | | | | | | | | | | | | | | |

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**Horses Measured Multiple Times on Different Dates**
**Variable: PS**
**Colts**

Average Months of Age Between Measurements

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.43 | 1.41 | 1.69 | 2.86 | 3.87 | 4.63 | 6.03 | | 7.66 | 8.84 | | | | 12.99 | | |
| 13 | | 0.23 | 1.51 | 1.99 | 3.18 | 3.92 | 4.82 | 6.03 | 6.90 | 7.50 | | 9.40 | | | | |
| 14 | | | 0.18 | 1.48 | 1.82 | 3.04 | 3.77 | 4.71 | 6.12 | 6.87 | 7.80 | 9.17 | 9.30 | 10.45 | 11.51 | |
| 15 | | | | 0.09 | 0.75 | 2.08 | 3.08 | 3.88 | 4.99 | 6.01 | 6.90 | 7.75 | 9.10 | | | |
| 16 | | | | | 0.18 | 1.14 | 2.04 | 3.02 | 4.03 | 5.12 | 5.90 | 6.97 | 7.83 | 9.21 | 9.81 | |
| 17 | | | | | | 0.18 | 0.99 | 2.01 | 2.75 | 4.01 | 4.93 | 5.85 | 6.90 | 7.47 | 8.93 | |
| 18 | | | | | | | | 0.70 | 2.18 | 3.02 | 4.14 | 4.92 | 6.09 | 7.05 | 7.96 | 9.14 |
| 19 | | | | | | | | 0.36 | 0.85 | 2.48 | 3.23 | 4.27 | 5.41 | 5.96 | 7.27 | |
| 20 | | | | | | | | | | 1.71 | 2.22 | 2.82 | 3.90 | | | |
| 21 | | | | | | | | | | | 0.78 | 2.21 | 2.95 | 3.48 | 4.34 | |
| 22 | | | | | | | | | | | | 1.12 | | | 3.35 | |
| 23 | | | | | | | | | | | | | 1.12 | 2.37 | 3.40 | |
| 24 | | | | | | | | | | | | | | | 2.20 | 3.11 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | 0.76 |
| 27 | | | | | | | | | | | | | | | | |

Number of Comparisons Made Between Each Age

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 1 | 3 | 5 | 13 | 8 | 4 | 2 | 0 | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 13 | | 2 | 4 | 14 | 17 | 6 | 12 | 3 | 1 | 1 | 0 | 2 | 0 | 0 | 0 | 0 |
| 14 | | | 3 | 7 | 13 | 17 | 6 | 11 | 10 | 9 | 6 | 4 | 2 | 1 | 1 | 0 |
| 15 | | | | 6 | 3 | 10 | 15 | 10 | 8 | 14 | 15 | 12 | 3 | 0 | 0 | 0 |
| 16 | | | | | 5 | 11 | 15 | 13 | 17 | 9 | 34 | 24 | 7 | 1 | 2 | 0 |
| 17 | | | | | | 3 | 6 | 13 | 4 | 18 | 10 | 28 | 21 | 4 | 2 | 0 |
| 18 | | | | | | | 0 | 4 | 6 | 8 | 14 | 10 | 15 | 11 | 6 | 2 |
| 19 | | | | | | | | 1 | 3 | 5 | 4 | 12 | 5 | 5 | 2 | 0 |
| 20 | | | | | | | | | 0 | 1 | 6 | 12 | 4 | 0 | 0 | 0 |
| 21 | | | | | | | | | | 0 | 3 | 6 | 5 | 2 | 1 | 0 |
| 22 | | | | | | | | | | | 0 | 4 | 0 | 0 | 1 | 0 |
| 23 | | | | | | | | | | | | 0 | 3 | 4 | 4 | 0 |
| 24 | | | | | | | | | | | | | 0 | 0 | 1 | 2 |
| 25 | | | | | | | | | | | | | | 0 | 0 | 0 |
| 26 | | | | | | | | | | | | | | | 0 | 1 |
| 27 | | | | | | | | | | | | | | | | 0 |

**Average Percent Change in PS Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 5.00% | 0.74% | 0.08% | -1.68% | 0.09% | 2.93% | -0.38% | | -0.81% | 0.67% | | | | -0.75% | | |
| 13 | | 1.25% | 3.62% | 0.72% | 0.53% | 1.85% | 1.21% | -0.47% | -11.61% | -2.90% | | -4.84% | | | | |
| 14 | | | -2.59% | 0.47% | 3.35% | 0.85% | -0.13% | 3.24% | -0.22% | 1.01% | -1.23% | -1.87% | 2.16% | 3.86% | -2.05% | |
| 15 | | | | -3.33% | 1.49% | -0.20% | 0.04% | 2.44% | -0.02% | 0.02% | 2.01% | 0.09% | 3.18% | | | |
| 16 | | | | | -0.64% | -0.07% | -1.74% | 0.23% | 0.67% | -1.24% | 0.59% | -0.50% | 1.11% | 0.48% | -2.09% | |
| 17 | | | | | | 0.77% | 1.79% | -0.01% | 2.88% | 1.10% | 1.56% | 0.38% | 1.50% | 2.13% | -1.28% | |
| 18 | | | | | | | | 0.33% | 0.25% | 0.09% | 0.31% | 0.23% | 1.24% | 1.71% | -0.04% | 0.49% |
| 19 | | | | | | | | 1.52% | 1.83% | -1.06% | 3.05% | 1.74% | -0.07% | 3.22% | 3.52% | |
| 20 | | | | | | | | | | -2.66% | 2.01% | 0.78% | 1.96% | | | |
| 21 | | | | | | | | | | | -1.71% | 0.80% | 0.54% | 3.13% | -0.92% | |
| 22 | | | | | | | | | | | | 2.98% | | | 0.03% | |
| 23 | | | | | | | | | | | | | -0.88% | -1.23% | -0.43% | |
| 24 | | | | | | | | | | | | | | | -1.19% | 1.79% |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | -0.19% |
| 27 | | | | | | | | | | | | | | | | |

**Average Change in PS Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 3.39 | 0.50 | 0.03 | -1.23 | 0.01 | 1.88 | -0.25 | | -0.54 | 0.45 | | | | -0.51 | | |
| 13 | | 0.85 | 2.42 | 0.42 | 0.26 | 1.14 | 0.74 | -0.32 | -8.32 | -2.03 | | -3.26 | | | | |
| 14 | | | -1.79 | 0.31 | 2.08 | 0.52 | -0.13 | 2.07 | -0.20 | 0.63 | -0.98 | -1.28 | 1.45 | 2.59 | -1.38 | |
| 15 | | | | -2.46 | 0.99 | -0.19 | 0.00 | 1.63 | -0.06 | -0.01 | 1.27 | 0.00 | 1.86 | | | |
| 16 | | | | | -0.47 | -0.19 | -1.29 | 0.12 | 0.42 | -0.88 | 0.35 | -0.38 | 0.71 | 0.32 | -1.50 | |
| 17 | | | | | | 0.50 | 1.19 | -0.13 | 1.77 | 0.69 | 1.03 | 0.24 | 0.94 | 1.40 | -0.90 | |
| 18 | | | | | | | | 0.09 | 0.12 | -0.03 | 0.17 | 0.09 | 0.78 | 1.00 | -0.03 | 0.34 |
| 19 | | | | | | | | 1.01 | 1.20 | -0.73 | 1.82 | 1.16 | -0.07 | 2.10 | 2.34 | |
| 20 | | | | | | | | | | -1.78 | 1.28 | 0.48 | 1.33 | | | |
| 21 | | | | | | | | | | | -1.24 | 0.48 | 0.34 | 2.08 | -0.62 | |
| 22 | | | | | | | | | | | | 1.87 | | | 0.02 | |
| 23 | | | | | | | | | | | | | -0.61 | -0.85 | -0.32 | |
| 24 | | | | | | | | | | | | | | | -0.82 | 1.19 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | -0.13 |
| 27 | | | | | | | | | | | | | | | | |

**Median Change in PS Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 3.39 | 0.60 | 0.50 | -0.31 | 0.32 | 1.84 | -0.25 | | -0.54 | 0.45 | | | | -0.51 | | |
| 13 | | 0.85 | 2.91 | 1.01 | -0.20 | 0.90 | 1.23 | -0.19 | -8.32 | -2.03 | | -3.26 | | | | |
| 14 | | | -0.81 | 0.61 | 1.95 | 0.49 | -0.25 | 1.91 | 0.37 | 1.00 | -0.99 | -1.90 | 1.45 | 2.59 | -1.38 | |
| 15 | | | | -1.44 | 0.14 | 0.15 | -0.61 | 1.17 | -0.17 | 0.18 | 0.22 | -0.92 | 0.09 | | | |
| 16 | | | | | -0.69 | 0.05 | -1.57 | -0.14 | 0.14 | -1.57 | 0.49 | -0.30 | 0.13 | 0.32 | -1.50 | |
| 17 | | | | | | 0.18 | 1.30 | -0.22 | 1.02 | 0.94 | 1.02 | 0.15 | 1.02 | 1.28 | -0.90 | |
| 18 | | | | | | | | -0.37 | -0.03 | 0.19 | 0.45 | -0.52 | 1.13 | 0.24 | -0.25 | 0.34 |
| 19 | | | | | | | | 1.01 | 1.19 | -0.84 | 2.27 | 0.72 | -0.11 | 1.75 | 2.34 | |
| 20 | | | | | | | | | | -1.78 | 1.67 | -0.13 | 0.67 | | | |
| 21 | | | | | | | | | | | -0.97 | 0.80 | -0.41 | 2.08 | -0.62 | |
| 22 | | | | | | | | | | | | 1.82 | | | 0.02 | |
| 23 | | | | | | | | | | | | | -0.50 | -0.97 | -0.23 | |
| 24 | | | | | | | | | | | | | | | -0.82 | 1.19 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | -0.13 |
| 27 | | | | | | | | | | | | | | | | |

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## Horses Measured Multiple Times on Different Dates
## Variable: SW
## Fillies

**Average Months of Age Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.23 | 1.41 | 2.15 | 3.31 | 4.22 | 4.81 | 6.07 | 7.04 | | 9.29 | | | | | | |
| 13 | | | 1.18 | 2.06 | 3.00 | 4.34 | 4.82 | 5.82 | 6.08 | | 8.84 | | | | | |
| 14 | | | 0.22 | 1.06 | 1.81 | 2.72 | 3.89 | 4.83 | 5.81 | 7.17 | 7.65 | 8.89 | 9.47 | | 12.59 | |
| 15 | | | | 0.59 | 1.14 | 2.10 | 2.97 | 3.99 | 4.47 | 5.91 | 7.01 | 7.77 | 8.90 | | 11.28 | |
| 16 | | | | | 0.29 | 1.84 | 1.97 | 2.96 | 4.26 | 5.29 | 5.92 | 7.11 | 7.41 | 9.07 | 9.34 | |
| 17 | | | | | | 0.16 | 1.20 | 1.93 | 3.10 | 3.84 | 5.00 | 6.01 | 6.94 | 7.94 | 8.67 | 9.72 |
| 18 | | | | | | | 0.28 | 1.33 | 1.83 | 2.88 | 4.12 | 5.16 | 6.12 | 7.27 | | 8.91 |
| 19 | | | | | | | | | 1.61 | 2.23 | 2.75 | 4.56 | 4.91 | 6.51 | 6.92 | |
| 20 | | | | | | | | | | | 2.68 | 3.07 | 4.11 | | 6.35 | 6.84 |
| 21 | | | | | | | | | | | | 2.65 | 2.93 | | | |
| 22 | | | | | | | | | | | | 0.89 | 2.14 | 3.11 | 3.98 | |
| 23 | | | | | | | | | | | | 0.39 | | 2.28 | 3.12 | |
| 24 | | | | | | | | | | | | | | | | 2.76 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 0.07 | |
| 27 | | | | | | | | | | | | | | | | |

**Number of Comparisons Made Between Each Age**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 2 | 1 | 4 | 7 | 3 | 6 | 2 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13 | | 0 | 1 | 3 | 8 | 6 | 4 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 14 | | | 4 | 6 | 8 | 8 | 4 | 1 | 5 | 3 | 7 | 2 | 1 | 0 | 1 | 0 |
| 15 | | | | 1 | 12 | 11 | 5 | 6 | 4 | 13 | 10 | 8 | 3 | 0 | 1 | 0 |
| 16 | | | | | 4 | 2 | 8 | 11 | 6 | 3 | 20 | 15 | 4 | 1 | 1 | 0 |
| 17 | | | | | | 3 | 5 | 3 | 5 | 3 | 10 | 16 | 5 | 2 | 3 | 2 |
| 18 | | | | | | | 2 | 2 | 5 | 6 | 4 | 7 | 9 | 5 | 0 | 1 |
| 19 | | | | | | | | 0 | 1 | 4 | 5 | 4 | 3 | 2 | 4 | 0 |
| 20 | | | | | | | | | 0 | 0 | 3 | 11 | 1 | 0 | 2 | 1 |
| 21 | | | | | | | | | | 0 | 0 | 2 | 6 | 0 | 0 | 0 |
| 22 | | | | | | | | | | | 0 | 1 | 3 | 6 | 1 | 0 |
| 23 | | | | | | | | | | | | 2 | 0 | 3 | 3 | 0 |
| 24 | | | | | | | | | | | | | 0 | 0 | 0 | 1 |
| 25 | | | | | | | | | | | | | | 0 | 0 | 0 |
| 26 | | | | | | | | | | | | | | | 1 | 0 |
| 27 | | | | | | | | | | | | | | | | 0 |

**Average Percent Change in SW Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 4.04% | 2.00% | 11.10% | 5.32% | 7.24% | 9.35% | 21.85% | 18.37% | | 6.95% | | | | | | |
| 13 | | | 9.09% | 6.88% | 9.62% | 9.64% | 9.95% | 3.85% | 12.50% | | 3.70% | | | | | |
| 14 | | | 0.84% | 2.19% | 2.55% | 5.56% | 4.20% | 0.69% | 11.93% | 9.56% | 6.69% | 12.17% | 7.50% | | 8.39% | |
| 15 | | | | 0.00% | 3.53% | 4.76% | 2.84% | 7.38% | 7.25% | 12.57% | 10.23% | 6.14% | 4.15% | | 23.91% | |
| 16 | | | | | 1.59% | -2.69% | 4.82% | 6.97% | 7.55% | 9.40% | 5.29% | 13.18% | 9.00% | 7.41% | -5.08% | |
| 17 | | | | | | 2.88% | 0.63% | 4.79% | 8.18% | 7.78% | 9.67% | 7.66% | 10.73% | 13.40% | 8.40% | 3.07% |
| 18 | | | | | | | -5.09% | 12.55% | 4.24% | 10.08% | -3.09% | 8.83% | 9.78% | 6.78% | | 9.26% |
| 19 | | | | | | | | | 6.38% | 6.14% | 7.16% | -1.77% | -1.58% | 11.94% | 2.31% | |
| 20 | | | | | | | | | | | 1.82% | 3.03% | 8.89% | | 2.15% | 0.00% |
| 21 | | | | | | | | | | | | 4.96% | 1.29% | | | |
| 22 | | | | | | | | | | | | 0.00% | 7.68% | 6.48% | 9.62% | |
| 23 | | | | | | | | | | | | 0.69% | | 7.21% | 0.33% | |
| 24 | | | | | | | | | | | | | | | | 1.42% |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 0.67% | |
| 27 | | | | | | | | | | | | | | | | |

**Average Change in SW Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 2.04 | 1.00 | 5.17 | 2.43 | 3.33 | 4.65 | 9.63 | 9.00 | | 3.67 | | | | | | |
| 13 | | | 4.00 | 3.00 | 4.46 | 4.68 | 5.06 | 2.00 | 6.00 | | 2.00 | | | | | |
| 14 | | | 0.50 | 1.11 | 1.19 | 2.83 | 2.25 | 0.33 | 6.20 | 4.56 | 2.90 | 5.50 | 3.00 | | 4.67 | |
| 15 | | | | 0.00 | 1.72 | 2.29 | 1.40 | 3.46 | 3.83 | 5.64 | 4.75 | 3.08 | 1.67 | | 11.00 | |
| 16 | | | | | 0.75 | -1.27 | 2.42 | 3.24 | 3.74 | 4.33 | 2.57 | 6.17 | 4.17 | 4.00 | -3.00 | |
| 17 | | | | | | 1.33 | 0.27 | 1.89 | 3.83 | 3.55 | 4.23 | 3.37 | 4.60 | 6.50 | 4.11 | 1.50 |
| 18 | | | | | | | -2.67 | 6.00 | 2.17 | 4.50 | -1.75 | 4.29 | 4.44 | 3.40 | | 5.00 |
| 19 | | | | | | | | | 3.00 | 3.00 | 3.47 | -1.33 | -1.44 | 6.17 | 0.98 | |
| 20 | | | | | | | | | | | 1.00 | 1.45 | 4.00 | | 0.96 | 0.00 |
| 21 | | | | | | | | | | | | 2.50 | 0.44 | | | |
| 22 | | | | | | | | | | | | 0.00 | 3.34 | 3.17 | 5.00 | |
| 23 | | | | | | | | | | | | 0.27 | | 3.56 | 0.22 | |
| 24 | | | | | | | | | | | | | | | | 0.67 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 0.35 | |
| 27 | | | | | | | | | | | | | | | | |

**Median Change in SW Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 2.04 | 1.00 | 5.00 | 2.66 | 3.00 | 5.00 | 9.63 | 9.00 | | 3.67 | | | | | | |
| 13 | | | 4.00 | 2.00 | 3.50 | 6.33 | 4.42 | 2.00 | 6.00 | | 2.00 | | | | | |
| 14 | | | 0.50 | 0.17 | 2.67 | 3.17 | 2.50 | 0.33 | 6.00 | 5.67 | 2.00 | 5.50 | 3.00 | | 4.67 | |
| 15 | | | | 0.00 | 1.84 | 3.00 | 1.00 | 4.20 | 4.67 | 5.00 | 4.50 | 2.50 | 2.00 | | 11.00 | |
| 16 | | | | | 0.50 | -1.27 | 3.50 | 3.00 | 4.50 | 5.00 | 2.17 | 5.00 | 4.00 | 4.00 | -3.00 | |
| 17 | | | | | | 2.00 | 1.00 | 3.00 | 4.00 | 3.66 | 5.17 | 2.84 | 5.00 | 6.50 | 3.67 | 1.50 |
| 18 | | | | | | | -2.67 | 6.00 | 2.17 | 4.00 | -1.83 | 3.67 | 3.00 | 3.00 | | 5.00 |
| 19 | | | | | | | | | 3.00 | 2.00 | 3.00 | 1.00 | -2.00 | 6.17 | 2.46 | |
| 20 | | | | | | | | | | | 0.00 | 1.00 | 4.00 | | 0.96 | 0.00 |
| 21 | | | | | | | | | | | | 2.50 | -0.17 | | | |
| 22 | | | | | | | | | | | | 0.00 | 8.67 | 2.00 | 5.00 | |
| 23 | | | | | | | | | | | | 0.27 | | -0.33 | -0.33 | |
| 24 | | | | | | | | | | | | | | | | 0.67 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 0.35 | |
| 27 | | | | | | | | | | | | | | | | |

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**Horses Measured Multiple Times on Different Dates**
**Variable: Height**
**Combined Sexes**

**Average Months of Age Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.30 | 1.41 | 1.90 | 3.02 | 3.96 | 4.74 | 6.05 | 7.04 | 7.66 | 9.14 | | | | 12.99 | | |
| 13 | | 0.23 | 1.45 | 2.00 | 3.12 | 4.13 | 4.82 | 5.98 | 6.49 | 7.50 | 8.84 | 9.40 | | | | |
| 14 | | | 0.20 | 1.28 | 1.81 | 2.94 | 3.82 | 4.72 | 6.02 | 6.95 | 7.72 | 9.08 | 9.36 | 10.45 | 12.05 | |
| 15 | | | | 0.16 | 1.06 | 2.09 | 3.05 | 3.92 | 4.82 | 5.96 | 6.94 | 7.76 | 9.00 | | 11.28 | |
| 16 | | | | | 0.23 | 1.25 | 2.02 | 2.99 | 4.09 | 5.16 | 5.91 | 7.03 | 7.68 | 9.14 | 9.65 | |
| 17 | | | | | | 0.17 | 1.08 | 2.00 | 2.95 | 3.99 | 4.97 | 5.91 | 6.91 | 7.63 | 8.77 | 9.72 |
| 18 | | | | | | | 0.28 | 0.91 | 2.02 | 2.96 | 4.13 | 5.01 | 6.10 | 7.12 | 7.96 | 9.06 |
| 19 | | | | | | | | 0.36 | 1.04 | 2.37 | 2.96 | 4.35 | 5.22 | 6.12 | 7.04 | |
| 20 | | | | | | | | | | 1.71 | 2.37 | 2.94 | 3.95 | | 6.35 | 6.84 |
| 21 | | | | | | | | | | | 0.78 | 2.32 | 2.94 | 3.48 | 4.34 | |
| 22 | | | | | | | | | | | | 1.07 | 2.14 | 3.11 | 3.67 | |
| 23 | | | | | | | | | | | | 0.39 | 1.12 | 2.33 | 3.28 | |
| 24 | | | | | | | | | | | | | | | 2.20 | 2.99 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 0.07 | 0.76 |
| 27 | | | | | | | | | | | | | | | | |

**Number of Comparisons Made Between Each Age**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 3 | 4 | 9 | 20 | 11 | 10 | 4 | 1 | 2 | 3 | 0 | 0 | 0 | 1 | 0 | 0 |
| 13 | | 2 | 5 | 17 | 25 | 12 | 16 | 4 | 2 | 1 | 1 | 2 | 0 | 0 | 0 | 0 |
| 14 | | | 7 | 13 | 21 | 25 | 10 | 12 | 15 | 12 | 13 | 6 | 3 | 1 | 2 | 0 |
| 15 | | | | 7 | 15 | 21 | 20 | 16 | 12 | 27 | 25 | 20 | 6 | 0 | 1 | 0 |
| 16 | | | | | 9 | 13 | 23 | 24 | 23 | 12 | 54 | 39 | 11 | 2 | 3 | 0 |
| 17 | | | | | | 6 | 11 | 16 | 9 | 21 | 20 | 44 | 26 | 6 | 5 | 2 |
| 18 | | | | | | | 2 | 6 | 11 | 14 | 18 | 17 | 24 | 16 | 6 | 3 |
| 19 | | | | | | | | 1 | 4 | 9 | 9 | 16 | 8 | 7 | 6 | 0 |
| 20 | | | | | | | | | 0 | 1 | 9 | 23 | 5 | 0 | 2 | 1 |
| 21 | | | | | | | | | | 0 | 3 | 8 | 11 | 2 | 1 | 0 |
| 22 | | | | | | | | | | | 0 | 5 | 3 | 6 | 2 | 0 |
| 23 | | | | | | | | | | | | 2 | 3 | 7 | 7 | 0 |
| 24 | | | | | | | | | | | | | 0 | 0 | 1 | 3 |
| 25 | | | | | | | | | | | | | | 0 | 0 | 0 |
| 26 | | | | | | | | | | | | | | | 1 | 1 |
| 27 | | | | | | | | | | | | | | | | 0 |

**Average Percent Change in HEIGHT Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.12% | 0.17% | 2.81% | 6.09% | 4.17% | 5.64% | 8.55% | 14.29% | 6.97% | 5.15% | | | | 9.29% | | |
| 13 | | 2.95% | -0.16% | 2.51% | 5.20% | 3.96% | 4.31% | 1.08% | 5.96% | -0.33% | 7.86% | 4.16% | | | | |
| 14 | | | 0.76% | 0.60% | 1.15% | 3.77% | 3.26% | 4.59% | 3.24% | 3.26% | 4.52% | 1.93% | 6.84% | 5.26% | 3.98% | |
| 15 | | | | 0.09% | 0.74% | 1.42% | 2.79% | 1.14% | 1.81% | 1.72% | 2.19% | 3.60% | 1.65% | | 8.51% | |
| 16 | | | | | -0.52% | 0.22% | 0.69% | 1.52% | 1.30% | 2.85% | 1.60% | 1.78% | 1.36% | 0.99% | 2.63% | |
| 17 | | | | | | 0.00% | 0.47% | 0.52% | 1.10% | 0.62% | 0.27% | 0.98% | 1.12% | 3.08% | 2.84% | 1.33% |
| 18 | | | | | | | 2.80% | -0.29% | 1.36% | 1.43% | 2.20% | 0.77% | 2.51% | 1.19% | 4.16% | 1.06% |
| 19 | | | | | | | | 0.66% | 0.33% | 0.77% | 0.95% | 1.17% | 0.00% | 0.51% | 2.59% | |
| 20 | | | | | | | | | | 0.67% | -0.04% | 1.71% | -0.99% | | -0.40% | 0.66% |
| 21 | | | | | | | | | | | -1.49% | 0.90% | 1.20% | 2.29% | 0.00% | |
| 22 | | | | | | | | | | | | 1.09% | 1.80% | 1.35% | -2.50% | |
| 23 | | | | | | | | | | | | -0.33% | 0.50% | 2.34% | 0.72% | |
| 24 | | | | | | | | | | | | | | | 4.88% | -1.41% |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | -0.33% | -4.98% |
| 27 | | | | | | | | | | | | | | | | |

**Average Change in HEIGHT Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.02 | 0.03 | 0.39 | 0.84 | 0.58 | 0.80 | 1.20 | 1.90 | 1.03 | 0.73 | | | | 1.30 | | |
| 13 | | 0.43 | -0.03 | 0.35 | 0.73 | 0.57 | 0.61 | 0.16 | 0.90 | -0.05 | 1.10 | 0.60 | | | | |
| 14 | | | 0.11 | 0.09 | 0.16 | 0.53 | 0.48 | 0.66 | 0.48 | 0.48 | 0.65 | 0.29 | 0.93 | 0.80 | 0.58 | |
| 15 | | | | 0.01 | 0.11 | 0.21 | 0.39 | 0.17 | 0.27 | 0.25 | 0.33 | 0.53 | 0.24 | | 1.20 | |
| 16 | | | | | -0.08 | 0.03 | 0.10 | 0.22 | 0.19 | 0.43 | 0.24 | 0.27 | 0.20 | 0.15 | 0.40 | |
| 17 | | | | | | 0.00 | 0.06 | 0.08 | 0.17 | 0.09 | 0.03 | 0.15 | 0.17 | 0.47 | 0.42 | 0.20 |
| 18 | | | | | | | 0.43 | -0.05 | 0.20 | 0.22 | 0.34 | 0.11 | 0.37 | 0.18 | 0.63 | 0.16 |
| 19 | | | | | | | | 0.10 | 0.05 | 0.12 | 0.14 | 0.17 | 0.00 | 0.07 | 0.39 | |
| 20 | | | | | | | | | | 0.10 | -0.01 | 0.26 | -0.16 | | -0.06 | 0.10 |
| 21 | | | | | | | | | | | -0.24 | 0.14 | 0.18 | 0.35 | 0.00 | |
| 22 | | | | | | | | | | | | 0.17 | 0.28 | 0.21 | -0.40 | |
| 23 | | | | | | | | | | | | -0.05 | 0.08 | 0.36 | 0.11 | |
| 24 | | | | | | | | | | | | | | | 0.70 | -0.23 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | -0.05 | -0.75 |
| 27 | | | | | | | | | | | | | | | | |

**Median Change in HEIGHT Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.00 | 0.05 | 0.10 | 0.95 | 0.30 | 0.93 | 1.00 | 1.90 | 1.03 | 0.95 | | | | 1.30 | | |
| 13 | | 0.43 | 0.00 | 0.10 | 0.90 | 0.68 | 0.53 | 0.15 | 0.90 | -0.05 | 1.10 | 0.60 | | | | |
| 14 | | | 0.00 | 0.03 | 0.10 | 0.30 | 0.45 | 0.80 | 0.68 | 0.30 | 0.80 | 0.20 | 0.95 | 0.80 | 0.58 | |
| 15 | | | | 0.00 | 0.07 | 0.10 | 0.20 | 0.10 | 0.10 | 0.10 | 0.20 | 0.45 | 0.18 | | 1.20 | |
| 16 | | | | | 0.00 | 0.00 | 0.00 | 0.10 | 0.15 | 0.18 | 0.10 | 0.15 | 0.20 | 0.15 | 0.30 | |
| 17 | | | | | | 0.00 | 0.00 | 0.00 | 0.10 | 0.10 | 0.08 | 0.10 | 0.10 | 0.55 | 0.20 | 0.20 |
| 18 | | | | | | | 0.43 | 0.05 | 0.00 | 0.10 | 0.09 | 0.05 | 0.20 | 0.10 | 0.80 | 0.18 |
| 19 | | | | | | | | 0.10 | 0.05 | 0.10 | 0.10 | 0.03 | 0.05 | 0.10 | 0.20 | |
| 20 | | | | | | | | | | 0.10 | 0.00 | 0.10 | 0.00 | | -0.06 | 0.10 |
| 21 | | | | | | | | | | | 0.00 | 0.08 | 0.05 | 0.35 | 0.00 | |
| 22 | | | | | | | | | | | | 0.08 | 0.10 | 0.13 | -0.40 | |
| 23 | | | | | | | | | | | | -0.05 | 0.10 | 0.10 | 0.03 | |
| 24 | | | | | | | | | | | | | | | 0.70 | 0.00 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | -0.05 | -0.75 |
| 27 | | | | | | | | | | | | | | | | |

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**Horses Measured Multiple Times on Different Dates**
**Variable: Height**
**Colts**

**Average Months of Age Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.43 | 1.41 | 1.69 | 2.86 | 3.87 | 4.63 | 6.03 | | 7.66 | 8.84 | | | | 12.99 | | |
| 13 | | 0.23 | 1.51 | 1.99 | 3.18 | 3.92 | 4.82 | 6.03 | 6.90 | 7.50 | | 9.40 | | | | |
| 14 | | | 0.18 | 1.48 | 1.82 | 3.04 | 3.77 | 4.71 | 6.12 | 6.87 | 7.80 | 9.17 | 9.30 | 10.45 | 11.51 | |
| 15 | | | | 0.09 | 0.75 | 2.08 | 3.08 | 3.88 | 4.99 | 6.01 | 6.90 | 7.75 | 9.10 | | | |
| 16 | | | | | 0.18 | 1.14 | 2.04 | 3.02 | 4.03 | 5.12 | 5.90 | 6.97 | 7.83 | 9.21 | 9.81 | |
| 17 | | | | | | 0.18 | 0.99 | 2.01 | 2.75 | 4.01 | 4.93 | 5.85 | 6.90 | 7.47 | 8.93 | |
| 18 | | | | | | | | 0.70 | 2.18 | 3.02 | 4.14 | 4.92 | 6.09 | 7.05 | 7.96 | 9.14 |
| 19 | | | | | | | | 0.36 | 0.85 | 2.48 | 3.23 | 4.27 | 5.41 | 5.96 | 7.27 | |
| 20 | | | | | | | | | | 1.71 | 2.22 | 2.82 | 3.90 | | | |
| 21 | | | | | | | | | | | 0.78 | 2.21 | 2.95 | 3.48 | 4.34 | |
| 22 | | | | | | | | | | | | 1.12 | | | 3.35 | |
| 23 | | | | | | | | | | | | | 1.12 | 2.37 | 3.40 | |
| 24 | | | | | | | | | | | | | | | 2.20 | 3.11 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | 0.76 |
| 27 | | | | | | | | | | | | | | | | |

**Number of Comparisons Made Between Each Age**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 1 | 3 | 5 | 13 | 8 | 4 | 2 | 0 | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 13 | | 2 | 4 | 14 | 17 | 6 | 12 | 3 | 1 | 1 | 0 | 2 | 0 | 0 | 0 | 0 |
| 14 | | | 3 | 7 | 13 | 17 | 6 | 11 | 10 | 9 | 6 | 4 | 2 | 1 | 1 | 0 |
| 15 | | | | 6 | 3 | 10 | 15 | 10 | 8 | 14 | 15 | 12 | 3 | 0 | 0 | 0 |
| 16 | | | | | 5 | 11 | 15 | 13 | 17 | 9 | 34 | 24 | 7 | 1 | 2 | 0 |
| 17 | | | | | | 3 | 6 | 13 | 4 | 18 | 10 | 28 | 21 | 4 | 2 | 0 |
| 18 | | | | | | | 0 | 4 | 6 | 8 | 14 | 10 | 15 | 11 | 6 | 2 |
| 19 | | | | | | | | 1 | 3 | 5 | 4 | 12 | 5 | 5 | 2 | 0 |
| 20 | | | | | | | | | 0 | 1 | 6 | 12 | 4 | 0 | 0 | 0 |
| 21 | | | | | | | | | | 0 | 3 | 6 | 5 | 2 | 1 | 0 |
| 22 | | | | | | | | | | | 0 | 4 | 0 | 0 | 1 | 0 |
| 23 | | | | | | | | | | | | 0 | 3 | 4 | 4 | 0 |
| 24 | | | | | | | | | | | | | 0 | 0 | 1 | 2 |
| 25 | | | | | | | | | | | | | | 0 | 0 | 0 |
| 26 | | | | | | | | | | | | | | | 0 | 1 |
| 27 | | | | | | | | | | | | | | | | 0 |

**Average Percent Change in HEIGHT Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.00% | 0.00% | 1.68% | 5.12% | 3.88% | 4.12% | 6.99% | | 6.97% | 1.66% | | | | 9.29% | | |
| 13 | | 2.95% | -0.20% | 2.55% | 4.43% | 4.64% | 4.50% | 1.22% | 5.96% | -0.33% | | 4.16% | | | | |
| 14 | | | 1.29% | -0.04% | 1.03% | 3.90% | 2.42% | 5.01% | 3.46% | 3.89% | 5.26% | 2.40% | 3.87% | 5.26% | 0.99% | |
| 15 | | | | 0.21% | 0.60% | 1.25% | 3.13% | 1.52% | 2.38% | 1.39% | 2.14% | 3.05% | 2.31% | | | |
| 16 | | | | | -0.13% | 0.71% | 0.24% | 1.31% | 0.91% | 2.36% | 1.73% | 2.13% | 1.28% | -4.65% | 1.50% | |
| 17 | | | | | | 0.22% | -0.33% | -0.25% | 1.98% | 0.59% | 0.30% | 1.03% | 1.13% | 1.82% | 3.83% | |
| 18 | | | | | | | | -0.76% | -0.27% | 0.86% | 2.87% | 0.85% | 2.48% | 1.31% | 4.16% | 0.93% |
| 19 | | | | | | | | 0.66% | 0.43% | 1.45% | 1.64% | 1.79% | 0.02% | 0.65% | 3.64% | |
| 20 | | | | | | | | | | 0.67% | 0.77% | 2.76% | -1.24% | | | |
| 21 | | | | | | | | | | | -1.49% | 0.92% | 1.45% | 2.29% | 0.00% | |
| 22 | | | | | | | | | | | | 1.36% | | | -0.62% | |
| 23 | | | | | | | | | | | | | 0.50% | 2.62% | 1.30% | |
| 24 | | | | | | | | | | | | | | | 4.88% | -2.11% |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | -4.98% |
| 27 | | | | | | | | | | | | | | | | |

**Average Change in HEIGHT Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.00 | 0.00 | 0.24 | 0.70 | 0.54 | 0.59 | 1.00 | | 1.03 | 0.25 | | | | 1.30 | | |
| 13 | | 0.43 | -0.04 | 0.36 | 0.63 | 0.66 | 0.63 | 0.18 | 0.90 | -0.05 | | 0.60 | | | | |
| 14 | | | 0.18 | -0.01 | 0.15 | 0.56 | 0.36 | 0.72 | 0.52 | 0.57 | 0.76 | 0.36 | 0.55 | 0.80 | 0.15 | |
| 15 | | | | 0.03 | 0.09 | 0.19 | 0.44 | 0.23 | 0.36 | 0.21 | 0.32 | 0.45 | 0.33 | | | |
| 16 | | | | | -0.02 | 0.10 | 0.03 | 0.19 | 0.13 | 0.36 | 0.26 | 0.32 | 0.19 | -0.70 | 0.23 | |
| 17 | | | | | | 0.03 | -0.05 | -0.04 | 0.30 | 0.09 | 0.04 | 0.15 | 0.17 | 0.28 | 0.58 | |
| 18 | | | | | | | | -0.13 | -0.04 | 0.13 | 0.44 | 0.13 | 0.37 | 0.20 | 0.63 | 0.14 |
| 19 | | | | | | | | 0.10 | 0.07 | 0.22 | 0.25 | 0.27 | 0.00 | 0.09 | 0.55 | |
| 20 | | | | | | | | | | 0.10 | 0.11 | 0.42 | -0.20 | | | |
| 21 | | | | | | | | | | | -0.24 | 0.14 | 0.22 | 0.35 | 0.00 | |
| 22 | | | | | | | | | | | | 0.21 | | | -0.10 | |
| 23 | | | | | | | | | | | | | 0.08 | 0.40 | 0.20 | |
| 24 | | | | | | | | | | | | | | | 0.70 | -0.34 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | -0.75 |
| 27 | | | | | | | | | | | | | | | | |

**Median Change in HEIGHT Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.00 | 0.00 | 0.10 | 0.30 | 0.30 | 0.65 | 1.00 | | 1.03 | 0.25 | | | | 1.30 | | |
| 13 | | 0.43 | -0.05 | 0.10 | 0.90 | 0.79 | 0.58 | 0.20 | 0.90 | -0.05 | | 0.60 | | | | |
| 14 | | | 0.00 | 0.00 | 0.10 | 0.70 | 0.20 | 0.80 | 0.74 | 0.75 | 0.80 | 0.25 | 0.55 | 0.80 | 0.15 | |
| 15 | | | | 0.00 | 0.10 | 0.10 | 0.20 | 0.18 | 0.15 | 0.10 | 0.20 | 0.20 | 0.20 | | | |
| 16 | | | | | 0.00 | 0.05 | 0.00 | 0.10 | 0.15 | 0.20 | 0.10 | 0.18 | 0.20 | -0.70 | 0.23 | |
| 17 | | | | | | 0.00 | -0.05 | 0.00 | 0.15 | 0.05 | 0.10 | 0.10 | 0.10 | 0.15 | 0.58 | |
| 18 | | | | | | | | 0.00 | 0.00 | 0.08 | 0.50 | 0.10 | 0.20 | 0.10 | 0.80 | 0.14 |
| 19 | | | | | | | | 0.10 | 0.10 | 0.10 | 0.10 | 0.03 | 0.00 | 0.10 | 0.55 | |
| 20 | | | | | | | | | | 0.10 | 0.05 | 0.20 | -0.05 | | | |
| 21 | | | | | | | | | | | 0.00 | 0.05 | 0.10 | 0.35 | 0.00 | |
| 22 | | | | | | | | | | | | 0.09 | | | -0.10 | |
| 23 | | | | | | | | | | | | | 0.10 | 0.38 | 0.08 | |
| 24 | | | | | | | | | | | | | | | 0.70 | -0.34 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | -0.75 |
| 27 | | | | | | | | | | | | | | | | |

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## Horses Measured Multiple Times on Different Dates
## Variable: Height
## Fillies

**Average Months of Age Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.23 | 1.41 | 2.15 | 3.31 | 4.22 | 4.81 | 6.07 | 7.04 | | 9.29 | | | | | | |
| 13 | | | 1.18 | 2.06 | 3.00 | 4.34 | 4.82 | 5.82 | 6.08 | | 8.84 | | | | | |
| 14 | | | 0.22 | 1.06 | 1.81 | 2.72 | 3.89 | 4.83 | 5.81 | 7.17 | 7.65 | 8.89 | 9.47 | | 12.59 | |
| 15 | | | | 0.59 | 1.14 | 2.10 | 2.97 | 3.99 | 4.47 | 5.91 | 7.01 | 7.77 | 8.90 | | 11.28 | |
| 16 | | | | | 0.29 | 1.84 | 1.97 | 2.96 | 4.26 | 5.29 | 5.92 | 7.11 | 7.41 | 9.07 | 9.34 | |
| 17 | | | | | | 0.16 | 1.20 | 1.93 | 3.10 | 3.84 | 5.00 | 6.01 | 6.94 | 7.94 | 8.67 | 9.72 |
| 18 | | | | | | | 0.28 | 1.33 | 1.83 | 2.88 | 4.12 | 5.16 | 6.12 | 7.27 | | 8.91 |
| 19 | | | | | | | | | 1.61 | 2.23 | 2.75 | 4.56 | 4.91 | 6.51 | 6.92 | |
| 20 | | | | | | | | | | | 2.68 | 3.07 | 4.11 | | 6.35 | 6.84 |
| 21 | | | | | | | | | | | | 2.65 | 2.93 | | | |
| 22 | | | | | | | | | | | | 0.89 | 2.14 | 3.11 | 3.98 | |
| 23 | | | | | | | | | | | | 0.39 | | 2.28 | 3.12 | |
| 24 | | | | | | | | | | | | | | | | 2.76 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 0.07 | |
| 27 | | | | | | | | | | | | | | | | |

**Number of Comparisons Made Between Each Age**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 2 | 1 | 4 | 7 | 3 | 6 | 2 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13 | | 0 | 1 | 3 | 8 | 6 | 4 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 14 | | | 4 | 6 | 8 | 8 | 4 | 1 | 5 | 3 | 7 | 2 | 1 | 0 | 1 | 0 |
| 15 | | | | 1 | 12 | 11 | 5 | 6 | 4 | 13 | 10 | 8 | 3 | 0 | 1 | 0 |
| 16 | | | | | 4 | 2 | 8 | 11 | 6 | 3 | 20 | 15 | 4 | 1 | 1 | 0 |
| 17 | | | | | | 3 | 5 | 3 | 5 | 3 | 10 | 16 | 5 | 2 | 3 | 2 |
| 18 | | | | | | | 2 | 2 | 5 | 6 | 4 | 7 | 9 | 5 | 0 | 1 |
| 19 | | | | | | | | 0 | 1 | 4 | 5 | 4 | 3 | 2 | 4 | 0 |
| 20 | | | | | | | | | 0 | 0 | 3 | 11 | 1 | 0 | 2 | 1 |
| 21 | | | | | | | | | | 0 | 0 | 2 | 6 | 0 | 0 | 0 |
| 22 | | | | | | | | | | | 0 | 1 | 3 | 6 | 1 | 0 |
| 23 | | | | | | | | | | | | 2 | 0 | 3 | 3 | 0 |
| 24 | | | | | | | | | | | | | 0 | 0 | 0 | 1 |
| 25 | | | | | | | | | | | | | | 0 | 0 | 0 |
| 26 | | | | | | | | | | | | | | | 1 | 0 |
| 27 | | | | | | | | | | | | | | | | 0 |

**Average Percent Change in HEIGHT Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.18% | 0.67% | 4.23% | 7.89% | 4.94% | 6.66% | 10.10% | 14.29% | | 6.89% | | | | | | |
| 13 | | | 0.00% | 2.33% | 6.83% | 3.28% | 3.76% | 0.67% | 5.96% | | 7.86% | | | | | |
| 14 | | | 0.35% | 1.34% | 1.35% | 3.49% | 4.53% | 0.00% | 2.79% | 1.38% | 3.88% | 1.00% | 12.78% | | 6.97% | |
| 15 | | | | -0.65% | 0.78% | 1.58% | 1.76% | 0.50% | 0.66% | 2.07% | 2.26% | 4.44% | 1.00% | | 8.51% | |
| 16 | | | | | -1.00% | -2.50% | 1.53% | 1.77% | 2.41% | 4.29% | 1.37% | 1.21% | 1.48% | 6.62% | 4.90% | |
| 17 | | | | | | -0.22% | 1.43% | 3.84% | 0.40% | 0.77% | 0.23% | 0.88% | 1.11% | 5.61% | 2.18% | 1.33% |
| 18 | | | | | | | 2.80% | 0.66% | 3.31% | 2.21% | -0.13% | 0.66% | 2.55% | 0.93% | | 1.32% |
| 19 | | | | | | | | | 0.00% | -0.08% | 0.40% | -0.70% | -0.04% | 0.16% | 2.06% | |
| 20 | | | | | | | | | | | -1.67% | 0.57% | 0.00% | | -0.40% | 0.66% |
| 21 | | | | | | | | | | | | 0.83% | 0.99% | | | |
| 22 | | | | | | | | | | | | 0.00% | 1.80% | 1.35% | -4.38% | |
| 23 | | | | | | | | | | | | -0.33% | | 1.96% | -0.05% | |
| 24 | | | | | | | | | | | | | | | | 0.00% |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | -0.33% | |
| 27 | | | | | | | | | | | | | | | | |

**Average Change in HEIGHT Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.03 | 0.10 | 0.59 | 1.09 | 0.67 | 0.93 | 1.40 | 1.90 | | 0.98 | | | | | | |
| 13 | | | 0.00 | 0.33 | 0.94 | 0.47 | 0.54 | 0.10 | 0.90 | | 1.10 | | | | | |
| 14 | | | 0.05 | 0.19 | 0.18 | 0.49 | 0.65 | 0.00 | 0.40 | 0.21 | 0.56 | 0.15 | 1.70 | | 1.00 | |
| 15 | | | | -0.10 | 0.11 | 0.23 | 0.25 | 0.08 | 0.10 | 0.30 | 0.34 | 0.65 | 0.15 | | 1.20 | |
| 16 | | | | | -0.15 | -0.38 | 0.22 | 0.26 | 0.37 | 0.62 | 0.20 | 0.18 | 0.23 | 1.00 | 0.75 | |
| 17 | | | | | | -0.03 | 0.19 | 0.57 | 0.06 | 0.12 | 0.03 | 0.13 | 0.16 | 0.85 | 0.32 | 0.20 |
| 18 | | | | | | | 0.43 | 0.10 | 0.49 | 0.33 | -0.02 | 0.09 | 0.37 | 0.14 | | 0.20 |
| 19 | | | | | | | | | 0.00 | -0.01 | 0.06 | -0.13 | -0.01 | 0.03 | 0.31 | |
| 20 | | | | | | | | | | | -0.27 | 0.09 | 0.00 | | -0.06 | 0.10 |
| 21 | | | | | | | | | | | | 0.13 | 0.14 | | | |
| 22 | | | | | | | | | | | | 0.00 | 0.28 | 0.21 | -0.70 | |
| 23 | | | | | | | | | | | | -0.05 | | 0.30 | -0.01 | |
| 24 | | | | | | | | | | | | | | | | 0.00 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | -0.05 | |
| 27 | | | | | | | | | | | | | | | | |

**Median Change in HEIGHT Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.03 | 0.10 | 0.70 | 1.00 | 0.20 | 0.95 | 1.40 | 1.90 | | 0.98 | | | | | | |
| 13 | | | 0.00 | 0.10 | 0.95 | 0.48 | 0.50 | 0.10 | 0.90 | | 1.10 | | | | | |
| 14 | | | 0.05 | 0.09 | 0.10 | 0.25 | 0.80 | 0.00 | 0.20 | 0.30 | 0.80 | 0.15 | 1.70 | | 1.00 | |
| 15 | | | | -0.10 | 0.01 | 0.10 | 0.05 | 0.10 | 0.10 | 0.20 | 0.30 | 0.80 | 0.15 | | 1.20 | |
| 16 | | | | | 0.00 | -0.38 | 0.00 | 0.10 | 0.13 | 0.15 | 0.19 | 0.10 | 0.10 | 1.00 | 0.75 | |
| 17 | | | | | | -0.10 | 0.10 | 0.80 | 0.10 | 0.10 | 0.03 | 0.10 | 0.00 | 0.85 | 0.20 | 0.20 |
| 18 | | | | | | | 0.43 | 0.10 | 0.70 | 0.15 | -0.02 | 0.00 | 0.10 | 0.10 | | 0.20 |
| 19 | | | | | | | | | 0.00 | 0.03 | 0.00 | -0.25 | 0.10 | 0.03 | 0.20 | |
| 20 | | | | | | | | | | | -0.10 | 0.00 | 0.00 | | -0.06 | 0.10 |
| 21 | | | | | | | | | | | | 0.13 | 0.03 | | | |
| 22 | | | | | | | | | | | | 0.00 | 0.10 | 0.13 | -0.70 | |
| 23 | | | | | | | | | | | | -0.05 | | 0.10 | 0.00 | |
| 24 | | | | | | | | | | | | | | | | 0.00 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | -0.05 | |
| 27 | | | | | | | | | | | | | | | | |

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**Horses Measured Multiple Times on Different Dates**
**Variable: Weight**
**Combined Sexes**

**Average Months of Age Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.30 | 1.41 | 1.90 | 3.02 | 3.96 | 4.74 | 6.05 | 7.04 | 7.66 | 9.14 | | | | 12.99 | | |
| 13 | | 0.23 | 1.45 | 2.00 | 3.12 | 4.13 | 4.82 | 5.98 | 6.49 | 7.50 | 8.84 | 9.40 | | | | |
| 14 | | | 0.20 | 1.28 | 1.81 | 2.94 | 3.82 | 4.72 | 6.02 | 6.95 | 7.72 | 9.08 | 9.36 | 10.45 | 12.05 | |
| 15 | | | | 0.16 | 1.06 | 2.09 | 3.05 | 3.92 | 4.82 | 5.96 | 6.94 | 7.76 | 9.00 | | 11.28 | |
| 16 | | | | | 0.23 | 1.25 | 2.02 | 2.99 | 4.09 | 5.16 | 5.91 | 7.03 | 7.68 | 9.14 | 9.65 | |
| 17 | | | | | | 0.17 | 1.08 | 2.00 | 2.95 | 3.99 | 4.97 | 5.91 | 6.91 | 7.63 | 8.77 | 9.72 |
| 18 | | | | | | | 0.28 | 0.91 | 2.02 | 2.96 | 4.13 | 5.01 | 6.10 | 7.12 | 7.96 | 9.06 |
| 19 | | | | | | | | 0.36 | 1.04 | 2.37 | 2.96 | 4.35 | 5.22 | 6.12 | 7.04 | |
| 20 | | | | | | | | | | 1.71 | 2.37 | 2.94 | 3.95 | | 6.35 | 6.84 |
| 21 | | | | | | | | | | | 0.78 | 2.32 | 2.94 | 3.48 | 4.34 | |
| 22 | | | | | | | | | | | | 1.07 | 2.14 | 3.11 | 3.67 | |
| 23 | | | | | | | | | | | | 0.39 | 1.12 | 2.33 | 3.28 | |
| 24 | | | | | | | | | | | | | | | 2.20 | 2.99 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 0.07 | 0.76 |
| 27 | | | | | | | | | | | | | | | | |

**Number of Comparisons Made Between Each Age**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 3 | 4 | 9 | 20 | 11 | 10 | 4 | 1 | 2 | 3 | 0 | 0 | 0 | 1 | 0 | 0 |
| 13 | | 2 | 5 | 17 | 25 | 12 | 16 | 4 | 2 | 1 | 1 | 2 | 0 | 0 | 0 | 0 |
| 14 | | | 7 | 13 | 21 | 25 | 10 | 12 | 15 | 12 | 13 | 6 | 3 | 1 | 2 | 0 |
| 15 | | | | 7 | 15 | 21 | 20 | 16 | 12 | 27 | 25 | 20 | 6 | 0 | 1 | 0 |
| 16 | | | | | 9 | 13 | 23 | 24 | 23 | 12 | 54 | 39 | 11 | 2 | 3 | 0 |
| 17 | | | | | | 6 | 11 | 16 | 9 | 21 | 20 | 44 | 26 | 6 | 5 | 2 |
| 18 | | | | | | | 2 | 6 | 11 | 14 | 18 | 17 | 24 | 16 | 6 | 3 |
| 19 | | | | | | | | 1 | 4 | 9 | 9 | 16 | 8 | 7 | 6 | 0 |
| 20 | | | | | | | | | 0 | 1 | 9 | 23 | 5 | 0 | 2 | 1 |
| 21 | | | | | | | | | | 0 | 3 | 8 | 11 | 2 | 1 | 0 |
| 22 | | | | | | | | | | | 0 | 5 | 3 | 6 | 2 | 0 |
| 23 | | | | | | | | | | | | 2 | 3 | 7 | 7 | 0 |
| 24 | | | | | | | | | | | | | 0 | 0 | 1 | 3 |
| 25 | | | | | | | | | | | | | | 0 | 0 | 0 |
| 26 | | | | | | | | | | | | | | | 1 | 1 |
| 27 | | | | | | | | | | | | | | | | 0 |

**Average Percent Change in WEIGHT Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.94% | 6.31% | 9.24% | 23.71% | 16.65% | 29.51% | 21.24% | 48.97% | 15.69% | 26.15% | | | | 57.04% | | |
| 13 | | 10.21% | 3.47% | 11.18% | 18.72% | 20.80% | 15.74% | 4.74% | 5.07% | 0.97% | 28.00% | 16.56% | | | | |
| 14 | | | 0.76% | 2.88% | 4.02% | 14.95% | 10.59% | 17.01% | 6.93% | 11.56% | 12.54% | 13.28% | 23.11% | 3.43% | 21.30% | |
| 15 | | | | 1.85% | 0.39% | 4.14% | 8.75% | 4.70% | 3.20% | 5.45% | 6.87% | 8.00% | 8.98% | | 27.27% | |
| 16 | | | | | -0.13% | 1.41% | 1.71% | 2.29% | 3.32% | 3.74% | 4.29% | 4.85% | 6.47% | 1.50% | 13.19% | |
| 17 | | | | | | 0.77% | 2.22% | -0.42% | 2.63% | 2.56% | 1.77% | 3.80% | 4.70% | 3.69% | 6.89% | 8.38% |
| 18 | | | | | | | 5.64% | 1.40% | 2.74% | 2.23% | 2.08% | 0.35% | 6.83% | 3.80% | 7.29% | 5.81% |
| 19 | | | | | | | | 2.06% | 2.94% | 1.32% | 0.77% | 1.25% | -0.96% | 3.10% | 4.81% | |
| 20 | | | | | | | | | | -0.51% | 1.29% | 3.03% | 2.00% | | -0.28% | 3.00% |
| 21 | | | | | | | | | | | -0.78% | 5.25% | 3.28% | 0.87% | 1.49% | |
| 22 | | | | | | | | | | | | 3.18% | -0.16% | 4.90% | 1.20% | |
| 23 | | | | | | | | | | | | -2.00% | 2.68% | 2.17% | 1.66% | |
| 24 | | | | | | | | | | | | | | | 8.33% | -0.29% |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 0.00% | -1.54% |
| 27 | | | | | | | | | | | | | | | | |

**Average Change in WEIGHT Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 7 | 53 | 72 | 180 | 131 | 212 | 169 | 355 | 148 | 205 | | | | 385 | | |
| 13 | | 83 | 29 | 86 | 146 | 158 | 121 | 44 | 50 | 10 | 210 | 143 | | | | |
| 14 | | | 5 | 26 | 34 | 122 | 88 | 135 | 66 | 102 | 108 | 120 | 185 | 35 | 178 | |
| 15 | | | | 17 | 3 | 38 | 72 | 44 | 31 | 50 | 64 | 73 | 81 | | 225 | |
| 16 | | | | | -2 | 13 | 15 | 19 | 32 | 33 | 40 | 47 | 61 | 15 | 123 | |
| 17 | | | | | | 8 | 20 | -5 | 25 | 23 | 17 | 36 | 44 | 38 | 66 | 80 |
| 18 | | | | | | | 55 | 13 | 26 | 22 | 21 | 3 | 62 | 37 | 73 | 57 |
| 19 | | | | | | | | 20 | 28 | 13 | 7 | 12 | -12 | 31 | 48 | |
| 20 | | | | | | | | | | -5 | 13 | 30 | 20 | | -3 | 30 |
| 21 | | | | | | | | | | | -8 | 51 | 32 | 8 | 15 | |
| 22 | | | | | | | | | | | | 31 | -2 | 48 | 13 | |
| 23 | | | | | | | | | | | | -20 | 27 | 23 | 16 | |
| 24 | | | | | | | | | | | | | | | 75 | -3 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 0 | -15 |
| 27 | | | | | | | | | | | | | | | | |

**Median Change in WEIGHT Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0 | 55 | 85 | 200 | 130 | 197 | 130 | 355 | 148 | 225 | | | | 385 | | |
| 13 | | 83 | 10 | 55 | 150 | 135 | 98 | 35 | 50 | 10 | 210 | 143 | | | | |
| 14 | | | 10 | 25 | 30 | 105 | 58 | 133 | 75 | 93 | 110 | 150 | 180 | 35 | 178 | |
| 15 | | | | 0 | 0 | 40 | 55 | 53 | 35 | 50 | 60 | 58 | 63 | | 225 | |
| 16 | | | | | 0 | 25 | 0 | 15 | 30 | 28 | 33 | 50 | 65 | 15 | 120 | |
| 17 | | | | | | 0 | 20 | -10 | 30 | 25 | 18 | 43 | 45 | 43 | 60 | 80 |
| 18 | | | | | | | 55 | 3 | 25 | 25 | 28 | 0 | 59 | 35 | 75 | 50 |
| 19 | | | | | | | | 20 | 15 | 10 | 10 | 13 | -30 | 30 | 48 | |
| 20 | | | | | | | | | | -5 | 5 | 25 | 25 | | -3 | 30 |
| 21 | | | | | | | | | | | 0 | 45 | 20 | 8 | 15 | |
| 22 | | | | | | | | | | | | 25 | 5 | 45 | 13 | |
| 23 | | | | | | | | | | | | -20 | 30 | 25 | 10 | |
| 24 | | | | | | | | | | | | | | | 75 | 0 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 0 | -15 |
| 27 | | | | | | | | | | | | | | | | |

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**Horses Measured Multiple Times on Different Dates**
**Variable: Weight**
**Colts**

**Average Months of Age Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.43 | 1.41 | 1.69 | 2.86 | 3.87 | 4.63 | 6.03 | | 7.66 | 8.84 | | | | 12.99 | | |
| 13 | | 0.23 | 1.51 | 1.99 | 3.18 | 3.92 | 4.82 | 6.03 | 6.90 | 7.50 | | 9.40 | | | | |
| 14 | | | 0.18 | 1.48 | 1.82 | 3.04 | 3.77 | 4.71 | 6.12 | 6.87 | 7.80 | 9.17 | 9.30 | 10.45 | 11.51 | |
| 15 | | | | 0.09 | 0.75 | 2.08 | 3.08 | 3.88 | 4.99 | 6.01 | 6.90 | 7.75 | 9.10 | | | |
| 16 | | | | | 0.18 | 1.14 | 2.04 | 3.02 | 4.03 | 5.12 | 5.90 | 6.97 | 7.83 | 9.21 | 9.81 | |
| 17 | | | | | | 0.18 | 0.99 | 2.01 | 2.75 | 4.01 | 4.93 | 5.85 | 6.90 | 7.47 | 8.93 | |
| 18 | | | | | | | | 0.70 | 2.18 | 3.02 | 4.14 | 4.92 | 6.09 | 7.05 | 7.96 | 9.14 |
| 19 | | | | | | | | 0.36 | 0.85 | 2.48 | 3.23 | 4.27 | 5.41 | 5.96 | 7.27 | |
| 20 | | | | | | | | | | 1.71 | 2.22 | 2.82 | 3.90 | | | |
| 21 | | | | | | | | | | | 0.78 | 2.21 | 2.95 | 3.48 | 4.34 | |
| 22 | | | | | | | | | | | | 1.12 | | | 3.35 | |
| 23 | | | | | | | | | | | | | 1.12 | 2.37 | 3.40 | |
| 24 | | | | | | | | | | | | | | | 2.20 | 3.11 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | 0.76 |
| 27 | | | | | | | | | | | | | | | | |

**Number of Comparisons Made Between Each Age**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 1 | 3 | 5 | 13 | 8 | 4 | 2 | 0 | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 13 | | 2 | 4 | 14 | 17 | 6 | 12 | 3 | 1 | 1 | 0 | 2 | 0 | 0 | 0 | 0 |
| 14 | | | 3 | 7 | 13 | 17 | 6 | 11 | 10 | 9 | 6 | 4 | 2 | 1 | 1 | 0 |
| 15 | | | | 6 | 3 | 10 | 15 | 10 | 8 | 14 | 15 | 12 | 3 | 0 | 0 | 0 |
| 16 | | | | | 5 | 11 | 15 | 13 | 17 | 9 | 34 | 24 | 7 | 1 | 2 | 0 |
| 17 | | | | | | 3 | 6 | 13 | 4 | 18 | 10 | 28 | 21 | 4 | 2 | 0 |
| 18 | | | | | | | 0 | 4 | 6 | 8 | 14 | 10 | 15 | 11 | 6 | 2 |
| 19 | | | | | | | | 1 | 3 | 5 | 4 | 12 | 5 | 5 | 2 | 0 |
| 20 | | | | | | | | | 0 | 1 | 6 | 12 | 4 | 0 | 0 | 0 |
| 21 | | | | | | | | | | 0 | 3 | 6 | 5 | 2 | 1 | 0 |
| 22 | | | | | | | | | | | 0 | 4 | 0 | 0 | 1 | 0 |
| 23 | | | | | | | | | | | | 0 | 3 | 4 | 4 | 0 |
| 24 | | | | | | | | | | | | | 0 | 0 | 1 | 2 |
| 25 | | | | | | | | | | | | | | 0 | 0 | 0 |
| 26 | | | | | | | | | | | | | | | 0 | 1 |
| 27 | | | | | | | | | | | | | | | | 0 |

**Average Percent Change in WEIGHT Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.00% | 4.49% | 11.77% | 22.59% | 15.08% | 23.89% | 13.54% | | 15.69% | 18.82% | | | | 57.04% | | |
| 13 | | 10.21% | 0.28% | 8.92% | 17.97% | 21.23% | 16.02% | 5.79% | 0.96% | 0.97% | | 16.56% | | | | |
| 14 | | | 0.66% | 1.60% | 4.05% | 15.83% | 8.91% | 17.81% | 6.52% | 11.81% | 14.41% | 14.06% | 17.07% | 3.43% | 11.35% | |
| 15 | | | | 2.41% | 0.10% | 3.93% | 9.65% | 5.65% | 4.17% | 3.83% | 5.30% | 6.35% | 11.63% | | | |
| 16 | | | | | -1.50% | 2.32% | 0.41% | 0.99% | 3.10% | 2.62% | 3.48% | 5.31% | 7.48% | -3.59% | 16.12% | |
| 17 | | | | | | 1.89% | 0.83% | -0.63% | 4.05% | 2.20% | 3.29% | 2.84% | 3.56% | 4.04% | 7.87% | |
| 18 | | | | | | | | 0.00% | 0.90% | 2.24% | 3.14% | 1.37% | 5.56% | 3.58% | 7.29% | 4.31% |
| 19 | | | | | | | | 2.06% | 3.26% | 2.26% | 0.49% | 1.23% | 1.02% | 3.44% | 3.68% | |
| 20 | | | | | | | | | | -0.51% | 2.59% | 4.12% | 1.22% | | | |
| 21 | | | | | | | | | | | -0.78% | 3.46% | 3.61% | 0.87% | 1.49% | |
| 22 | | | | | | | | | | | | 2.60% | | | 0.46% | |
| 23 | | | | | | | | | | | | | 2.68% | 3.59% | 1.34% | |
| 24 | | | | | | | | | | | | | | | 8.33% | -1.41% |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | -1.54% |
| 27 | | | | | | | | | | | | | | | | |

**Average Change in WEIGHT Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0 | 37 | 95 | 173 | 120 | 184 | 123 | | 148 | 160 | | | | 385 | | |
| 13 | | 83 | 4 | 72 | 143 | 163 | 123 | 53 | 10 | 10 | | 143 | | | | |
| 14 | | | 5 | 15 | 38 | 127 | 77 | 142 | 63 | 103 | 120 | 129 | 150 | 35 | 105 | |
| 15 | | | | 23 | 2 | 38 | 79 | 53 | 41 | 37 | 51 | 60 | 102 | | | |
| 16 | | | | | -15 | 21 | 4 | 8 | 29 | 23 | 33 | 51 | 71 | -35 | 148 | |
| 17 | | | | | | 18 | 8 | -7 | 39 | 20 | 31 | 27 | 35 | 41 | 75 | |
| 18 | | | | | | | | 0 | 9 | 23 | 32 | 14 | 54 | 35 | 73 | 43 |
| 19 | | | | | | | | 20 | 30 | 22 | 5 | 12 | 8 | 34 | 38 | |
| 20 | | | | | | | | | | -5 | 27 | 42 | 13 | | | |
| 21 | | | | | | | | | | | -8 | 36 | 36 | 8 | 15 | |
| 22 | | | | | | | | | | | | 26 | | | 5 | |
| 23 | | | | | | | | | | | | | 27 | 38 | 14 | |
| 24 | | | | | | | | | | | | | | | 75 | -15 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | -15 |
| 27 | | | | | | | | | | | | | | | | |

**Median Change in WEIGHT Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0 | 50 | 100 | 170 | 105 | 140 | 123 | | 148 | 160 | | | | 385 | | |
| 13 | | 83 | 8 | 55 | 180 | 140 | 105 | 35 | 10 | 10 | | 143 | | | | |
| 14 | | | 0 | 15 | 40 | 120 | 58 | 160 | 73 | 85 | 103 | 150 | 150 | 35 | 105 | |
| 15 | | | | 0 | 0 | 45 | 55 | 65 | 45 | 43 | 50 | 50 | 70 | | | |
| 16 | | | | | -25 | 25 | 0 | 10 | 30 | 25 | 25 | 53 | 65 | -35 | 148 | |
| 17 | | | | | | 0 | 10 | -5 | 40 | 18 | 30 | 28 | 40 | 48 | 75 | |
| 18 | | | | | | | | 0 | 5 | 28 | 45 | 15 | 57 | 40 | 75 | 43 |
| 19 | | | | | | | | 20 | 10 | 35 | 5 | 0 | 0 | 30 | 38 | |
| 20 | | | | | | | | | | -5 | 10 | 35 | 13 | | | |
| 21 | | | | | | | | | | | 0 | 35 | 45 | 8 | 15 | |
| 22 | | | | | | | | | | | | 23 | | | 5 | |
| 23 | | | | | | | | | | | | | 30 | 25 | 10 | |
| 24 | | | | | | | | | | | | | | | 75 | -15 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | -15 |
| 27 | | | | | | | | | | | | | | | | |

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**Horses Measured Multiple Times on Different Dates**
**Variable: Weight**
**Fillies**

**Average Months of Age Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.23 | 1.41 | 2.15 | 3.31 | 4.22 | 4.81 | 6.07 | 7.04 | | 9.29 | | | | | | |
| 13 | | | 1.18 | 2.06 | 3.00 | 4.34 | 4.82 | 5.82 | 6.08 | | 8.84 | | | | | |
| 14 | | | 0.22 | 1.06 | 1.81 | 2.72 | 3.89 | 4.83 | 5.81 | 7.17 | 7.65 | 8.89 | 9.47 | | 12.59 | |
| 15 | | | | 0.59 | 1.14 | 2.10 | 2.97 | 3.99 | 4.47 | 5.91 | 7.01 | 7.77 | 8.90 | | 11.28 | |
| 16 | | | | | 0.29 | 1.84 | 1.97 | 2.96 | 4.26 | 5.29 | 5.92 | 7.11 | 7.41 | 9.07 | 9.34 | |
| 17 | | | | | | 0.16 | 1.20 | 1.93 | 3.10 | 3.84 | 5.00 | 6.01 | 6.94 | 7.94 | 8.67 | 9.72 |
| 18 | | | | | | | 0.28 | 1.33 | 1.83 | 2.88 | 4.12 | 5.16 | 6.12 | 7.27 | | 8.91 |
| 19 | | | | | | | | | 1.61 | 2.23 | 2.75 | 4.56 | 4.91 | 6.51 | 6.92 | |
| 20 | | | | | | | | | | | 2.68 | 3.07 | 4.11 | | 6.35 | 6.84 |
| 21 | | | | | | | | | | | | 2.65 | 2.93 | | | |
| 22 | | | | | | | | | | | | 0.89 | 2.14 | 3.11 | 3.98 | |
| 23 | | | | | | | | | | | | 0.39 | | 2.28 | 3.12 | |
| 24 | | | | | | | | | | | | | | | | 2.76 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 0.07 | |
| 27 | | | | | | | | | | | | | | | | |

**Number of Comparisons Made Between Each Age**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 2 | 1 | 4 | 7 | 3 | 6 | 2 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13 | | 0 | 1 | 3 | 8 | 6 | 4 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 14 | | | 4 | 6 | 8 | 8 | 4 | 1 | 5 | 3 | 7 | 2 | 1 | 0 | 1 | 0 |
| 15 | | | | 1 | 12 | 11 | 5 | 6 | 4 | 13 | 10 | 8 | 3 | 0 | 1 | 0 |
| 16 | | | | | 4 | 2 | 8 | 11 | 6 | 3 | 20 | 15 | 4 | 1 | 1 | 0 |
| 17 | | | | | | 3 | 5 | 3 | 5 | 3 | 10 | 16 | 5 | 2 | 3 | 2 |
| 18 | | | | | | | 2 | 2 | 5 | 6 | 4 | 7 | 9 | 5 | 0 | 1 |
| 19 | | | | | | | | 0 | 1 | 4 | 5 | 4 | 3 | 2 | 4 | 0 |
| 20 | | | | | | | | | 0 | 0 | 3 | 11 | 1 | 0 | 2 | 1 |
| 21 | | | | | | | | | | 0 | 0 | 2 | 6 | 0 | 0 | 0 |
| 22 | | | | | | | | | | | 0 | 1 | 3 | 6 | 1 | 0 |
| 23 | | | | | | | | | | | | 2 | 0 | 3 | 3 | 0 |
| 24 | | | | | | | | | | | | | 0 | 0 | 0 | 1 |
| 25 | | | | | | | | | | | | | | 0 | 0 | 0 |
| 26 | | | | | | | | | | | | | | | 1 | 0 |
| 27 | | | | | | | | | | | | | | | | 0 |

**Average Percent Change in WEIGHT Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 1.41% | 11.76% | 6.07% | 25.79% | 20.83% | 33.27% | 28.94% | 48.97% | | 29.82% | | | | | | |
| 13 | | | 16.25% | 21.77% | 20.32% | 20.37% | 14.88% | 1.57% | 9.18% | | 28.00% | | | | | |
| 14 | | | 0.83% | 4.37% | 3.96% | 13.07% | 13.11% | 8.16% | 7.74% | 10.79% | 10.95% | 11.72% | 35.17% | | 31.25% | |
| 15 | | | | -1.50% | 0.46% | 4.33% | 6.03% | 3.12% | 1.25% | 7.18% | 9.22% | 10.49% | 6.33% | | 27.27% | |
| 16 | | | | | 1.58% | -3.63% | 4.15% | 3.83% | 3.92% | 7.09% | 5.67% | 4.11% | 4.72% | 6.60% | 7.32% | |
| 17 | | | | | | -0.35% | 3.89% | 0.47% | 1.48% | 4.70% | 0.26% | 5.48% | 9.52% | 2.98% | 6.23% | 8.38% |
| 18 | | | | | | | 5.64% | 4.21% | 4.94% | 2.22% | -1.64% | -1.11% | 8.93% | 4.26% | | 8.81% |
| 19 | | | | | | | | | 1.98% | 0.14% | 0.99% | 1.31% | -4.24% | 2.26% | 5.38% | |
| 20 | | | | | | | | | | | -1.31% | 1.85% | 5.13% | | -0.28% | 3.00% |
| 21 | | | | | | | | | | | | 10.64% | 3.01% | | | |
| 22 | | | | | | | | | | | | 5.49% | -0.16% | 4.90% | 1.94% | |
| 23 | | | | | | | | | | | | -2.00% | | 0.28% | 2.08% | |
| 24 | | | | | | | | | | | | | | | | 1.94% |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 0.00% | |
| 27 | | | | | | | | | | | | | | | | |

**Average Change in WEIGHT Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 10 | 100 | 44 | 194 | 160 | 231 | 215 | 355 | | 228 | | | | | | |
| 13 | | | 130 | 155 | 152 | 153 | 118 | 15 | 90 | | 210 | | | | | |
| 14 | | | 5 | 38 | 27 | 110 | 104 | 60 | 71 | 98 | 99 | 103 | 255 | | 250 | |
| 15 | | | | -15 | 4 | 39 | 53 | 29 | 11 | 63 | 84 | 93 | 60 | | 225 | |
| 16 | | | | | 15 | -35 | 36 | 32 | 38 | 63 | 51 | 40 | 45 | 65 | 75 | |
| 17 | | | | | | -3 | 35 | 2 | 14 | 45 | 3 | 52 | 80 | 30 | 60 | 80 |
| 18 | | | | | | | 55 | 40 | 47 | 22 | -16 | -12 | 74 | 41 | | 85 |
| 19 | | | | | | | | | 20 | 1 | 9 | 13 | -45 | 23 | 54 | |
| 20 | | | | | | | | | | | -15 | 18 | 50 | | -3 | 30 |
| 21 | | | | | | | | | | | | 98 | 28 | | | |
| 22 | | | | | | | | | | | | 50 | -2 | 48 | 20 | |
| 23 | | | | | | | | | | | | -20 | | 3 | 20 | |
| 24 | | | | | | | | | | | | | | | | 20 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 0 | |
| 27 | | | | | | | | | | | | | | | | |

**Median Change in WEIGHT Between Measurements**

| Age | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 10 | 100 | 45 | 200 | 170 | 249 | 215 | 355 | | 228 | | | | | | |
| 13 | | | 130 | 150 | 125 | 135 | 95 | 15 | 90 | | 210 | | | | | |
| 14 | | | 18 | 30 | 15 | 88 | 58 | 60 | 75 | 110 | 125 | 103 | 255 | | 250 | |
| 15 | | | | -15 | 0 | 25 | 55 | 35 | 8 | 50 | 78 | 85 | 55 | | 225 | |
| 16 | | | | | 10 | -35 | 28 | 15 | 30 | 50 | 50 | 50 | 48 | 65 | 75 | |
| 17 | | | | | | -5 | 40 | -25 | 25 | 50 | 0 | 50 | 50 | 30 | 60 | 80 |
| 18 | | | | | | | 55 | 40 | 40 | 18 | -20 | -15 | 60 | 30 | | 85 |
| 19 | | | | | | | | | 20 | 5 | 15 | 25 | -40 | 23 | 48 | |
| 20 | | | | | | | | | | | 5 | 25 | 50 | | -3 | 30 |
| 21 | | | | | | | | | | | | 98 | 18 | | | |
| 22 | | | | | | | | | | | | 50 | 5 | 45 | 20 | |
| 23 | | | | | | | | | | | | -20 | | 0 | 25 | |
| 24 | | | | | | | | | | | | | | | | 20 |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | 0 | |
| 27 | | | | | | | | | | | | | | | | |

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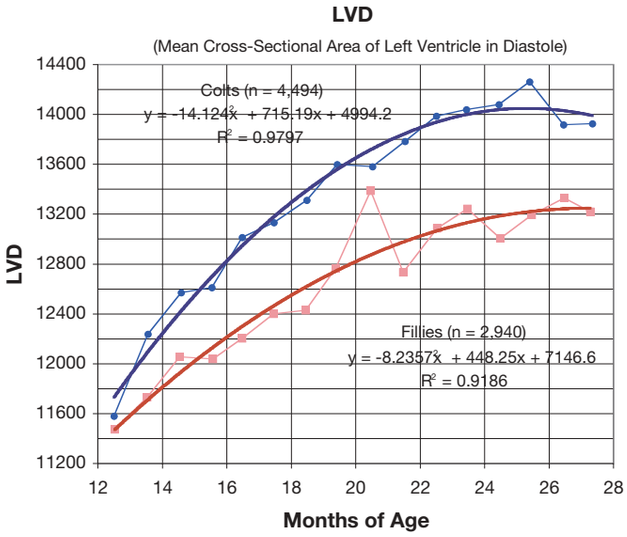
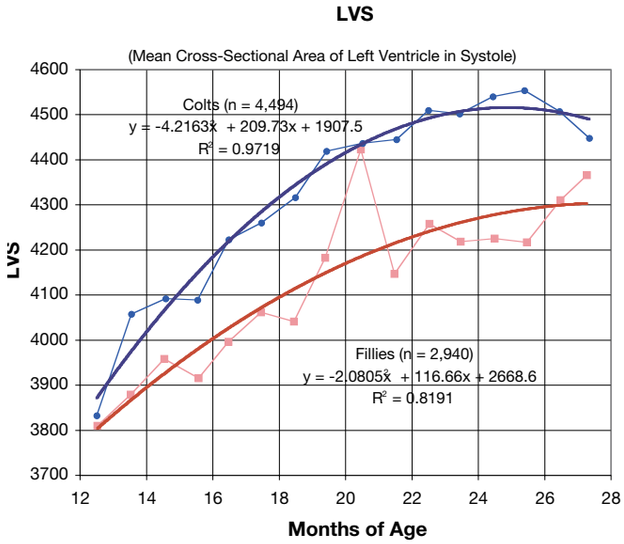
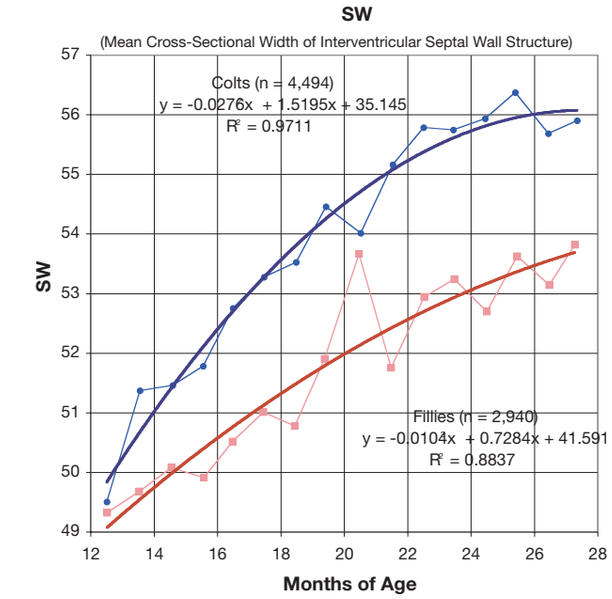
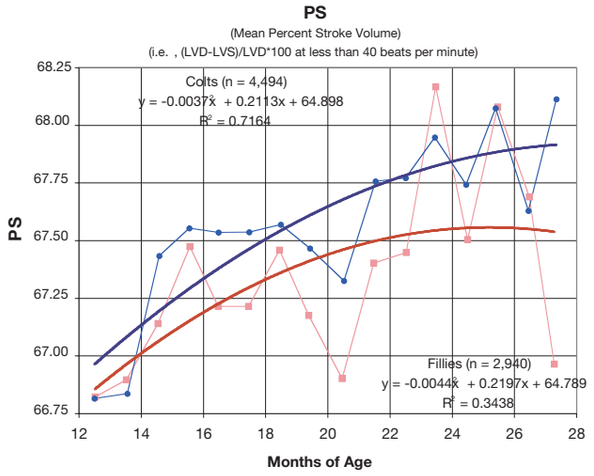
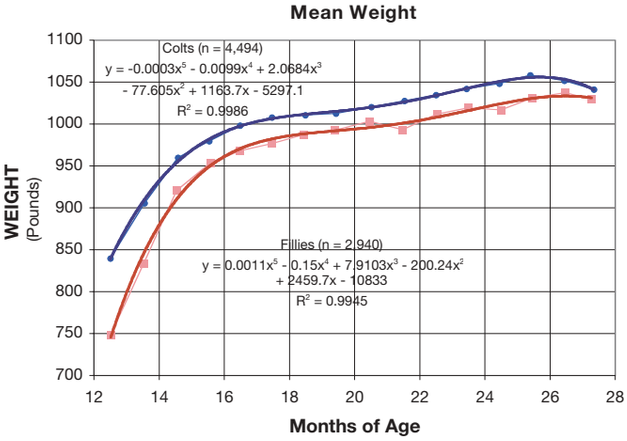
# APPENDIX B

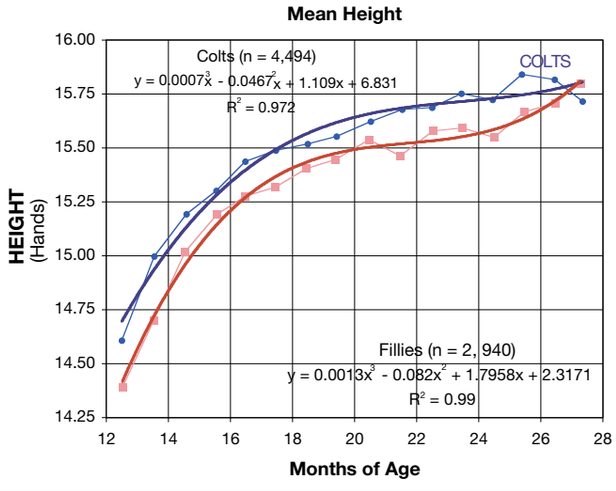


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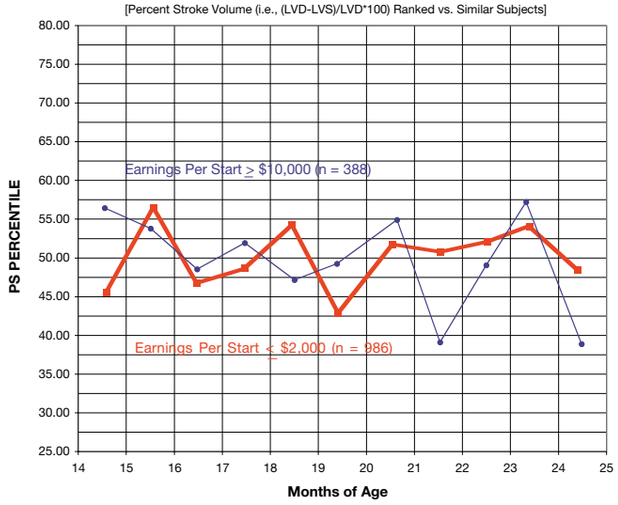
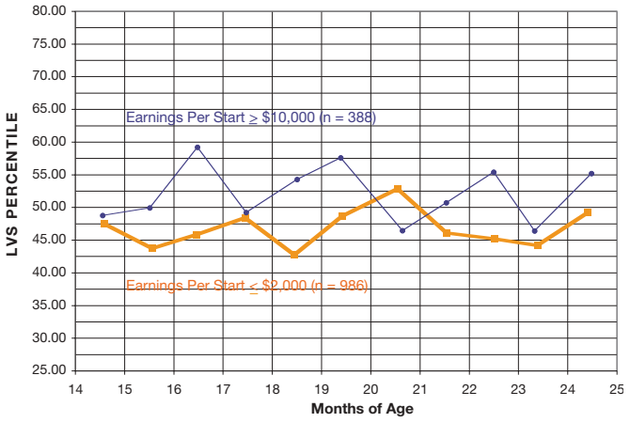
**Mean PS Percentile**

[Percent Stroke Volume (i.e., (LVD-LVS)/LVD*100) Ranked vs. Similar Subjects]



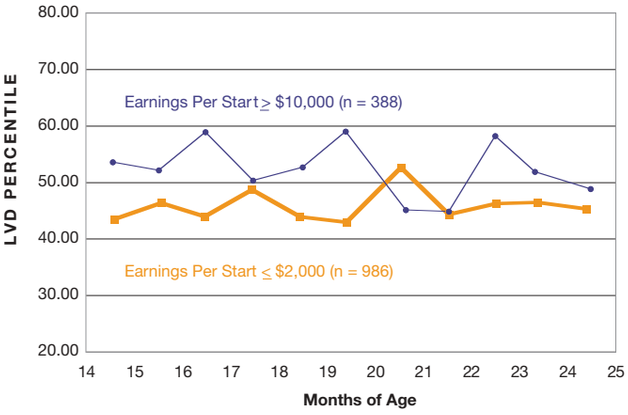

**Mean LVS Percentile**

(Cross-Sectional Area of Left Ventrical in Systole Ranked vs. Similar Subjects)



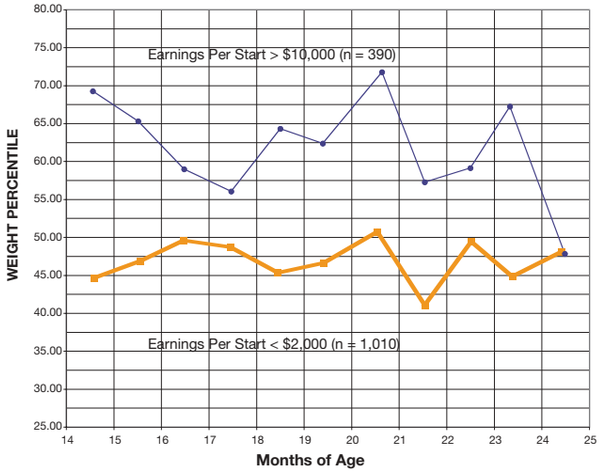

**Mean LVD Percentile**

(Cross-Sectional Area of Left Ventricle in Diastole Ranked vs. Similar Subjects)



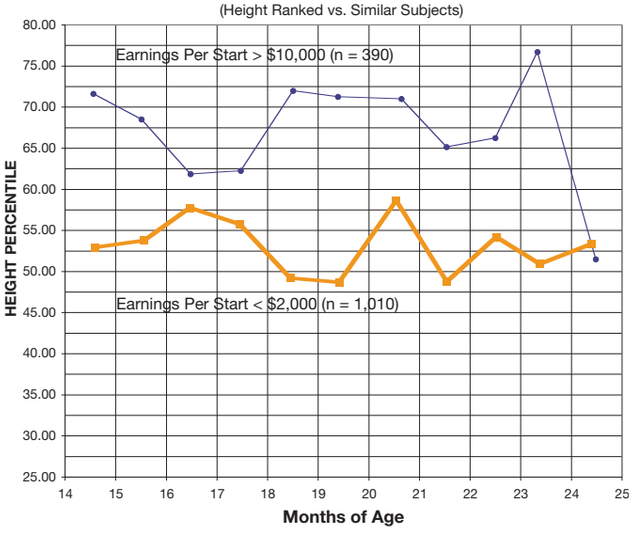

**Mean Weight Percentile**

(Weight Ranked vs. Similar Subjects)



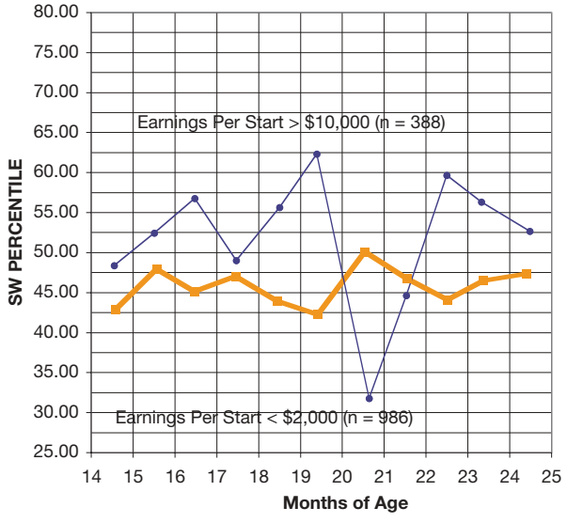

**Mean HEIGHT Percentile**

(Height Ranked vs. Similar Subjects)




**Mean Septal Wall Percentile**

(Cross-Sectional Width of Interventricular Septal Wall Structure Ranked vs. Similar Subjects)



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| MEANS -- COMBINED SEXES -- EPS GE $10,000 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| N | MONTHS | EPS | LVDRAT | LVSRAT | SWRAT | PSRAT | WTRAT | HTRAT |
| 5 | 12.616 | 49233.84 | 46.875 | 59.7917 | 46.0417 | 44.375 | 33.8298 | 47.8702 |
| 10 | 13.673 | 40049.76 | 67.2698 | 63.5189 | 63.5474 | 54.5711 | 43.8031 | 58.3209 |
| 22 | 14.5559 | 23264.61 | 53.5947 | 48.7631 | 48.3654 | 56.4353 | 69.2702 | 71.6112 |
| 46 | 15.5098 | 33410.55 | 52.1732 | 49.9327 | 52.416 | 53.8048 | 65.2963 | 68.5244 |
| 64 | 16.4786 | 25637.45 | 58.9193 | 59.2154 | 56.7412 | 48.5175 | 58.9946 | 61.846 |
| 67 | 17.4681 | 21893.94 | 50.3693 | 49.2305 | 48.9889 | 51.9344 | 56.055 | 62.2372 |
| 50 | 18.503 | 24157.4 | 52.6823 | 54.2894 | 55.6504 | 47.1449 | 64.3208 | 71.9994 |
| 14 | 19.3907 | 14635.41 | 59.0447 | 57.6136 | 62.3214 | 49.2432 | 62.3748 | 71.2704 |
| 8 | 20.6413 | 18354.41 | 45.1407 | 46.4425 | 31.7573 | 54.893 | 71.7638 | 70.9806 |
| 28 | 21.535 | 22021.86 | 44.8612 | 50.7016 | 44.6109 | 39.0941 | 57.2759 | 65.1359 |
| 34 | 22.4971 | 17820.05 | 58.2507 | 55.3847 | 59.6649 | 49.0643 | 59.1389 | 66.2584 |
| 29 | 23.3276 | 22588.46 | 51.8999 | 46.4112 | 56.2996 | 57.2037 | 67.2487 | 76.7197 |
| 28 | 24.4818 | 21230.62 | 48.8754 | 55.1888 | 52.6522 | 38.8719 | 47.8371 | 51.4829 |
| 9 | 25.4344 | 12349.93 | 50.866 | 46.4737 | 57.776 | 67.2242 | 65.987 | 70.4292 |
| 6 | 26.5817 | 21362.36 | 39.3265 | 35.5736 | 39.9255 | 47.2868 | 76.8298 | 78.3143 |
| 4 | 27.4675 | 17395.46 | 67.2222 | 64.1919 | 73.9899 | 44.798 | 49.6915 | 53.3287 |

| MEANS -- COMBINED SEXES -- EPS LE $2,000 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| N | MONTHS | EPS | LVDRAT | LVSRAT | SWRAT | PSRAT | WTRAT | HTRAT |
| 5 | 12.508 | 1559.47 | 19.173 | 25.6892 | 39.9749 | 33.4587 | 37.5103 | 35.2926 |
| 15 | 13.4733 | 900.57 | 37.7224 | 45.4669 | 44.7524 | 45.1021 | 34.7291 | 40.5123 |
| 50 | 14.5854 | 973.34 | 43.4902 | 47.48 | 42.8769 | 45.5403 | 44.6241 | 52.9084 |
| 101 | 15.564 | 994.82 | 46.3536 | 43.7058 | 47.9087 | 56.5103 | 46.8676 | 53.7778 |
| 176 | 16.4661 | 865.51 | 43.9427 | 45.8381 | 45.1069 | 46.7297 | 49.5741 | 57.7629 |
| 171 | 17.4512 | 977.15 | 48.693 | 48.4086 | 47.015 | 48.5529 | 48.7074 | 55.7436 |
| 133 | 18.4505 | 857.95 | 43.9109 | 42.7099 | 43.9025 | 54.2364 | 45.3347 | 49.1906 |
| 81 | 19.4149 | 977.85 | 42.9557 | 48.6361 | 42.2143 | 42.8748 | 46.6243 | 48.6736 |
| 47 | 20.5426 | 977.76 | 52.6598 | 52.8302 | 50.0707 | 51.745 | 50.7409 | 58.6359 |
| 56 | 21.54 | 1076.15 | 44.3562 | 46.0926 | 46.7465 | 50.774 | 41.0807 | 48.741 |
| 67 | 22.5184 | 1013.4 | 46.2685 | 45.1765 | 44.094 | 52.0769 | 49.4432 | 54.2091 |
| 70 | 23.3804 | 1126.9 | 46.4546 | 44.1548 | 46.4801 | 54.0881 | 44.8203 | 50.905 |
| 58 | 24.4053 | 975.97 | 45.3004 | 49.1915 | 47.3485 | 48.37 | 48.0833 | 53.3556 |
| 40 | 25.4915 | 869.56 | 51.3746 | 48.0316 | 53.7282 | 53.1098 | 51.1696 | 57.476 |
| 13 | 26.5015 | 958.09 | 57.3033 | 55.5822 | 61.3035 | 51.7679 | 54.5348 | 57.0246 |
| 8 | 27.4738 | 918.55 | 47.2048 | 52.4548 | 52.6215 | 43.0926 | 42.4223 | 59.7912 |

| STANDARD DEVIATIONS -- COMBINED SEXES -- EPS GE $10,000 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| N | MONTHS | EPS | LVDRAT | LVSRAT | SWRAT | PSRAT | WTRAT | HTRAT |
| 5 | 0.22165 | 40312.06 | 32.8744 | 37.3817 | 22.4162 | 33.2177 | 30.7108 | 27.3166 |
| 10 | 0.27236 | 42114.61 | 22.3988 | 24.2484 | 23.4675 | 31.1842 | 17.708 | 22.7154 |
| 22 | 0.30525 | 16491.94 | 26.8225 | 28.6052 | 22.8566 | 27.3793 | 20.3557 | 21.12 |
| 46 | 0.29728 | 38681.28 | 26.6017 | 28.4559 | 27.463 | 26.4717 | 26.4495 | 26.3435 |
| 64 | 0.28674 | 23143.64 | 27.5959 | 26.5818 | 26.0029 | 28.9743 | 28.184 | 27.7695 |
| 67 | 0.30184 | 18372.75 | 31.5108 | 30.4723 | 28.0325 | 31.7486 | 30.719 | 27.1568 |
| 50 | 0.28998 | 18612.38 | 27.9148 | 27.8554 | 22.9841 | 29.2314 | 25.9642 | 21.5854 |
| 14 | 0.28372 | 5679.15 | 30.7803 | 33.9915 | 27.5009 | 27.6681 | 27.292 | 26.2877 |
| 8 | 0.26449 | 13493.47 | 14.6105 | 28.9473 | 20.0452 | 33.9458 | 23.5092 | 21.4582 |
| 28 | 0.27542 | 14960.9 | 31.5768 | 31.4292 | 31.8759 | 29.6434 | 25.4966 | 27.1306 |
| 34 | 0.25713 | 10070.58 | 26.3362 | 28.4908 | 26.879 | 29.8039 | 25.6398 | 24.8898 |
| 29 | 0.27101 | 20862.14 | 27.8286 | 25.516 | 26.5169 | 27.8438 | 28.2328 | 22.7258 |
| 28 | 0.26562 | 11769.72 | 28.1063 | 25.6113 | 32.5075 | 25.6004 | 28.2722 | 32.5533 |
| 9 | 0.22722 | 2957.17 | 33.9395 | 33.2514 | 31.4835 | 25.8921 | 13.4735 | 13.605 |
| 6 | 0.32902 | 7439.17 | 30.2526 | 27.4126 | 28.7005 | 26.8365 | 21.6274 | 18.0986 |
| 4 | 0.21654 | 4964.97 | 8.8612 | 13.416 | 8.1711 | 20.5616 | 34.5363 | 24.5515 |

| STANDARD DEVIATIONS -- COMBINED SEXES -- EPS LE $2,000 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| N | MONTHS | EPS | LVDRAT | LVSRAT | SWRAT | PSRAT | WTRAT | HTRAT |
| 5 | 0.34281 | 269.244 | 11.0759 | 7.3796 | 8.7145 | 3.9069 | 21.828 | 30.4947 |
| 15 | 0.29308 | 673.62 | 26.8255 | 26.4185 | 27.49 | 22.5277 | 27.6457 | 31.4267 |
| 50 | 0.28217 | 643.233 | 27.5756 | 29.6938 | 28.5836 | 31.022 | 31.723 | 31.1003 |
| 101 | 0.2869 | 621.876 | 29.9244 | 28.3234 | 26.2033 | 28.2354 | 30.6592 | 28.5439 |
| 176 | 0.28746 | 598.339 | 28.7696 | 29.0231 | 28.0913 | 28.2328 | 29.4474 | 27.6321 |
| 171 | 0.29238 | 582.621 | 27.9707 | 29.0197 | 26.985 | 31.9464 | 29.5447 | 27.7825 |
| 133 | 0.27661 | 612.917 | 27.2511 | 27.9484 | 27.3293 | 29.9894 | 29.5213 | 27.5641 |
| 81 | 0.29611 | 543.712 | 26.6226 | 26.3145 | 25.9974 | 30.2977 | 31.1897 | 30.2683 |
| 47 | 0.28419 | 556.452 | 27.3714 | 27.1824 | 24.6097 | 29.9934 | 31.8028 | 29.5297 |
| 56 | 0.28062 | 527.395 | 28.4267 | 28.9499 | 29.1733 | 25.4437 | 30.5099 | 30.0443 |
| 67 | 0.28244 | 625.118 | 28.5813 | 28.9543 | 28.2827 | 31.1427 | 28.4189 | 29.9978 |
| 70 | 0.26186 | 519.093 | 30.9638 | 30.1295 | 28.6963 | 28.7889 | 26.8349 | 28.5695 |
| 58 | 0.29523 | 608.917 | 30.4344 | 29.4225 | 29.711 | 28.3495 | 26.7831 | 26.25 |
| 40 | 0.29612 | 576.411 | 30.0899 | 29.3682 | 29.0449 | 30.5664 | 27.489 | 27.446 |
| 13 | 0.27138 | 677.666 | 34.9393 | 28.4378 | 30.398 | 20.9986 | 25.5958 | 27.2227 |
| 8 | 0.29976 | 496.436 | 30.808 | 33.4571 | 30.0377 | 37.9304 | 23.9567 | 29.3148 |

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| MEDIANS -- COMBINED SEXES -- EPS GE $10,000 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| N | MONTHS | EPS | LVDRAT | LVSRAT | SWRAT | PSRAT | WTRAT | HTRAT |
| 5 | 12.62 | 43904.22 | 50 | 75 | 56.6667 | 45 | 23.913 | 46.875 |
| 10 | 13.76 | 19063.42 | 74 | 61.3636 | 54 | 63.75 | 39.6994 | 58.0592 |
| 22 | 14.58 | 16749.67 | 60.7932 | 54.4968 | 47.2139 | 61.3863 | 68.9672 | 78.4761 |
| 46 | 15.45 | 21439.77 | 49.7159 | 50.1742 | 51.9262 | 59.0684 | 66.3012 | 77.0729 |
| 64 | 16.455 | 16732.69 | 62.7067 | 62.9732 | 62.3351 | 50.8777 | 63.5388 | 66.3577 |
| 67 | 17.49 | 14562.5 | 52.0115 | 50.2358 | 51.3587 | 58.2237 | 52.7328 | 63.5287 |
| 50 | 18.545 | 15771.67 | 56.2874 | 56.2655 | 57.3555 | 42.0608 | 68.8545 | 77.6711 |
| 14 | 19.33 | 12433.86 | 65.6136 | 69.9707 | 63.0995 | 51.7483 | 74.7854 | 83.8709 |
| 8 | 20.695 | 12770.48 | 48.0979 | 42.1196 | 25.7609 | 66.0729 | 82.9782 | 73.4853 |
| 28 | 21.6 | 16670.7 | 50.9709 | 47.7099 | 34.5833 | 30.4688 | 56.985 | 69.9828 |
| 34 | 22.49 | 14638.21 | 57.0122 | 50.6993 | 63.0841 | 55.8252 | 62.0872 | 65.0992 |
| 29 | 23.31 | 17393.11 | 53.2787 | 41.2088 | 60.1124 | 64.6067 | 75.7384 | 83.758 |
| 28 | 24.495 | 18355.67 | 49.7716 | 55.5009 | 49.3507 | 35.2441 | 44.9247 | 53.0752 |
| 9 | 25.38 | 11128 | 55.2083 | 55.2083 | 73.9583 | 80.7692 | 73.5294 | 71.6346 |
| 6 | 26.645 | 21857.84 | 55.2632 | 43.1818 | 34.6154 | 47.4359 | 76.4655 | 75.7076 |
| 4 | 27.53 | 18445.88 | 65.9091 | 65.9091 | 70.4545 | 36.6667 | 56.1086 | 50.3394 |

| MEDIANS -- COMBINED SEXES -- EPS LE $2,000 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| N | MONTHS | EPS | LVDRAT | LVSRAT | SWRAT | PSRAT | WTRAT | HTRAT |
| 5 | 12.53 | 1523.33 | 21.4286 | 21.4286 | 35.7143 | 35.7143 | 26.2712 | 25 |
| 15 | 13.45 | 776.43 | 24.359 | 46.4286 | 39.7436 | 50 | 30 | 31.7204 |
| 50 | 14.63 | 1100.03 | 41.7006 | 46.6518 | 37.5959 | 42.6634 | 47.0671 | 60.7597 |
| 101 | 15.65 | 1046 | 43.5976 | 43.1122 | 48.1949 | 58.5714 | 46.0602 | 53.5714 |
| 176 | 16.47 | 778.97 | 42.0836 | 43.2152 | 46.1936 | 45.48 | 43.7322 | 64.3718 |
| 171 | 17.42 | 939.83 | 47.7401 | 43.6475 | 46.8056 | 44.877 | 50.5991 | 53.8927 |
| 133 | 18.41 | 736.36 | 42.4623 | 37.3457 | 45.4023 | 59.4118 | 46.5278 | 45.7692 |
| 81 | 19.4 | 970.17 | 39.1599 | 51.6084 | 40.3269 | 37.3228 | 41.4081 | 48.9474 |
| 47 | 20.58 | 1009 | 54.9474 | 57.8891 | 50.7976 | 54.6429 | 53.2967 | 62.1019 |
| 56 | 21.53 | 1166.96 | 40.9091 | 43.9655 | 44.2857 | 47.9167 | 36.5551 | 49.5791 |
| 67 | 22.55 | 1008.18 | 47.7273 | 42.6724 | 45.7317 | 52.4096 | 45.3216 | 60.687 |
| 70 | 23.34 | 1189.33 | 48.1679 | 43.0852 | 44.3145 | 59.1405 | 44.3223 | 50.3984 |
| 58 | 24.33 | 1040.35 | 47.2477 | 43.9597 | 46.1765 | 45.2 | 49.0262 | 58.4939 |
| 40 | 25.51 | 837.58 | 57.8041 | 41.5179 | 57.6823 | 58.2857 | 52.7093 | 61.855 |
| 13 | 26.4 | 720.67 | 44.2308 | 38.5714 | 66 | 52.8571 | 50 | 73.2759 |
| 8 | 27.47 | 1047.4 | 43.75 | 53.5417 | 55.125 | 46.0417 | 40.463 | 68.6298 |

| NUMBER OF OBSERVATIONS -- COMBINED SEXES -- EPS GE $10,000 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| N | MONTHS | EPS | LVDRAT | LVSRAT | SWRAT | PSRAT | WTRAT | HTRAT |
| 5 | 5 | 5 | 4 | 4 | 4 | 4 | 5 | 5 |
| 10 | 10 | 10 | 9 | 9 | 9 | 9 | 10 | 10 |
| 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 |
| 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 |
| 64 | 64 | 64 | 64 | 64 | 64 | 64 | 64 | 64 |
| 67 | 67 | 67 | 67 | 67 | 67 | 67 | 67 | 67 |
| 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 |
| 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| 28 | 28 | 28 | 27 | 27 | 27 | 27 | 28 | 28 |
| 34 | 34 | 34 | 33 | 33 | 33 | 33 | 34 | 34 |
| 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 |
| 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 |
| 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| 6 | 6 | 6 | 5 | 5 | 5 | 5 | 6 | 6 |
| 4 | 4 | 4 | 3 | 3 | 3 | 3 | 4 | 4 |
| 424 | 424 | 424 | 418 | 418 | 418 | 418 | 424 | 424 |

| NUMBER OF OBSERVATIONS -- COMBINED SEXES -- EPS LE $2,000 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| N | MONTHS | EPS | LVDRAT | LVSRAT | SWRAT | PSRAT | WTRAT | HTRAT |
| 5 | 5 | 5 | 3 | 3 | 3 | 3 | 5 | 5 |
| 15 | 15 | 15 | 13 | 13 | 13 | 13 | 15 | 15 |
| 50 | 50 | 50 | 46 | 46 | 46 | 46 | 50 | 50 |
| 101 | 101 | 101 | 99 | 99 | 99 | 99 | 101 | 101 |
| 176 | 176 | 176 | 174 | 174 | 174 | 174 | 176 | 176 |
| 171 | 171 | 171 | 169 | 169 | 169 | 169 | 171 | 171 |
| 133 | 133 | 133 | 131 | 131 | 131 | 131 | 133 | 133 |
| 81 | 81 | 81 | 74 | 74 | 74 | 74 | 81 | 81 |
| 47 | 47 | 47 | 46 | 46 | 46 | 46 | 47 | 47 |
| 56 | 56 | 56 | 55 | 55 | 55 | 55 | 56 | 56 |
| 67 | 67 | 67 | 65 | 65 | 65 | 65 | 67 | 67 |
| 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 |
| 58 | 58 | 58 | 57 | 57 | 57 | 57 | 58 | 58 |
| 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 |
| 8 | 8 | 8 | 6 | 6 | 6 | 6 | 8 | 8 |

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# APPENDIX C

## Months of Age Relative to Month Born and Month Measured

| Month Born | MONTH MEASURED AS YEARLINGS | | | | | | | | | | | | MONTH MEASURED AS TWO-YEAR-OLDS | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Miscellaneous yearling Measurements | | | | | | Best Yearling Auctions | | | Misc. Farms and Auctions | | | Best Two-Year-Old Auctions | | | | Misc. Farms and Auctions | | | |
| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG |
| JAN | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | | | |
| FEB | | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | | |
| MAR | | | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | |
| APR | | | | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| MAY | | | | | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| JUN | | | | | | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |
| | | | | | | | | | | | | | | | | | | | | |
| n= | 2 | 1 | 28 | 102 | 85 | 225 | 1,241 | 1,057 | 2,144 | 336 | 162 | 48 | 576 | 555 | 355 | 277 | 194 | 33 | 12 | 1 |

Note: All horses in the study (n=7,434) were measured between 12.0 and 27.99 months of age.
The number of horses measured (n=) is provided for each month of measurement.

# APPENDIX D

## Blind Test of Electronic Scale Weight Measurements of Horses vs. Weight Estimation Methods

### SUMMARY

In a blind test protocol, weights, measured with an electronic scale, and heights, measured with a height stick, of 38 Thoroughbred racehorses were used to assess the accuracy of various weight and height estimation methods.

One EQB ultrasound technician was used for the study n this appendix, and it was the same technician who took all the ultrasound measurements for the main body of text of this study, attached. This technician had more than 20 years of experience with Thoroughbred racehorses at breeding farms and at major American racetracks, as a jockey, an exercise rider, a farm manager and as a trainer. During 5 years of that time the technician had used an electronic scale to weigh racehorses daily.

This technician first estimated weight and height based solely on visual inspection. The technician then measured the girth circumference and the length of each horse with a weight tape, and measured height with a height stick. Finally, the horses were weighed on an electronic scale.

The study in this appendix shows that the technician's weight estimates proved more accurate than conventional weight tape estimates, and the technician's height estimates were consistently close to actual height stick measurements.

For the main cardiac measurement study, attached, to have physically measured the girth, length and height of more than 5,000 horses annually, even at just 4 minutes per horse, would have required 330 additional hours of hands-on work for both the technician and grooms (the horses are held while the measurements are made), increasing the costs, and greatly magnifying the risks of injury to themselves and to the nervous auction racehorses. Further, often time was at a great premium at an auction where EQB was trying to measure all the required subject horses in the allotted time period.

Given the technician's known error margins for weight and height estimation, as demonstrated in this appendix, it seems reasonable to have used the technician's estimates of weight and height based solely on visual inspection, in place of using a weight tape and height stick, which would have actually detracted from the accuracy. Furthermore, the technician's weight estimation errors were all within one standard deviation (as measured with an electronic scale) of the population mean for any subject's sex and chronological age. These weight errors would not be expected to alter multivariate discriminant classifications of horses based on echocardiographic measurements relative to weight, as those are discussed in the body of this paper.

The methods used to estimate weight were:

1. An electronic scale, accurate to within 1 lb., was used to estimate weight.
2. The ultrasound technician estimated weight based solely on physical inspection.
3. A weight tape was used to estimate weight based solely on girth circumference.
4. A constant of 40 lbs. was added as an adjustment to the weight tape's weight estimate.
5. A weight chart from Equinews, a horse journal, was used to estimate weight based on girth circumference and body length.
6. A regression equation was created with weight as the dependent variable, and with girth circumference, length and height as the independent variables.

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The technician's weight estimates, based solely on physical inspection, were similar in accuracy to the other methods studied (see Table 1).

**Table 1.** Mean Weight Estimation Error vs. Scale (n = 38)

| | Technician's Estimate | Weight Tape Estimate | Weight Tape + 40 lbs. Estimate | Article Estimate | Model Estimate |
|---|---|---|---|---|---|
| Mean Weight Error | + 36 lbs. | + 48 lbs. | + 28 lbs. | + 55 lbs. | + 28 lbs. |
| Standard Deviation | + 26 lbs. | + 26 lbs. | + 25 lbs. | + 44 lbs. | + 21 lbs. |

Compared to the electronic scale's measurements, the technician's average weight error was ± 36 lbs. The technician would be expected to be within ± 62 lbs. 75% of the time, within ± 88 lbs. 95% of the time and within ± 114 lbs. 99.9% of the time.

When an adjustment was made to weight tape estimates, by adding 40 lbs. (equivalent to adding 1.3 cm. to girth circumference), the weight tape was slightly more accurate than the technician's estimates. The average error of the adjusted weight tape measurements was ± 28 lbs. The adjusted weight tape measurement would be expected to be within ± 53 lbs. 75% of the time, within ± 78 lbs. 95% of the time and within ± 103 lbs. 99.9% of the time.

The methods used to estimate height were:

1. A height stick with a built-in level was used to measure height in hands and fingers.
2. The ultrasound technician estimated height based solely on physical inspection.

The technician's height estimates, based solely on physical inspection, were similar in accuracy to the other methods studied.

The technician's average height error was ± 0.4 inches. The technician would be expected to be within ± 0.84 inches 75 percent of the time, within ± 1.3 inches 95 percent of the time and within ± 1.7 inches 99.9 percent of the time.

## METHODOLOGY

EQB used a digital loadbar scale (Scale Systems, Chester Heights, PA) to weigh 38 Thoroughbred horses. Accuracy was quoted by Scale Systems as within 1 lb. The scale consisted of two 4' x 4' steel platforms, each weighing approximately 200 lbs., placed side-by-side and linked digitally for a total weight reading. The scales were 3 to 5 inches tall. The metal platforms were covered with a non-slip material.

The horses were weighed between 2:00 PM and 4:00 PM. Most horses cooperatively stepped onto the scale. Some fit racehorses were initially jumpy at the sound of the metal platforms, but were kept controlled by the groom and trainer.

The technician first estimated each horse's weight and height based solely on visual inspection. Next, the technician measured the horses with a weight tape (Horse Health Products) and height stick. Finally, the horses were weighed on the electronic scale. The technician was not informed of scale weights.

Weight was measured or estimated using the following methods:

- **Technician's Weight Estimate.** The technician estimated weight based solely on a visual inspection of the horse.
- **Scale.** Digital loadbar scale accurate to within 1 lb.
- **Weight Tape.** A traditional weight tape was wrapped around the girth area, providing a direct weight estimate.
- **Weight Tape + 40 lbs.** The weight tape consistently underestimated weight by 40 lbs., so an adjustment was made by adding 40 lbs. to the weight tape's weight estimate.
- **Weight Chart.** A weight chart was used based on girth and length measurements made with a weight tape.
- **Regression Model.** A linear regression equation was created to use girth, height and length measurements to estimate weight.

Height was measured or estimated using the following methods:

- **Technician's Height Estimate**. The technician estimated height based solely on a visual inspection of the horse.
- **Height Stick.** A traditional height stick with a built-in level was used to measure height.

## RESULTS

### Weight

Table 2 summarizes the means and standard deviations for weight estimates by various methods. Table 3 provides a profile of error ranges (i.e., ≤ 1%, ≤ 2%, etc.) associated with each weight estimation method.

***Technician's Weight Estimate.*** When the technician estimated weights based on her visual inspection, average weight was 1,091 lbs., median weight was 1,095 lbs., and the standard deviation was 122 lbs.

***Scale.*** 38 horses were measured. Average weight was 1,099 lbs., with a median of 1,095 lbs. and standard deviation of 122 lbs.

***Weight Tape***. Average weight was 1,059 lbs., with a median of 1,052 and standard deviation of 114 lbs.

***Weight Tape + 40 lbs.*** It was clear that the weight tape was underestimating weights consistently by about 40 lbs. Therefore, 40 lbs. were added to weight tape measurements as a standard adjustment. This brought average weights to 1,099 lbs., median weights to 1,092 lbs. and standard deviation to 114 lbs. This was the most accurate estimation method.

***Magazine Article***. A magazine article titled "What does your horse weigh?" published in Equinews/Spring 1998, by Dr. Joe D. Pagan, from Kentucky Equine Research, Inc., included a chart to estimate a horse's weight based on girth circumference and body length. This was the least accurate weight estimation method. Average weight was 1,135 lbs., median weight was 1,124 lbs. and the standard deviation was 148 lbs. Pagan's study assessed the ability of 77 horsemen plus 62 veterinarians to estimate a horse's weight. Pagan's study found that 96% of veterinarians and 68% of horsemen said they primarily made a "guestimate" of the horses' weight. Pagan stated that "over 85% of both groups underestimated all the horses' weights, by an average of 150 to 185 pounds." A comparison of Pagan's findings with the technician's "guestimates" indicated that the technician was far more accurate than the horsemen Pagan studied were.

***Regression Models.*** EQB created linear regression models to estimate weight based on girth circumference, height and length. This system produced the most accurate estimates. However, the model was created using the same data it later estimated, so the results are biased. Average weight was 1,099 lbs., median weight was 1,099 lbs. and the standard deviation was 100.5 lbs. The adjusted $R^2$ was 88%. The equation was:

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Weight = -978+9.05* girth circumference (cm.) + 2.76* length (cm.) – 5.84* height (hands)

Girth circumference was measured in centimeters, as described in the Equinews article. Length was measured in centimeters as described in the same article. Height was measured in hands with a height stick and converted to fractions, such that a horse measured at 16 hands and 2 fingers was listed as 16.5 hands. The regression equation was illogical, in that if 2 horses had identical girth and length measurements, the taller horse would weigh less than the shorter horse. This problem with the equation was likely due to high correlation between height and the other measurements in the model.

**Table 2.** Weight Estimates by Various Methods

| | Weight Estimation Method (n = 38) | | | | | |
|---|---|---|---|---|---|---|
| | Scale | Technician's Estimate | Weight Tape | Weight Tape +40 lbs. | Article Estimate | Model Estimate |
| Mean Weight (lbs.) | 1099 | 1091 | 1059 | 1099 | 1135 | 1099 |
| Standard Deviation (SD) [lbs.] | 122 | 122 | 114 | 114 | 148 | 100 |
| SD as Percent of Mean | 11.10 | 11.18 | 10.76 | 10.37 | 13.04 | 9.10 |

## Height

***Technician's Height Estimate.*** The technician's average and median height estimate based solely on physical inspection was 16.0 hands, and the standard deviation was 0.54 hands.

***Height Stick.*** The average height stick measurement of the horses was 16.01 hands. The median was 16.00 hands and the standard deviation was 0.49 hands.

**Table 3.** Percentage of Weight Estimates within Various Error Ranges (n = 38)

| Error Range | Technician's Estimate | Weight Tape | Weight Tape +40 lbs. | Article Estimate | Model Estimate |
|---|---|---|---|---|---|
| Error of 1.00% or less (approx. ≤ 11 lbs.) vs. scale weight | 16% | 11% | 37% | 16% | 24% |
| Error of 2.00% or less (approx. ≤ 22 lbs.) vs. scale weight | 34% | 18% | 47% | 24% | 37% |
| Error of 3.00% or less (approx. ≤ 33 lbs.) vs. scale weight | 61% | 26% | 61% | 34% | 74% |
| Error of 4.00% or less (approx. ≤ 44 lbs.) vs. scale weight | 68% | 47% | 68% | 50% | 84% |
| Error of 5.00% or less (approx. ≤ 55 lbs.) vs. scale weight | 76% | 63% | 84% | 61% | 89% |
| Error of 6.00% or less (approx. ≤ 66 lbs.) vs. scale weight | 87% | 74% | 97% | 68% | 92% |
| Error Exceeding 6.00% (approx. > 66 lbs.) vs. scale weight | 13% | 26% | 3% | 32% | 8% |

## SUMMARY TABLES

### Mean Weight Estimates and Standard Deviations Of Various Estimation Methods

| Weight by Estimation Method (n = 38) | | | | | | |
|---|---|---|---|---|---|---|
| | Scale | Technician's Estimate | Weight Tape | Weight Tape + 40 lbs. | Article Estimate | Model Estimate |
| Mean Weight (lbs.) | 1099 | 1091 | 1059 | 1099 | 1135 | 1099 |
| Standard Deviation (lbs) | 122 | 122 | 114 | 114 | 148 | 100 |

### Mean Weight Estimation Errors For Various Estimation Methods

| Weight Estimation Errors vs. Scale (n = 38) | | | | | | |
|---|---|---|---|---|---|---|
| Estimate | Scale | Technician's Estimate | Weight Tape | Weight Tape +40 lbs. | Article Estimate | Model |
| Mean Weight Error (lbs.) | 0 | ± 36 | ± 48 | ± 28 | ± 55 | ± 28 |
| Standard Deviation (lbs.) | 0 | ± 26 | ± 26 | ± 25 | ± 44 | ± 21 |

### Mean Height Estimates and Standard Deviations Of Various Estimation Methods

| | Height Estimation Method | |
|---|---|---|
| | Height Stick | Technician's Estimate |
| Mean Height | 16.01 hands | 16.00 hands |
| Standard Deviation | 0.49 hands | 0.54 hands |

### Mean Height Estimation Errors For Technician's Visual Estimates

| | Height Estimation Errors | |
|---|---|---|
| | Height Stick | Technician's Estimate |
| Mean Height Error | 0 hands | ± 0.10 hands |
| Standard Deviation | 0 hands | ± 0.11 hands |

# APPENDIX E

## Replacing Weight in Pounds with More General 1-5 Rating on Scale from Small to Big

In this monograph's study the ultrasound technician estimated weight in pounds and height in hands.[1] That technique could be difficult for others to duplicate. So, we asked: "What if the technician categorized weight and height into groups as defined below? Wouldn't it then be easier for others to reproduce this study's overall methodology?"

1. **Well below average**. At least 1.0 standard deviation below the mean
2. **Below average.** From 0.5 to 1.0 standard deviations below the mean
3. **Average.** Within 0.5 standard deviations of the mean
4. **Above average.** From 0.5 to 1.0 standard deviations above the mean
5. **Well above average.** At least 1.0 standard deviation above the mean

Each weight and height measurement was assigned a whole

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number from 1 to 5, with 1 equal to "well below average" and 5 equal to "well above average." HTPLUSWT was created as the sum of these weight and height ratings, providing an overall physical size estimate.

Each horse's cardiac measurements (i.e., LVD, LVS, SW, and PS) were ranked (expressed as a percentile ranging from 0 to 100) relative to those of other horses of the same sex, chronological age, and of the same 1-5 weight group.

Stepwise and discriminant results based on the 1-5 weight categories, as listed on the following pages, were very similar to those in the main study for high vs. low earners where numerical weight estimates in pounds had been assigned instead.

## STEPWISE DISCRIMINANT ANALYSIS OF THE RELATIONSHIP OF CARDIAC MEASUREMENTS TO PERFORMANCE

***High Earners vs. Low Earners.*** Stepwise analysis was used to identify statistically significant variables that could differentiate between groups of horses categorized as high and low earners, defined as:

***High Earners.*** Horses raced at least 3 times, before the end of their arbitrarily defined three-year-old racing year, with earnings per start of at least $10,000.

***Low Earners.*** Horses raced at least 3 times, before the end of their arbitrarily defined three-year-old racing year, with earnings per start of $2,000 or less.

For high vs. low earners, stepwise analysis identified the following significant variables:

Combined Sexes. HTPLUSWT, SW, LVS

Colts. HTPLUSWT, LVS

Fillies. HTPLUSWT, SW

## MULTIVARIATE DISCRIMINANT ANALYSIS OF THE RELATIONSHIP OF CARDIAC MEASUREMENTS TO PERFORMANCE

### High Earners vs. Low Earners

The variables identified by stepwise analysis were used in the high vs. low earner discriminant models .

***Combined Sexes.*** Tables 1-3 summarize discriminant analysis results for non-blind and blind tests of high vs. low earners that had raced at least 3 times (i.e., had 3 "starts") before the end of their arbitrarily defined 3 year old racing year. High earners earned at least $10,000 per start and low earners earned $2,000 or less per start. The improvement associated with discriminant modeling was statistically significant (*P*-values ≤ .0488) for both high and low earners among all groups studied.

***Non-Blind A-Z.*** Table 1 shows that among 1,501 total horses, non-blind discriminant models improved the odds of correctly classifying high earners from 27.98% without models to 37.27% with models. They improved the odds of correctly classifying low earners from 72.02% without models to 80.02% with models. The improvement associated with discriminant modeling was statistically significant for both high and low earners (*P*-values < .0001).

**Table 1.** Discriminant Model Results–High Earners vs. Low Earners-Non-Blind Tests–Combined Sexes–Names Starting with Letters A-Z

| | Pre-Model Probability | | Post-Model Probability | | |
|---|---|---|---|---|---|
| **Category** | **Ratio** | **Pct.** | **Ratio** | **Pct.** | ***P*-Value** |
| High Earners | 420/1501 | 27.98 | 259/695 | 37.27 | 0.0000 |
| Low Earners | 1081/1501 | 72.02 | 645/806 | 80.02 | 0.0000 |

***Non-Blind A-M.*** Table 2 shows that among horses with names beginning with the letters A-M, non-blind discriminant models improved the odds of correctly classifying high earners from 27.51% without models to 37.01% with models. They improved the odds of correctly classifying low earners from 72.49% without models to 80.41% with models. The improvement associated with discriminant modeling was statistically significant for both high and low earners (*P*-values ≤ .0001).

**Table 2.** Discriminant Model Results–High Earners vs. Low Earners-Non-Blind Tests–Combined Sexes–Names Starting with Letters A-M

| | Pre-Model Probability | | Post-Model Probability | | |
|---|---|---|---|---|---|
| **Category** | **Ratio** | **Pct.** | **Ratio** | **Pct.** | ***P*-Value** |
| High Earners | 247/898 | 27.51 | 151/408 | 37.01 | 0.0000 |
| Low Earners | 651/898 | 72.49 | 394/490 | 80.41 | 0.0001 |

***Blind N-Z.*** Table 3 shows that among horses with names beginning with the letters N-Z, blind discriminant models based on the A-M horses improved the odds of correctly classifying high earners from 28.69% without models to 37.41% with models. They improved the odds of correctly classifying low earners from 71.31% without models to 79.18% with models. The improvement associated with discriminant modeling was statistically significant for both high and low earners (*P*-values ≤ .0019).

**Table 3.** Discriminant Model Results – High Earners vs. Low Earners-Blind-Test–Combined Sexes–Names Starting with Letters N-Z

| | Pre-Model Probability | | Post-Model Probability | | |
|---|---|---|---|---|---|
| **Category** | **Ratio** | **Pct.** | **Ratio** | **Pct.** | ***P*-Value** |
| High Earners | 173/603 | 28.69 | 107/286 | 37.41 | 0.0011 |
| Low Earners | 430/603 | 71.31 | 251/317 | 79.18 | 0.0019 |

### Colts

Tables 4-6 summarize discriminant analysis results for high vs. low earners among colts.

***Non-Blind A-Z.*** Table 4 shows that among 891 colts, non-blind discriminant models improved the odds of correctly classifying high earners from 26.60% without models to 34.51% with models. They improved the odds of correctly classifying low earners from 73.40% without models to 80.65% with models. The improvement associated with discriminant modeling was statistically significant for both high and low earners (*P*-values ≤ .0004).

**Table 4.** Discriminant Model Results–High Earners vs. Low Earners-Non-Blind Tests–Colts–Names Starting with Letters A-Z

| | Pre-Model Probability | | Post-Model Probability | | |
|---|---|---|---|---|---|
| **Category** | **Ratio** | **Pct.** | **Ratio** | **Pct.** | ***P*-Value** |
| High Earners | 237/891 | 26.60 | 147/426 | 34.51 | 0.0002 |
| Low Earners | 654/891 | 73.40 | 375/465 | 80.65 | 0.0004 |

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***Non-Blind A-M.*** Table 5 shows that among colts with names beginning with the letters A-M, non-blind discriminant models improved the odds of correctly classifying high earners from 26.44% without models to 32.16% with models. They improved the odds of correctly classifying low earners from 73.56% without models to 78.72% with models. The improvement associated with discriminant modeling was statistically significant for both high and low earners (*P*-values ≤ .0488).

**Table 5.** Discriminant Model Results–High Earners vs. Low Earners-Non-Blind Tests–Colts–Names Starting with Letters A-M

| | Pre-Model Probability | | Post-Model Probability | | |
|---|---|---|---|---|---|
| **Category** | **Ratio** | **Pct.** | **Ratio** | **Pct.** | ***P*-Value** |
| High Earners | 142/537 | 26.44 | 82/255 | 32.16 | 0.0385 |
| Low Earners | 395/537 | 73.56 | 222/282 | 78.72 | 0.0488 |

***Blind N-Z.*** Table 6 shows that among colts with names beginning with the letters N-Z, blind discriminant models based on the A-M horses improved the odds of correctly classifying high earners from 26.84% without models to 35.71% with models. They improved the odds of correctly classifying low earners from 73.16% without models to 81.18% with models. The improvement associated with discriminant modeling was statistically significant for both high and low earners (*P*-values ≤ .0135).

**Table 6.** Discriminant Model Results – High Earners vs. Low Earners-Blind Test–Colts–Names Starting with Letters N-Z

| | Pre-Model Probability | | Post-Model Probability | | |
|---|---|---|---|---|---|
| **Category** | **Ratio** | **Pct.** | **Ratio** | **Pct.** | ***P*-Value** |
| High Earners | 95/354 | 26.84 | 60/168 | 35.71 | 0.0093 |
| Low Earners | 259/354 | 73.16 | 151/186 | 81.18 | 0.0135 |

## Fillies

Tables 7-9 summarize discriminant analysis results for high vs. low earners among fillies.

***Non-Blind A-Z.*** Table 7 shows that among 610 fillies, non-blind discriminant models improved the odds of correctly classifying high earners from 30.00% without models to 42.44% with models. They improved the odds of correctly classifying low earners from 70.00% without models to 79.94% with models. The improvement associated with discriminant modeling was statistically significant for both high and low earners (*P*-values < .0001).

**Table 7.** Discriminant Model Results – High Earners vs. Low Earners-Non-Blind Tests–Fillies–Names Starting with Letters A-Z

| | Pre-Model Probability | | Post-Model Probability | | |
|---|---|---|---|---|---|
| **Category** | **Ratio** | **Pct.** | **Ratio** | **Pct.** | ***P*-Value** |
| High Earners | 183/610 | 30.00 | 115/271 | 42.44 | 0.0000 |
| Low Earners | 427/610 | 70.00 | 271/339 | 79.94 | 0.0001 |

***Non-Blind A-M.*** Table 8 shows that among fillies with names beginning with the letters A-M, non-blind discriminant models improved the odds of correctly classifying high earners from 29.09% without models to 42.86% with models. They improved the odds of correctly classifying low earners from 70.91% without models to 81.16% with models. The improvement associated with discriminant modeling was statistically significant for both high and low earners (*P*-values ≤ .0012).

**Table 8.** Discriminant Model Results – High Earners vs. Low Earners-Non-Blind Tests – Fillies – Names Starting with Letters A-M

| | Pre-Model Probability | | Post-Model Probability | | |
|---|---|---|---|---|---|
| **Category** | **Ratio** | **Pct.** | **Ratio** | **Pct.** | ***P*-Value** |
| High Earners | 105/361 | 29.09 | 66/154 | 42.86 | 0.0002 |
| Low Earners | 256/361 | 70.91 | 168/207 | 81.16 | 0.0012 |

***Blind N-Z.*** Table 9 shows that among fillies with names beginning with the letters N-Z, blind discriminant models based on the A-M horses improved the odds of correctly classifying high earners from 31.33% without models to 41.03% with models. They improved the odds of correctly classifying low earners from 68.67% without models to 77.27% with models. The improvement associated with discriminant modeling was statistically significant for both high and low earners (*P*-values ≤ .0332).

**Table 9.** Discriminant Model Results – High Earners vs. Low Earners-Blind Test – Fillies – Names Starting with Letters N-Z

| | Pre-Model Probability | | Post-Model Probability | | |
|---|---|---|---|---|---|
| **Category** | **Ratio** | **Pct.** | **Ratio** | **Pct.** | ***P*-Value** |
| High Earners | 78/249 | 31.33 | 48/117 | 41.03 | 0.0238 |
| Low Earners | 171/249 | 68.67 | 102/132 | 77.27 | 0.0332 |

# APPENDIX F

## Using Subjective Visual ratings of Ultrasound cardiac Images

Late in this study, the ultrasound technician began recording subjective ratings (ranging from 1 = poor to 5 = excellent) to describe the images on the ultrasound machine – visual impressions of ecogenicity (e.g., clarity, sharpness of contrast, type and symmetry of shapes, smoothness of functioning of structures) of the 2D images. Therefore these ratings were made for approximately 25% of horses measured in this whole study.

These ratings were recorded as: Ecogenicity (EC and VEC); general shape of the image at diastole and systole (CATE and SQ); clarity and sharpness of contrast of left ventricle during diastole and systole (DCL and SCL); smoothness of left ventricle during diastole and systole (DSM and SSM); blood backflow from left ventricle during diastole and systole (DBF and SBF); double-beat wave (XB); overall irregularity of the heart image (IRRG); how well the valve closes (NVC); and overall clearness of image in diastole (PVAR).

## USING SUBJECTIVE VISUAL CARDIAC PARAMETERS TO PREDICT RACING PERFORMANCE

### Stepwise Discriminant Analysis of the Relationship of These Cardiac Measurements to Performance

***High Earners vs. Low Earners.*** Stepwise analysis identified statistically significant variables that could differentiate between groups of horses categorized as high and low earners, defined as:

***High Earners.*** Horses raced at least 3 times before the end of the arbitrarily defined 3-year-old racing year, with earnings per start of at least $10,000.

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***Low Earners.*** Horses raced at least 3 times before the end of the arbitrarily defined 3-year-old racing year, with earnings per start of $2,000 or less.

The variables considered in the analysis were LVD, LVS, SW, PS, HTWT, EC, CATE, DCL, DSM, DBF, XB, VEC, SQ, SCL, SSM, SBF, IRRG, NVC, and PVAR. Among these variables, LVD, LVS, SW, PS were standardized for sex, age and weight, and HTWT was standardized for sex and age.

For high vs. low earners, with the additional consideration of visual ratings as described above, stepwise analysis identified the following significant variables:

Combined Sexes. HTWT, PVAR, SBF

Colts. SBF, HTWT, DSM

Fillies. HTWT, PVAR, SQ, DSM

## Multivariate Discriminant Analysis of the Relationship of These Cardiac Measurements to Performance–Combined Sexes

***High Earners vs. Low Earners.*** In order to work with higher numbers of horses for discriminant analyses using the subjective visual variables (assessed each on a scale from 1 to 5), horses for which we only had two-year-old race records were added to the groups of raced horses used elsewhere to assess racing performance levels in this study. These were horses born in 1998. Thus, unlike everywhere else in this monograph, this appendix's analysis of raced horses had some horses with 2-and 3-year-old race records and others with just 2-year-old race records.

The variables used in discriminant analysis were those identified as significant by stepwise analysis. Only combined sex models were analyzed due to limited number of horses.

***Non-Blind A-Z.*** Table 1 shows that among 394 horses, non-blind discriminant models improved the odds of correctly classifying high earners from 33.25% without models to 43.93% with models. They improved the odds of correctly classifying low earners from 66.75% without models to 75.11% with models. All results were statistically significant ($P$-values ≤ .0083).

**Table 1.** Discriminant Model Results Using Subjective 1-5 Variables–High vs. Low Earners-Non-Blind Tests–Combined Sexes–Names Starting with Letters A-Z

| | Pre-Model Probability | | Post-Model Probability | | |
|---|---|---|---|---|---|
| Category | Ratio | Pct. | Ratio | Pct. | *P*-Value |
| High Earners | 131/394 | 33.25 | 76/173 | 43.93 | 0.0029 |
| Low Earners | 263/394 | 66.75 | 166/221 | 75.11 | 0.0083 |

***Non-Blind A-M.*** Table 2 shows that among horses with names beginning with the letters A-M, non-blind discriminant models improved the odds of correctly classifying high earners from 34.18% without models to 41.28% with models. They improved the odds of correctly classifying low earners from 65.82% without models to 71.88% with models. Results were not statistically significant ($P$ ≤ .1499).

**Table 2.** Discriminant Model Results Using Subjective 1-5 Variables –High vs. Low Earners-Non-Blind Tests-Combined Sexes–Names Starting with Letters A-M

| | Pre-Model Probability | | Post-Model Probability | | |
|---|---|---|---|---|---|
| Category | Ratio | Pct. | Ratio | Pct. | *P*-Value |
| High Earners | 81/237 | 34.18 | 45/109 | 41.28 | 0.1188 |
| Low Earners | 156/237 | 65.82 | 92/128 | 71.88 | 0.1499 |

***Blind N-Z.*** Table 3 shows that among horses with names beginning with the letters N-Z, blind discriminant models based on the A-M horses improved the odds of correctly classifying high earners from 31.85% without models to 43.42% with models. They improved the odds of correctly classifying low earners from 68.15% without models to 79.01% with models. All results were statistically significant ($P$-values < .0444).

**Table 3.** Discriminant Model Results Using Subjective 1-5 Variables–High vs. Low Earners-Blind Test–Combined Sexes–Names Starting with Letters N-Z

| | Pre-Model Probability | | Post-Model Probability | | |
|---|---|---|---|---|---|
| Category | Ratio | Pct. | Ratio | Pct. | *P*-Value |
| High Earners | 50/157 | 31.85 | 33/76 | 43.42 | 0.0300 |
| Low Earners | 107/157 | 68.15 | 64/81 | 79.01 | 0.0444 |

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# APPENDIX G

## The Relationship of Selected Two-dimensional Echocardiographic Measurements to the Racing Performance of 5,431 yearlings and 2,003 2-year-old Thoroughbred Racehorses

### MULTIVARIATE DISCRIMINANT ANALYSIS MODEL RATINGS OF CARDIAC MEASUREMENTS VS. SUBSEQUENT RACING PERFORMANCE

Multivariate Discriminant Analysis Model Ratings of
Cardiac Measurements vs. Subsequent Racing Performance*

| Horses with 0+ Starts (n=4,668) | | |
|---|---|---|
| Model Rating | ≥ 50% | < 50% |
| Number of Horses | 2,294 | 2,374 |
| Pct. Relative to n=4,668 | 49% | 51% |
| Average Earnings | $46,270 | $34,591 |
| Average Starts | 6.15 | 6.95 |
| Average Earnings Per Start | $5,160 | $3,682 |

| Horses with 3+ Starts (n=3,150) | | |
|---|---|---|
| Model Rating | ≥ 50% | < 50% |
| Number of Horses | 1,520 | 1,630 |
| Pct. Relative to n=3,150 | 48% | 52% |
| Average Earnings | $69,079 | $49,785 |
| Average Starts | 9.04 | 9.90 |
| Average Earnings Per Start | $7,311 | $4,957 |

| Model Rating | ≥ 55% | < 45% |
|---|---|---|
| Number of Horses | 1,687 | 1,784 |
| Pct. Relative to n=4,668 | 36% | 38% |
| Average Earnings | $49,554 | $33,835 |
| Average Starts | 6.07 | 7.13 |
| Average Earnings Per Start | $5,564 | $3,560 |

| Model Rating | ≥ 55% | < 45% |
|---|---|---|
| Number of Horses | 1,111 | 1,228 |
| Pct. Relative to n=3,150 | 35% | 39% |
| Average Earnings | $74,439 | $48,518 |
| Average Starts | 8.97 | 10.13 |
| Average Earnings Per Start | $7,938 | $4,738 |

| Model Rating | ≥ 60% | < 40% |
|---|---|---|
| Number of Horses | 1,119 | 1,160 |
| Pct. Relative to n=4,668 | 24% | 25% |
| Average Earnings | $52,127 | $30,360 |
| Average Starts | 6.05 | 7.33 |
| Average Earnings Per Start | $5,753 | $3,220 |

| Model Rating | ≥ 60% | < 40% |
|---|---|---|
| Number of Horses | 739 | 817 |
| Pct. Relative to n=3,150 | 23% | 26% |
| Average Earnings | $78,340 | $42,570 |
| Average Starts | 8.93 | 10.19 |
| Average Earnings Per Start | $8,370 | $4,193 |

| Model Rating | ≥ 65% | < 35% |
|---|---|---|
| Number of Horses | 590 | 642 |
| Pct. Relative to n=4,668 | 13% | 14% |
| Average Earnings | $52,443 | $29,080 |
| Average Starts | 5.85 | 7.59 |
| Average Earnings Per Start | 5,936 | $3,097 |

| Model Rating | ≥ 65% | < 35% |
|---|---|---|
| Number of Horses | 369 | 458 |
| Pct. Relative to n=3,150 | 12% | 15% |
| Average Earnings | $83,285 | $40,240 |
| Average Starts | 9.12 | 10.42 |
| Average Earnings Per Start | 9,146 | $3,947 |

| Model Rating | ≥ 70% | < 30% |
|---|---|---|
| Number of Horses | 215 | 267 |
| Pct. Relative to n=4,668 | 5% | 6% |
| Average Earnings | $60,226 | $26,476 |
| Average Starts | 5.45 | 7.80 |
| Average Earnings Per Start | $7,007 | $2,726 |

| Model Rating | ≥ 70% | < 30% |
|---|---|---|
| Number of Horses | 129 | 199 |
| Pct. Relative to n=3,150 | 4% | 6% |
| Average Earnings | $99,974 | $35,184 |
| Average Starts | 8.85 | 10.26 |
| Average Earnings Per Start | $11,448 | $3,452 |

| Model Rating | ≥ 75% | < 25% |
|---|---|---|
| Number of Horses | 22 | 48 |
| Pct. Relative to n=4,668 | 0% | 1% |
| Average Earnings | $129,821 | $25,338 |
| Average Starts | 4.73 | 8.67 |
| Average Earnings Per Start | $15,541 | $2,264 |

| Model Rating | ≥ 75% | < 25% |
|---|---|---|
| Number of Horses | 13 | 39 |
| Pct. Relative to n=3,150 | 0% | 1% |
| Average Earnings | $219,194 | $30,997 |
| Average Starts | 7.54 | 10.46 |
| Average Earnings Per Start | $26,049 | $2,693 |

**All horses:**

Were born by 1997, so we had three-year-old data for 2000 racing year.
Had at least 5 other similar horses in database in terms of sex, weight (within 25 lbs.) and age (within 30 days).
Were not known to be foreign raced.

The chart on the left included horses regardless of whether or not they ever started.
The chart on the right included only horses that raced at least 3 times.
* Race records were through these horses' three-year-old year only.
See Exhibit PM05290203 for detailed discriminant analysis results.

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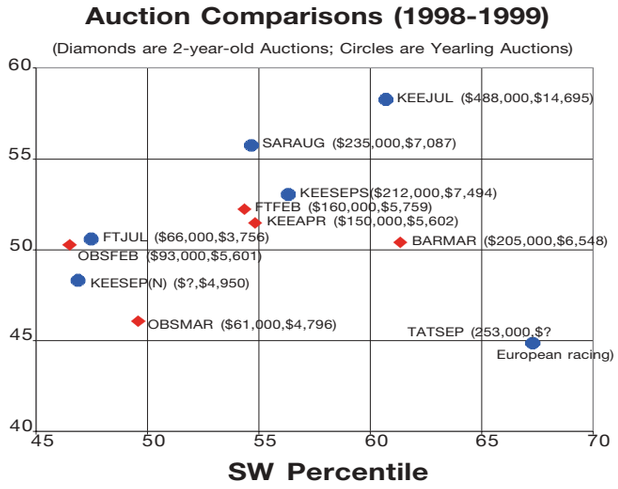
# APPENDIX H

## Auction Comparisons

Cardiac measurements from the following auctions were compared for the years 1998 and 1999 (see multivariate discriminate run #PM11140101):

### Yearlings

FTJUL: Fasig-Tipton July
KEEJUL: Keeneland July
KEESEPS: Keeneland September Select (1st day)
KEESEPN: Keeneland September Non-Select (2nd-final day)
SARAUG: Saratoga August
TATSEP: Tattersalls Houghton September (Europe) 2-Year-Olds
BARMAR: Barretts March
FTFEB: Fasig-Tipton February (Calder)
KEEAPR: Keeneland April
OBSFEB: Ocala Breeders' Sale February (Calder)
OBSMAR: Ocala Breeders' Sale March (Ocala)




The *Auction Comparisons* graph plots an interventricular septal wall structure thickness (SW) and overall horse physical size (HTWT) percentiles from different auctions. These variables were identified during discriminant analysis as the most significant predictors of subsequent earnings. In parentheses following each sale ID is average sale price (for all horses at the sale) and average earnings per start through each horse's 3-year-old year (among horses measured), respectively. SW was generally higher for horses at higher-priced sales.

# APPENDIX I

## Influence of Pedigree on Cardiac Measurements

While this study did not focus on pedigree, pedigree was recorded for each subject measured. A cursory review of the relationship between pedigree and cardiac measurements indicates that it could be a useful subject for further study. The following observations are provided in order to highlight possible areas of interest, and are not intended to represent a thorough or statistically sound analysis of the subject.

Northern Dancer frequently appeared in the sire and damsire lines commonly associated with large cardiovascular systems with thick left ventricle septal walls. Northern Dancer was far less prevalent among smaller cardiac systems.

Not all horses with large cardiac systems were large horses, yet size is also an important predictor of success. Deputy Minister and his sons (French Deputy and Dehere) sired foals with consistently large hearts and large size. Deputy Minister is by Vice Regent, by Northern Dancer. While not from the Northern Dancer line, Kris S., by Roberto, also sired foals with large hearts and physical size.

### SIRES OF MULTIPLE OFFSPRING

Average interventricular septal wall structural thickness in diastole and physical size, as measured by SW (standardized for age, sex and weight) and HTWT (standardized for age and sex), were calculated for the offspring of the 72 sires that had at least 30 offspring in this study (see Excel Spreadsheet: Pedigree Nov 19 2001).

**Northern Dancer** sired 3 (30%) of the 10 sires of offspring with the highest average interventricular septal wall structural thickness. Among the 10 sires of offspring with the highest average interventricular septal wall structural thickness, 6/10 (60%) of their sire lines traced back to Northern Dancer by the fourth generation.

Northern Dancer sired none of the 10 sires of horses with the smallest average interventricular septal wall structural thickness. Among the 10 sires of offspring with the smallest average interventricular septal wall structural thickness, 2/10 (20%) of their sire lines traced back to Northern Dancer by the fourth generation.

The offspring of 4 sires had both high interventricular septal wall structural thickness and large size. Among these 4 sires, one was Deputy Minister, and two were his sons (French Deputy and Dehere). Deputy Minister's sire, Vice Regent, was by Northern Dancer. The other sire whose offspring had high interventricular septal wall structural thickness and large size was Kris S., by Roberto.

### DAMS OF MULTIPLE OFFSPRING

Sixty-four dams had at least 4 foals represented in this study. Among the 10 dams whose foals had the highest average SW, average SW among foals ranged from 0.73 to 1.2. This was about $1^1/_2$ times as high as for the offspring of the top sires and 3 times higher than among the offspring of the top damsires.

Foals out of these top 10 dams had average earnings of $84,850 through their 3-year-old year, compared to $36,500 for the 40 foals out of the 10 dams with the lowest average SW among foals. 23% of foals from the 10 best dams earned at least $100,000, compared to 10% of foals of the 10 worst dams.

### DAMSIRES OF MULTIPLE OFFSPRING

Forty-six damsires had at least 30 offspring represented in this study. We created 2 groups of these damsires: The "top 6 damsires'" offspring had the highest average SW and the "worst 6 damsires'" offspring had the lowest average SW.

Northern Dancer sired 3 (50%) of the top 6 damsires. Average SW among the top 6 damsires ranged from 0.20 to 0.40–about half that of the top 10 sires, and a third that of the top 10 dams.

Northern Dancer sired none of the 6 damsires associated

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with foals that had the lowest interventricular septal wall structural thickness.

Interestingly, among 21 foals in this study that raced in North America (none of which were known to race outside of North America) with race records through their 3-year-old year, and with Northern Dancer as their damsire, none earned more than $100,000. The foals' cardiac measurements and physical size were above average.

## Influence of Pedigree on Cardiac Measurements
## (SW standardized for age, sex, and weight; HTWT standardized for age and sex)

**Damsires of Horses with Large SW**

| Rank | Damsire | n | HTWT | SW | Damsire's Sire (DS2) | DS3 | DS4 |
|---|---|---|---|---|---|---|---|
| 1 | Nureyev | 43 | -0.1534 | 0.3956 | **Northern Dancer** | Nearctic | Nearco |
| 2 | Secretariat | 119 | 0.0714 | 0.3379 | Bold Ruler | Nasrullah | Nearco |
| 3 | Danzig | 89 | -0.1499 | 0.2491 | **Northern Dancer** | Nearctic | Nearco |
| 4 | Blushing Groom | 44 | 0.1262 | 0.2415 | Red God | Nasrullah | Nearco |
| 5 | Alleged | 60 | -0.0526 | 0.2197 | Hoist The Flag | Tom Rolfe | Ribot |
| 6 | Vice Regent | 63 | 0.0535 | 0.2110 | **Northern Dancer** | Nearctic | Nearco |

**Damsires of Horses with Small SW**

| Rank | Damsire | n | HTWT | SW | Damsire's Sire (DS2) | DS3 | DS4 |
|---|---|---|---|---|---|---|---|
| 1 | Star De Naskra | 32 | -0.0364 | -0.3530 | Naskra | Nasram | Nasrullah |
| 2 | Spectacular Bid | 30 | 0.0447 | -0.3066 | Bold Bidder | Bold Ruler | Nasrullah |
| 3 | Stop The Music | 34 | -0.3648 | -0.2782 | Hail To Reason | Turn-To | Royal Charger |
| 4 | Raja Baba | 35 | -0.1175 | -0.2357 | Bold Ruler | Nasrullah | Nearco |
| 5 | Fappiano | 89 | 0.3929 | -0.2267 | Mr. Prospector | Raise A Native | Native Dancer |
| 6 | Damascus | 52 | 0.1896 | -0.2264 | Sword Dancer | Sunglow | Sun Again |

**Sires of Horses with Large SW**

| Rank | Sire | n | HTWT | SW | Sire's Sire (S2) | S3 | S4 |
|---|---|---|---|---|---|---|---|
| 1 | Caerleon | 32 | -0.0153 | 0.8041 | Nijinsky II | **Northern Dancer** | Nearctic |
| 2 | Kris S. | 86 | 0.4836 | 0.5534 | Roberto | Hail To Reason | Turn-To |
| 3 | Storm Cat | 120 | -0.1048 | 0.5242 | Storm Bird | **Northern Dancer** | Nearctic |
| 4 | Gulch | 109 | -0.1564 | 0.4836 | Mr. Prospector | Raise A Native | Native Dancer |
| 5 | Sadler's Wells | 92 | -0.1068 | 0.4581 | **Northern Dancer** | Nearctic | Nearco |
| 6 | Marquetry | 31 | -0.1337 | 0.4439 | Conquistador Cielo | Mr. Prospector | Raise A Native |
| 7 | Storm Bird | 62 | -0.0876 | 0.4336 | **Northern Dancer** | Nearctic | Nearco |
| 8 | French Deputy | 32 | 0.1966 | 0.3890 | Deputy Minister | Vice Regent | **Northern Dancer** |
| 9 | Nureyev | 81 | -0.6360 | 0.3767 | **Northern Dancer** | Nearctic | Nearco |
| 10 | Broad Brush | 52 | -0.2011 | 0.3760 | Ack Ack | Battle Joined | Armageddon |
| 11 | Danzig | 85 | -0.0270 | 0.3615 | **Northern Dancer** | Nearctic | Nearco |
| 12 | Gone West | 127 | 0.0044 | 0.3574 | Mr. Prospector | Raise A Native | Native Dancer |
| 13 | Woodman | 147 | -0.1530 | 0.3573 | Mr. Prospector | Raise A Native | Native Dancer |
| 14 | Dehere | 75 | 0.1046 | 0.3566 | Deputy Minister | Vice Regent | **Northern Dancer** |
| 15 | Deputy Minister | 126 | 0.2475 | 0.3332 | Vice Regent | **Northern Dancer** | Nearctic |

**Sires of Horses with Small SW**

| Rank | Sire | n | HTWT | SW | Sire's Sire (S2) | S3 | S4 |
|---|---|---|---|---|---|---|---|
| 1 | Housebuster | 42 | 0.0650 | -0.6286 | Mt. Livermore | Blushing Groom | Red God |
| 2 | Mt. Livermore | 94 | -0.2919 | -0.4505 | Blushing Groom | Red God | Nasrullah |
| 3 | Rubiano | 54 | -0.2779 | -0.4148 | Fappiano | Mr. Prospector | Raise A Native |
| 4 | Devil's Bag | 53 | 0.0906 | -0.3923 | Halo | Hail To Reason | Turn-To |
| 5 | Conquistador Cielo | 40 | 0.1121 | -0.3755 | Mr. Prospector | Raise A Native | Native Dancer |
| 6 | Colonial Affair | 30 | 0.8734 | -0.3694 | Pleasant Colony | His Majesty | Ribot |
| 7 | Dayjur | 30 | -0.2012 | -0.3589 | Danzig | **Northern Dancer** | Nearctic |
| 8 | Tabasco Cat | 45 | 0.1664 | -0.3210 | Storm Cat | Storm Bird | **Northern Dancer** |
| 9 | Clever Trick | 31 | -0.0500 | -0.3110 | Icecapade | Nearctic | Nearco |
| 10 | Dynaformer | 64 | 0.4688 | -0.3037 | Roberto | Hail To Reason | Turn-To |

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| Dams of Horses with Large SW | | | | | | | |
|---|---|---|---|---|---|---|---|
| Rank | Dam | n | HTWT | SW | Damsire | Damsire's Sire (D2) | D3 |
| 1 | Creaking Board | 4 | 0.3601 | 1.1745 | Night Shift | **Northern Dancer** | Nearctic |
| 2 | La Spia | 4 | -0.2536 | 1.0665 | Capote | Seattle Slew | Bold Reasoning |
| 3 | Barbara Sue | 4 | 0.2076 | 0.9820 | Big Spruce | Herbager | Vandale |
| 4 | Bank Key | 4 | -0.1485 | 0.9399 | Key to the Mint | Graustark | Ribot |
| 5 | Green Boundary | 4 | 0.3765 | 0.9390 | Robellino | Roberto | Hail To Reason |
| 6 | Charming Tigress | 4 | 0.7694 | 0.8491 | Tim The Tiger | Nashua | Nasrullah |
| 7 | Escrow Agent | 4 | 0.2070 | 0.8019 | El Gran Senor | **Northern Dancer** | Nearctic |
| 8 | Beware of the Cat | 4 | 0.8540 | 0.7615 | Caveat | Cannonade | Bold Bidder |
| 9 | Love from the Air | 4 | 1.2740 | 0.7540 | Deputy Minister | Vice Regent | **Northern Dancer** |
| 10 | Weresolucky | 4 | -0.3790 | 0.7286 | Lucky North | **Northern Dancer** | Nearctic |

| Dams of Horses with Small SW | | | | | | | |
|---|---|---|---|---|---|---|---|
| Rank | Dam | n | HTWT | SW | Damsire | Damsire's Sire (D2) | D3 |
| 1 | Thrill Me Again | 4 | -0.6522 | -0.9987 | Naskra | Nasram | Nasrullah |
| 2 | Caitland | 4 | 0.1947 | -0.8227 | Key to the Kingdom | Bold Ruler | Nasrullah |
| 3 | Marianna's Girl | 4 | -0.2886 | -0.6797 | Dewan | Bold Ruler | Nasrullah |
| 4 | Delagating | 4 | 1.4753 | -0.6066 | Deputy Minister | Vice Regent | **Northern Dancer** |
| 5 | Evil Elaine | 4 | -0.4983 | -0.5554 | Medieval Man | Noholme II | Star Kingdom |
| 6 | Icy Folly | 4 | 0.0622 | -0.4878 | Icecapade | Nearctic | Nearco |
| 7 | Saratoga Madame | 4 | -0.7978 | -0.4864 | Mr. Prospector | Raise a Native | Native Dancer |
| 8 | Distaff Magic | 4 | -0.4736 | -0.4706 | Fluorescent Light | Herbager | Vandale |
| 9 | Babe's Joy | 4 | -0.2075 | -0.4473 | King of the Sea | Sailor | Eight Thirty |
| 10 | Windmill Point | 4 | -0.5411 | -0.4394 | Storm Bird | **Northern Dancer** | Nearctic |

# APPENDIX J

## Chi-Square Analysis of Performance vs. Normalized Heart Size and Normalized Physical Size


## SUMMARY

EQB's cardiac research, as described in this monograph, i.e., the attached main body of the text of EQB's main cardiac study, has shown that two-dimensional ultrasound measurements (normalized for sex, age and weight) of the hearts of young, unraced Thoroughbred racehorses are predictive of earnings and distance ability. This same cardiac research has also shown that a young Thoroughbred racehorse's physical size (percentage rank when compared only to similar sex and chronological age), as measured by height and weight, is similarly predictive of earnings and distance ability.

It is important to emphasize here that all the heart size measurements in this appendix, and in much of the study as a whole, were reported in terms of percentiles, determined relative to other horses the same sex, age (within 30 days), and weight (within 25 lbs.). Thus, heart size measurements, as used in this study, were independent of a horse's sex, age or weight. Weight was similarly normalized versus sex and chronological age.

Heart size was measured in terms of variables labeled as LVD, LVS, PS, and SW, as described in the main cardiac study. Physical size was measured in terms of the variable labeled as HTWT, which is the product of height times weight. Thus, 5 key variables examined in this study were the variables labeled as LVD, LVS, PS, SW, and HTWT.

Subject to the definitions listed above, this study looked at earnings and successful racing distances relative to

- Physical size only
- Heart size only
- Physical size and heart size

Various statistical methods were used to show the predictive nature of each of the 5 cardiac measurement variables individually, and in conjunction with physical size (i.e., HTWT).

### This study showed that:

- Physical size (normalized for sex and chronological age), and heart size (normalized for sex, chronological age, and for the overall physical size of the horse) were more predictive when combined.
- High earners, generally, and high earner routers were more likely to be above average in normalized physical size and in normalized heart size.

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- Low earners were more likely to be below average in normalized physical size and normalized heart size.
- High earner sprinters were more likely to be above average in normalized physical size and normalized heart wall thickness, as measured by SW. High earner sprinters were only slightly more likely to have above average normalized LVD and LVS as below average normalized LVD and LVS.

Statistics describing these relationships are summarized in this appendix in two- and 3-way cross-tabulated contingency tables, from which chi-square and related statistics were derived to assess the significance of differences between the cardiac measurements of different earnings and distance performance groups of horses.

## DESCRIPTION OF HORSES STUDIED

The 3,150 horses in this study were a subset from EQB's main cardiac study. This subset was determined by taking only those horses that went on to race and meet minimum criteria for doing so, e.g., number of races. All horses in this subset raced at least 3 times in North America by the end of their arbitrarily defined 3-year-old calendar racing year. A minimum of 3 career starts was required because it is impossible to know the level of ability of most horses that never raced, or that raced just a couple of times. The earnings performance of the 3,150 horses in this study was high, compared to "average" horses, due to the minimum starts requirement.

**Summary Statistics for 3,150 Horses Studied (Horses raced at least 3 times in North America by the end of their arbitrarily defined 3-year-old calendar racing year):**

Average money earned through 3-year-old year: $59,095

Percent that earned at least $59,095: 25.3%

Median money earned through 3-year-old year: $29,395

Average earnings per start (EPS): $6,093

Percent with EPS ≥ $6,093: 28.4%

Median earnings per start (EPS): $3,360

Percentage with EPS ≥ $10,000: 13.3%

Percentage with EPS ≤ $2,000: 33.7%

To place these statistics into perspective, in North America, average career earnings are approximately $30,000 and average earnings per start (EPS) are approximately $1,500.

Table 1 shows the percentage of horses with EPS of at least $10,000 among horses grouped by normalized physical size and normalized heart variable sizes. Overall, 13.3% of horses earned at least $10,000 per start.

**Table 1.** Percentage of Horses with Earnings Per Start (EPS) of at least $10,000 Based on Percentile Rankings for Normalized Individual Variables

| | Percentile Rankings | | | |
|---|---|---|---|---|
| | **0-25%** | **25-50%** | **50-75%** | **75-100%** |
| HTWT | 7.6 | 12.8 | 14.5 | 17.8 |
| LVD | 11.6 | 11.1 | 13.4 | 17.5 |
| LVS | 11.4 | 11.8 | 13.9 | 16.3 |
| SW | 10.8 | 13.1 | 13.1 | 16.3 |
| PS | 14.3 | 11.4 | 14.0 | 13.3 |
| Average* | 10.4 | 12.2 | 13.7 | 17.0 |

**Average was calculated excluding PS, which wasn't generally predictive.*

Table 1 shows that as the normalized physical size and normalized heart size increased, except for PS, so did the percentage of high earners. The percentage of horses with EPS ≥ $10,000 was below average (13.3% was average for all horses studied) for groups below the 50th percentile. Horses in the 75th and higher percentiles had the highest percentage with EPS ≥ $10,000, and, on average, fared 28% better than the average for all horses (i.e., 17% vs. 13.3%).

The normalized HTWT percentage rank (the product of height times weight) was the most predictive individual variable among those listed in Table 1. Table 2 (next page) looks at how well each cardiac variable, when combined with HTWT, predicted EPS ≥ $10,000.

Table 2 shows that all groups of horses with normalized HTWT percentiles of 75-100% (right-hand column) produced higher than average percentages of horses with EPS ≥ $10,000 (13.3% was average for all horses studied). All groups of horses with HTWT percentiles of 0-25% (left-hand column) produced fewer than average percentages of horses with EPS ≥ $10,000, regardless of heart size.

Shaded areas in Table 2 show groups with higher than average percentages of horses with EPS ≥ $10,000. Horses with HTWT percentiles in the 25-50% range generally performed as well as average as long as normalized cardiac variables were above average, i.e., when pre-adjusted for the sex, chronological age and normalized overall size of the subject. The highest percentages of high earners occurred when percentiles for both normalized HTWT and normalized heart size were at least 75%. In cases where normalized HTWT and normalized heart size percentiles were at least 75%, the average percentage of horses with EPS ≥ $10,000 was 23.0% (excluding PS) – a 73% improvement over random odds of selecting high earners (13.3% vs. 23.0%).

**Table 2.** Percentage of Horses that Earned at least $10,000 Per Start Based on Percentiles for Normalized Individual Cardiac Variables Combined with Normalized HTWT. N.B.: The normalized cardiac variable percentile ranking refers to the percentile rank when compared only to other horses of the same age, sex and physical size (HTWT), and 100% is the largest.

| | HTWT | | | |
|---|---|---|---|---|
| | **0-25%** | **25-50%** | **50-75%** | **75-100%** |
| **0-25%** | | | | |
| LVD | 6.7 | 10.4 | 13.7 | 16.4 |
| LVS | 6.9 | 10.5 | 12.3 | 16.2 |
| SW | 6.7 | 12.3 | 11.3 | 13.5 |
| PS | 7.8 | 13.1 | 15.1 | 21.4 |
| **25-50%** | | | | |
| LVD | 9.4 | 9.6 | 11.9 | 13.4 |
| LVS | 8.0 | 10.9 | 14.5 | 14.0 |
| SW | 7.0 | 11.4 | 14.7 | 18.3 |
| PS | 5.9 | 10.4 | 13.2 | 15.4 |
| **50-75%** | | | | |
| LVD | 4.7 | 15.2 | 14.5 | 18.8 |
| LVS | 7.3 | 14.6 | 15.9 | 16.9 |
| SW | 9.1 | 12.3 | 14.4 | 16.4 |
| PS | 8.3 | 13.4 | 14.6 | 19.2 |
| **75-100%** | | | | |
| LVD | 11.0 | 16.8 | 17.9 | 22.2 |
| LVS | 8.4 | 16.0 | 15.1 | 24.0 |
| SW | 7.5 | 15.8 | 17.6 | 22.7 |
| PS | 8.2 | 14.0 | 15.0 | 15.3 |

*Above average performance categories are bolded.*

## Extremely High Earners

Among 3,150 horses that raced at least 3 times by the end of their 3-year-old year, 101 (3.2%) earned at least $250,000 and had earnings per start of at least $20,000. The following tables show

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the percentage of extremely high earners with various combinations of above and below average normalized HTWT and normalized cardiac measurements (LVD, LVS, SW and PS).

These tables show that a disproportionately high percentage of extremely high earners were large physically (for their sex, and chronological age), and had large hearts even relative to other large horses, i.e., when cardiac measurement variables were normalized for sex, chronological age, and physical size. Extremely high earners were 3 times more likely to have above average normalized HTWT and normalized cardiac measurements than to have below average normalized HTWT and normalized cardiac measurements. When breaking normalized HTWT categories down further, 4% of extremely high earners had HTWT of 0-25%, while 38% had HTWT of 75-100%–a nearly ten-fold difference. The general population, e.g., when not looking at racing performance success variables, is fairly evenly distributed among the 4 quartiles listed in the tables.

| | HTWT | |
|---|---|---|
| | **Below Average** | **Above Average** |
| **LVD** | | |
| Below Average | 17% | 19% |
| Above Average | 15% | 50% |

| | HTWT | |
|---|---|---|
| | **Below Average** | **Above Average** |
| **SW** | | |
| Below Average | 15% | 23% |
| Above Average | 17% | 46% |

| | HTWT | |
|---|---|---|
| | **Below Average** | **Above Average** |
| **LVS** | | |
| Below Average | 18% | 24% |
| Above Average | 14% | 45% |

| | HTWT | |
|---|---|---|
| | **Below Average** | **Above Average** |
| **PS** | | |
| Below Average | 12% | 31% |
| Above Average | 20% | 38% |

## High Earner Routers

The definition of high earner routers here matched that in the body of the attached text of EQB's main cardiac study. High earner routers raced at least 3 times at distances of at least 8.5 furlongs, with earnings per start of at least $10,000 at those distances.

The following tables show the percentage of high earner routers with various combinations of above and below average normalized HTWT and normalized cardiac measurements (LVD, LVS, SW and PS).

These tables show that a disproportionately high percentage of high earner routers were large physically (compared to other subjects of the same sex and chronological age), and had large hearts even relative to other large horses, i.e., when normalized for sex, chronological age, height and weight. High earner routers were 4 times more likely to have above average normalized HTWT and normalized cardiac measurements than to have below average normalized HTWT and normalized cardiac measurements. The general population is fairly evenly distributed among the 4 quartiles listed in the tables when not considering the racing performance variables.

| | HTWT | |
|---|---|---|
| | **Below Average** | **Above Average** |
| **LVD** | | |
| Below Average | 12% | 25% |
| Above Average | 15% | 48% |

| | HTWT | |
|---|---|---|
| | **Below Average** | **Above Average** |
| **LVS** | | |
| Below Average | 13% | 26% |
| Above Average | 13% | 47% |

| | HTWT | |
|---|---|---|
| | **Below Average** | **Above Average** |
| **SW** | | |
| Below Average | 10% | 31% |
| Above Average | 16% | 43% |

| | HTWT | |
|---|---|---|
| | **Below Average** | **Above Average** |
| **PS** | | |
| Below Average | 12% | 37% |
| Above Average | 14% | 37% |

## High Earner Sprinters

The definition of high earner sprinters here matched that in the attached body of the text of EQB's main cardiac study. High earner sprinters raced at least 3 times at distances below 7.0 furlongs and had earnings per start of at least $10,000 at those sprinting distances. High earner sprinters earned no more than $2,000 per start at router distances of at least 8.5 furlongs.

The following tables show the percentage of high earner sprinters with various combinations of above and below average normalized HTWT and normalized cardiac measurements (LVD, LVS, SW and PS).

These tables show that high earner sprinters were fairly evenly distributed by normalized physical size and the 2 normalized heart size variables of LVD and LVS, especially compared to distributions of the same variables for high earner routers. However, the tables show that high earner sprinters were about 50% more likely to have been big physically (normalized HTWT) with above average normalized SW and/or PS, than to be small physically, with small SW and/or PS. High earner sprinters were most likely to be relatively big horses with thick heart walls (normalized SW). The general population, i.e., all levels of racing performance, and not just sprinters or high earner sprinters, is fairly evenly distributed among the four quartiles listed in the tables.

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| | HTWT | |
|---|---|---|
| | **Below Average** | **Above Average** |
| **LVD** | | |
| Below Average | 22% | 27% |
| Above Average | 24% | 26% |

| | HTWT | |
|---|---|---|
| | **Below Average** | **Above Average** |
| **LVS** | | |
| Below Average | 23% | 28% |
| Above Average | 24% | 26% |

| | HTWT | |
|---|---|---|
| | **Below Average** | **Above Average** |
| **SW** | | |
| Below Average | 22% | 22% |
| Above Average | 25% | 32% |

| | HTWT | |
|---|---|---|
| | **Below Average** | **Above Average** |
| **PS** | | |
| Below Average | 19% | 23% |
| Above Average | 28% | 31% |

## Low Earners

The definition of low earners in this appendix matched that in the attached main body of the text of this monograph on EQB's main cardiac study. Low earners earned no more than $2,000 per start and had at least 3 starts, i.e. raced 3 times.

The following tables show the percentage of low earners with various combinations of above and below average normalized HTWT and normalized cardiac measurements (LVD, LVS, SW and PS).

These tables show that a disproportionately high percentage of low earners were relatively small physically, and had small hearts even relative to other small horses. Low earners were about 1.5 times more likely to have below average normalized HTWT and normalized cardiac measurements than to have above average normalized HTWT and normalized cardiac measurements. The general population is fairly evenly distributed among the 4 quartiles listed in the tables when not considering subsets of different levels of racing performance.

| | HTWT | |
|---|---|---|
| | **Below Average** | **Above Average** |
| **LVD** | | |
| Below Average | 31% | 23% |
| Above Average | 25% | 20% |

| | HTWT | |
|---|---|---|
| | **Below Average** | **Above Average** |
| **LVS** | | |
| Below Average | 32% | 23% |
| Above Average | 24% | 20% |

| | HTWT | |
|---|---|---|
| | **Below Average** | **Above Average** |
| **SW** | | |
| Below Average | 31% | 23% |
| Above Average | 25% | 20% |

| | HTWT | |
|---|---|---|
| | **Below Average** | **Above Average** |
| **PS** | | |
| Below Average | 28% | 21% |
| Above Average | 29% | 22% |

## CHI-SQUARE ANALYSIS

Chi-square analysis was used to examine how Thoroughbreds' normalized heart size (as measured by LVD, LVS, PS, and SW) and normalized physical size (as measured by HTWT, which is the product of height times weight) relate to subsequent earnings and racing distances. Chi-square methods were used to show the predictive nature of each variable individually. Chi-square methods were then used to show the predictive nature of each cardiac variable, when used in conjunction with HTWT.

Physical size and heart size were more predictive when combined. High earners and high earner routers were more likely to be above average in normalized physical size and normalized heart size (as measured by LVD, LVS, and SW). Low earners were more likely to be below average in normalized physical size and normalized heart size. High earner sprinters tended to be above average in normalized physical size with thick heart walls (as measured by normalized SW).

Statistics describing these relationships are summarized in two- and 3-way cross-tabulated contingency tables.

## Variables listed within each table are:

- ***Earnings groups.*** Earnings groups were defined in terms of earnings per start (EPS) through each horse's 3-year-old year. All horses in this appendix raced at least 3 times. The EPS groups studied were: EPS ≤ $2K, EPS = $2-10K, EPS ≥ $10K, and EPS ≥ $20K. The EPS ≥ $20K group also had the additional requirement of having earned at least $250,000.
- ***Distance groups.*** High earner routers had earnings per start of at least $10,000 at distances of 8.5 furlongs and further, with at least 3 starts at those route distances. High earner sprinters had earnings per start of at least $10,000 at distances shorter than 7.0 furlongs, with at least 3 starts at those sprint distances. To prevent overlap between high earner routers and sprinters, the sprinters had the additional restriction of earnings per start of no more than $2,000 at distances of 8.5 furlongs and further.
- ***Cardiac variables.*** The cardiac variables studied were LVD, LVS, SW, and PS, as defined in EQB's main cardiac study. Additionally, physical size of the horses was represented by the variable HTWT, which was the product of each horse's height times weight. These variables were normalized into

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percentile rankings within subsets determined by sex, chronological age, height and weight.

- ***f.*** This is the frequency, which was the number of horses that were in each category.
- ***%.*** This was the percentage associated with the frequency reported in each column (i.e., the percentage relative to the column total).

## Statistics listed at the bottom of each table are:

- ***Chi-square ($X^2$).*** The Chi-square statistic is a test of the significance of differences among categories of variables being studied. In this study, chi-square was used to see if cardiac measurements were different between different earnings and distance groups of horses.
- ***P-value (P).*** This is the level of confidence associated with the chi-square statistic. A value of $P \leq 0.05$ would indicate the existence of a statistically significant difference between categories.
- ***Total horses (n).*** This is the sum of all the categories represented in the table.
- ***Degrees of freedom (DF)***. This is a statistical term used with chi-square, which reports the number of cells that are free to vary. This is measured as (number of rows – 1) times (number of columns –1) within the contingency tables.

**Table 1**

**Earnings Per Start by Normalized HTWT**

| | HTWT | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0-25% | | 25-50% | | 50-75% | | 75-100% | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 309 | 41.3% | 292 | 36.6% | 241 | 30.0% | 219 | 27.3% | 1061 | 33.7% |
| EPS = $2-10K | 382 | 51.1% | 404 | 50.6% | 445 | 55.5% | 440 | 54.9% | 1671 | 53.0% |
| EPS ≥ $10K | 57 | 7.6% | 102 | 12.8% | 116 | 14.5% | 143 | 17.8% | 418 | 13.3% |
| Total | 748 | 100.0% | 798 | 100.0% | 802 | 100.0% | 802 | 100.0% | 3150 | 100.0% |

Chi-square ($\underline{x}^2$ ) = 62.1, $P \leq .001$, n = 3150, DF = 6

**Table 1B**
**Earnings Per Start by Normalized HTWT**

| | HTWT | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0-25% | | 25-50% | | 50-75% | | 75-100% | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 309 | 98.7% | 292 | 91.2% | 241 | 88.6% | 219 | 85.2% | 1061 | 91.3% |
| EPS ≥ $20K | 4 | 1.3% | 28 | 8.8% | 31 | 11.4% | 38 | 14.8% | 101 | 8.7% |
| Total | 313 | 100.0% | 320 | 100.0% | 272 | 100.0% | 257 | 100.0% | 1162 | 100.0% |

Chi-square ($\underline{x}^2$ ) = 36.2, $P \leq .001$, n = 1162, DF = 3

**Table 2**

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**Table 2**
**Earnings Per Start by Normalized LVD**

| | LVD | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0-25% | | 25-50% | | 50-75% | | 75-100% | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 326 | 40.2% | 255 | 33.6% | 262 | 29.7% | 218 | 31.2% | 1061 | 33.7% |
| EPS = $2-10K | 390 | 48.2% | 420 | 55.3% | 502 | 56.9% | 359 | 51.4% | 1671 | 53.0% |
| EPS ≥ $10K | 94 | 11.6% | 84 | 11.1% | 118 | 13.4% | 122 | 17.4% | 418 | 13.3% |
| Total | 810 | 100.0% | 759 | 100.0% | 882 | 100.0% | 699 | 100.0% | 3150 | 100.0% |

Chi-square ($\chi^2$) = 36.8, $P \leq 0.001$, n = 3150, DF = 6

**Table 2B**
**Earnings Per Start by Normalized LVD**

| | LVD | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0-25% | | 25-50% | | 50-75% | | 75-100% | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 326 | 94.5% | 255 | 93.8% | 262 | 88.8% | 218 | 87.2% | 1061 | 91.3% |
| EPS ≥ $20K | 19 | 5.5% | 17 | 6.2% | 33 | 11.2% | 32 | 12.8% | 101 | 8.7% |
| Total | 345 | 100.0% | 272 | 100.0% | 295 | 100.0% | 250 | 100.0% | 1162 | 100.0% |

Chi-square ($\chi^2$) = 14.1, $P < 0.003$, n = 1162, DF = 3

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## Appendix J

**Table 3**
**Earnings Per Start by Normalized LVS**

| | LVS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0-25% | | 25-50% | | 50-75% | | 75-100% | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 310 | 38.8% | 276 | 33.9% | 243 | 30.4% | 232 | 31.4% | 1061 | 33.7% |
| EPS = $2-10K | 398 | 49.8% | 442 | 54.3% | 445 | 55.7% | 386 | 52.3% | 1671 | 53.0% |
| EPS ≥ $10K | 91 | 11.4% | 96 | 11.8% | 111 | 13.9% | 120 | 16.3% | 418 | 13.3% |
| Total | 799 | 100.0% | 814 | 100.0% | 799 | 100.0% | 738 | 100.0% | 3150 | 100.0% |

Chi-square ($\chi^2$) = 21.5, $P \leq 0.002$, n = 3150, DF = 6

**Table 3B**
**Earnings Per Start by Normalized LVS**

| | LVS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0-25% | | 25-50% | | 50-75% | | 75-100% | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 310 | 94.2% | 276 | 92.3% | 243 | 89.7% | 232 | 88.2% | 1061 | 91.3% |
| EPS ≥ $20K | 19 | 5.8% | 23 | 7.7% | 28 | 10.3% | 31 | 11.8% | 101 | 8.7% |
| Total | 329 | 100.0% | 299 | 100.0% | 271 | 100.0% | 263 | 100.0% | 1162 | 100.0% |

Chi-square ($\chi^2$) = 8.0, $P < 0.046$, n = 1162, DF = 3

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**Table 4**
**Earnings Per Start by Normalized SW**

| | SW | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0-25% | | 25-50% | | 50-75% | | 75-100% | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 295 | 40.0% | 281 | 35.3% | 283 | 30.9% | 202 | 28.9% | 1061 | 33.7% |
| EPS = $2-10K | 363 | 49.2% | 411 | 51.6% | 513 | 56.0% | 384 | 54.8% | 1671 | 53.0% |
| EPS ≥ $10K | 80 | 10.8% | 104 | 13.1% | 120 | 13.1% | 114 | 16.3% | 418 | 13.3% |
| Total | 810 | 100.0% | 759 | 100.0% | 882 | 100.0% | 699 | 100.0% | 3150 | 100.0% |

Chi-square ($x^2$) = 28.7%, P < .001, n = 3150, DF = 6

**Table 4B**
**Earnings Per Start by Normalized SW**

| | SW | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0-25% | | 25-50% | | 50-75% | | 75-100% | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 295 | 95.8% | 281 | 91.8% | 283 | 88.7% | 202 | 88.2% | 1061 | 91.3% |
| EPS ≥ $20K | 13 | 4.2% | 25 | 8.2% | 36 | 11.3% | 27 | 11.8% | 101 | 8.7% |
| Total | 308 | 100.0% | 306 | 100.0% | 319 | 100.0% | 229 | 100.0% | 1162 | 100.0% |

Chi-square ( $x^2$)= 13.3, P ≤ .004, n = 1162, DF = 3

**Table 5**
**Earnings Per Start by Normalized PS**

| | PS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0-25% | | 25-50% | | 50-75% | | 75-100% | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 272 | 33.5% | 251 | 34.3% | 254 | 32.3% | 284 | 34.6% | 1061 | 33.7% |
| EPS = $2-10K | 424 | 52.2% | 397 | 54.3% | 422 | 53.7% | 428 | 52.1% | 1671 | 53.0% |
| EPS ≥ $10K | 116 | 14.3% | 83 | 11.4% | 110 | 14.0% | 109 | 13.3% | 418 | 13.3% |
| Total | 812 | 100.0% | 731 | 100.0% | 786 | 100.0% | 821 | 100.0% | 3150 | 100.0% |

Chi-square ($x^2$ ) = 4.2%, *P* ≤ 0.647, n = 3150, DF = 6

**Table 5B**
**Earnings Per Start by Normalized PS**

| | PS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0-25% | | 25-50% | | 50-75% | | 75-100% | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 272 | 91.0% | 251 | 94.0% | 254 | 90.4% | 284 | 90.2% | 1061 | 91.3% |
| EPS ≥ $20K | 27 | 9.0% | 16 | 6.0% | 27 | 9.6% | 31 | 9.8% | 101 | 8.7% |
| Total | 299 | 100.0% | 267 | 100.0% | 281 | 100.0% | 315 | 100.0% | 1162 | 100.0% |

Chi-square ($x^2$ ) = 3.3, *P* ≤ 0.345, n = 1162, DF = 3

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**Table 6**

**Earnings Per Start by HTWT and LVD**

| | HTWT < Average | | | | HTWT ≥ Average | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | LVD < Average | | LVD ≥ Average | | LVD < Average | | LVD ≥ Average | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 332 | 41.0% | 269 | 36.5% | 249 | 32.8% | 211 | 25.0% | 1061 | 33.7% |
| EPS = $2-10K | 404 | 50.0% | 382 | 51.8% | 406 | 53.4% | 479 | 56.8% | 1671 | 53.0% |
| EPS ≥ $10K | 73 | 9.0% | 86 | 11.7% | 105 | 13.8% | 154 | 18.2% | 418 | 13.3% |
| Total | 809 | 100.0% | 737 | 100.0% | 760 | 100.0% | 844 | 100.0% | 3150 | 100.0% |

Chi-square ($x^2$) = 66.0, $P \leq 0.001$, n = 3150, DF = 6 HTWT and LVD normalized.

**Table 6B**

**Earnings Per Start by HTWT and LVD**

| | HTWT < Average | | | | HTWT ≥ Average | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | LVD < Average | | LVD ≥ Average | | LVD < Average | | LVD ≥ Average | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 332 | 95.1% | 269 | 94.7% | 249 | 92.9% | 211 | 80.8% | 1061 | 91.3% |
| EPS ≥ $20K | 17 | 4.9% | 15 | 5.3% | 19 | **7.1%** | 50 | **19.2%** | 101 | 8.7% |
| Total | 349 | 100.0% | 284 | 100.0% | 268 | 100.0% | 261 | 100.0% | 1162 | 100.0% |

Chi-square ($x^2$) = 47.5, $P \leq 0.001$, n = 1162, DF = 3 HTWT and LVD normalized.

**Table 7**

**Earnings Per Start by HTWT and LVS**

| | HTWT < Average | | | | HTWT ≥ Average | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | LVS < Average | | LVS ≥ Average | | LVS < Average | | LVS ≥ Average | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 343 | 41.2% | 258 | 36.2% | 243 | 31.2% | 217 | 26.3% | 1061 | 33.7% |
| EPS = $2-10K | 414 | 49.7% | 372 | 52.2% | 426 | 54.6% | 459 | 55.7% | 1671 | 53.0% |
| EPS ≥ $10K | 76 | 9.1% | 83 | 11.6% | 111 | 14.2% | 148 | 18.0% | 418 | 13.3% |
| Total | 833 | 100.0% | 713 | 100.0% | 780 | 100.0% | 824 | 100.0% | 3150 | 100.0% |

Chi-square ($x^2$) = 59.6, $P \leq 0.001$, n = 3150, DF = 6 HTWT and LVS normalized.

**Table 7B**

**Earnings Per Start by HTWT and LVS**

| | HTWT < Average | | | | HTWT ≥ Average | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | LVS < Average | | LVS ≥ Average | | LVS < Average | | LVS ≥ Average | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 343 | 95.0% | 258 | 94.8% | 243 | 91.0% | 217 | 82.8% | 1061 | 91.3% |
| EPS ≥ $20K | 18 | 5.0% | 14 | 5.2% | 24 | **9.0%** | 45 | **17.2%** | 101 | 8.7% |
| Total | 361 | 100.0% | 272 | 100.0% | 267 | 100.0% | 262 | 100.0% | 1162 | 100.0% |

Chi-square ($x^2$) = 34.3, $P \leq 0.001$, n = 1162, DF = 3 HTWT and LVS normalized.

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**Table 8**
**Earnings Per Start by HTWT and SW**

| | HTWT < Average | | | | HTWT ≥ Average | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | SW < Average | | SW ≥ Average | | SW < Average | | SW ≥ Average | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 331 | 42.9% | 270 | 34.9% | 245 | 32.1% | 215 | 25.5% | 1061 | 33.7% |
| EPS = $2-10K | 368 | 47.7% | 418 | 54.0% | 406 | 53.3% | 479 | 56.9% | 1671 | 53.0% |
| EPS ≥ $10K | 73 | 9.4% | 86 | 11.1% | 111 | 14.6% | 148 | 17.6% | 418 | 13.3% |
| Total | 772 | 100.0% | 774 | 100.0% | 762 | 100.0% | 842 | 100.0% | 3150 | 100.0% |

Chi-square ($x^2$) = 67.4, $P \leq 0.001$, n = 3150, DF = 6. HTWT and SW normalized.

**Table 8B**
**Earnings Per Start by HTWT and SW**

| | HTWT < Average | | | | HTWT ≥ Average | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | SW < Average | | SW ≥ Average | | SW < Average | | SW ≥ Average | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 331 | 95.7% | 270 | 94.1% | 245 | 91.4% | 215 | 82.4% | 1061 | 91.3% |
| EPS ≥ $20K | 15 | 4.3% | 17 | 5.9% | 23 | 8.6% | 46 | 17.6% | 101 | 8.7% |
| Total | 346 | 100.0% | 287 | 100.0% | 268 | 100.0% | 261 | 100.0% | 1162 | 100.0% |

Chi-square ($x^2$) = 37.3, $P \leq .001$, n = 1162, DF = 3. HTWT and SW normalized.

**Table 9**
**Earnings Per Start by HTWT and PS**

| | HTWT < Average | | | | HTWT ≥ Average | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PS < Average | | PS ≥ Average | | PS < Average | | PS ≥ Average | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 295 | 39.0% | 306 | 38.7% | 228 | 29.0% | 232 | 28.4% | 1061 | 33.7% |
| EPS = $2-10K | 390 | 51.6% | 396 | 50.1% | 431 | 54.8% | 454 | 55.6% | 1671 | 53.0% |
| EPS ≥ $10K | 71 | 9.4% | 88 | 11.1% | 128 | 16.2% | 131 | 16.0% | 418 | 13.3% |
| Total | 756 | 100.0% | 790 | 100.0% | 787 | 100.0% | 817 | 100.0% | 3150 | 100.0% |

Chi-square ($x^2$) = 48.6, $P < .001$, n = 3150, DF = 6. HTWT and PS normalized.

**Table 9B**
**Earnings Per Start by HTWT and PS**

| | HTWT < Average | | | | HTWT ≥ Average | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PS < Average | | PS ≥ Average | | PS < Average | | PS ≥ Average | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 295 | 96.1% | 306 | 93.9% | 228 | 88.0% | 232 | 85.9% | 1061 | 91.3% |
| EPS ≥ $20K | 12 | 3.9% | 20 | 6.1% | 31 | 12.0% | 38 | 14.1% | 101 | 8.7% |
| Total | 307 | 100.0% | 326 | 100.0% | 259 | 100.0% | 270 | 100.0% | 1162 | 100.0% |

Chi-square ($x^2$) = 24.9, $P \leq .001$, n = 1162, DF = 3. HTWT and PS normalized.

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**Table 10A**
**Earnings Per Start by HTWT and LVD**

| | HTWT 0-25% | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | LVD 0-25% | | LVD 25-50% | | LVD 50-75% | | LVD 75-100% | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 115 | 55.0% | 60 | 33.3% | 84 | 39.2% | 50 | 34.5% | 309 | 41.3% |
| EPS = $2-10K | 80 | 38.3% | 103 | 57.2% | 120 | 56.1% | 79 | 54.5% | 382 | 51.1% |
| EPS ≥ $10K | 14 | 6.7% | 17 | 9.5% | 10 | 4.7% | 16 | 11.0% | 57 | 7.6% |
| Total | 209 | 100.0% | 180 | 100.0% | 214 | 100.0% | 145 | 100.0% | 748 | 100.0% |

Chi-square ($x^2$) = 29.2, $P \leq 0.001$, n = 748, DF = 6. HTWT and LVD normalized.

**Table 10B**
**Earnings Per Start by HTWT and LVD**

| | HTWT 25-50% | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | LVD 0-25% | | LVD 25-50% | | LVD 50-75% | | LVD 75-100% | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 79 | 35.6% | 78 | 39.4% | 73 | 34.6% | 62 | 37.1% | 292 | 36.6% |
| EPS = $2-10K | 120 | 54.0% | 101 | 51.0% | 106 | 50.2% | 77 | 46.1% | 404 | 50.6% |
| EPS ≥ $10K | 23 | 10.4% | 19 | 9.6% | 32 | 15.2% | 28 | 16.8% | 102 | 12.8% |
| Total | 222 | 100.0% | 198 | 100.0% | 211 | 100.0% | 167 | 100.0% | 798 | 100.0% |

Chi-square ($x^2$) = 7.5, $P \leq .274$, n = 798, DF = 6. HTWT and LVD normalized.

**Table 10C**
**Earnings Per Start by HTWT and LVD**

| | HTWT 50-75% | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | LVD 0-25% | | LVD 25-50% | | LVD 50-75% | | LVD 75-100% | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 77 | 40.5% | 57 | 29.4% | 55 | 23.5% | 52 | 28.3% | 241 | 30.0% |
| EPS = $2-10K | 87 | 45.8% | 114 | 58.7% | 145 | 62.0% | 99 | 53.8% | 445 | 55.5% |
| EPS ≥ $10K | 26 | 13.7% | 23 | 11.9% | 34 | 14.5% | 33 | 17.9% | 116 | 14.5% |
| Total | 190 | 100.0% | 194 | 100.0% | 234 | 100.0% | 184 | 100.0% | 802 | 100.0% |

Chi-square ($x^2$) = 18.5, $P < .005$, n = 802, DF = 6 (see Exhibit PM07170207). HTWT and LVD normalized.

**Table 10D**
**Earnings Per Start by HTWT and LVD**

| | HTWT 75-100% | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | LVD 0-25% | | LVD 25-50% | | LVD 50-75% | | LVD 75-100% | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 55 | 29.1% | 60 | 32.1% | 50 | 22.4% | 54 | 26.6% | 219 | 27.3% |
| EPS = $2-10K | 103 | 54.5% | 102 | 54.5% | 131 | 58.8% | 104 | 51.2% | 440 | 54.9% |
| EPS ≥ $10K | 31 | 16.4% | 25 | 13.4% | 42 | 18.8% | 45 | 22.2% | 143 | 17.8% |
| Total | 189 | 100.0% | 187 | 100.0% | 223 | 100.0% | 203 | 100.0% | 802 | 100.0% |

Chi-square ($x^2$) = 9.5, $P < 0.150$, n = 802, DF = 6 (see Exhibit PM07170207). HTWT and LVD normalized.

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**Table 11A**
**Earnings Per Start by HTWT and LVS**

| | HTWT 0-25% | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | LVS 0-25% | | LVS 25-50% | | LVS 50-75% | | LVS 75-100% | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 96 | 47.5% | 85 | 42.3% | 60 | 33.5% | 68 | 41.0% | 309 | 41.3% |
| EPS = $2-10K | 92 | 45.6% | 100 | 49.7% | 106 | 59.2% | 84 | 50.6% | 382 | 51.1% |
| EPS ≥ $10K | 14 | 6.9% | 16 | 8.0% | 13 | 7.3% | 14 | 8.4% | 57 | 7.6% |
| Total | 202 | 100.0% | 201 | 100.0% | 179 | 100.0% | 166 | 100.0% | 748 | 100.0% |

Chi-square ($x^2$) = 8.5, $P \leq .203$, n = 748, DF = 6. HTWT and LVS normalized.

**Table 11B**
**Earnings Per Start by HTWT and LVS**

| | HTWT 25-50% | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | LVS 0-25% | | LVS 25-50% | | LVS 50-75% | | LVS 75-100% | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 85 | 40.5% | 77 | 35.0% | 70 | 35.2% | 60 | 35.5% | 292 | 36.6% |
| EPS = $2-10K | 103 | 49.0% | 119 | 54.1% | 100 | 50.2% | 82 | 48.5% | 404 | 50.6% |
| EPS ≥ $10K | 22 | 10.5% | 24 | 10.9% | 29 | 14.6% | 27 | 16.0% | 102 | 12.8% |
| Total | 210 | 100.0% | 220 | 100.0% | 199 | 100.0% | 169 | 100.0% | 798 | 100.0% |

Chi-square ($x^2$) = 5.3, $P \leq 0.508$, n = 798, DF = 6. HTWT and LVS normalized.

**Table 11C**
**Earnings Per Start by HTWT and LVS**

| | HTWT 50-75% | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | LVS 0-25% | | LVS 25-50% | | LVS 50-75% | | LVS 75-100% | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 70 | 35.9% | 58 | 29.0% | 59 | 28.4% | 54 | 27.1% | 241 | 30.0% |
| EPS = $2-10K | 101 | 51.8% | 113 | 56.5% | 116 | 55.7% | 115 | 57.8% | 445 | 55.5% |
| EPS ≥ $10K | 24 | 12.3% | 29 | 14.5% | 33 | 15.9% | 30 | 15.1% | 116 | 14.5% |
| Total | 195 | 100.0% | 200 | 100.0% | 208 | 100.0% | 199 | 100.0% | 802 | 100.0% |

Chi-square ($x^2$) = 4.7, P ≤ .580, n = 802, DF = 6. HTWT and LVS normalized.

**Table 11D**
**Earnings Per Start by HTWT and LVS**

| | HTWT 75-100% | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | LVS 0-25% | | LVS 25-50% | | LVS 50-75% | | LVS 75-100% | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 59 | 30.7% | 56 | 29.0% | 54 | 25.3% | 50 | 24.5% | 219 | 27.3% |
| EPS = $2-10K | 102 | 53.1% | 110 | 57.0% | 123 | 57.8% | 105 | 51.5% | 440 | 54.9% |
| EPS ≥ $10K | 31 | 16.2% | 27 | 14.0% | 36 | 16.9% | 49 | 24.0% | 143 | 17.8% |
| Total | 192 | 100.0% | 193 | 100.0% | 213 | 100.0% | 204 | 100.0% | 802 | 100.0% |

Chi-square ($x^2$) = 9.3, $P \leq 0.157$, n = 802, DF = 6. HTWT and LVS normalized.

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**Table 12A**
**Earnings Per Start by HTWT and SW**

| | HTWT 0-25% | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | SW 0-25% | | SW 25-50% | | SW 50-75% | | SW 75-100% | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 101 | 51.8% | 70 | 40.9% | 78 | 35.3% | 60 | 37.3% | 309 | 41.3% |
| EPS = $2-10K | 81 | 41.5% | 89 | 52.1% | 123 | 55.7% | 89 | 55.3% | 382 | 51.1% |
| EPS ≥ $10K | 13 | 6.7% | 12 | 7.0% | 20 | 9.0% | 12 | 7.4% | 57 | 7.6% |
| Total | 195 | 100.0% | 171 | 100.0% | 221 | 100.0% | 161 | 100.0% | 748 | 100.0% |

Chi-square ($x^2$) = 13.7, $P \leq .034$, n = 748, DF = 6. HTWT and SW normalized.

**Table 12B**
**Earnings Per Start by HTWT and SW**

| | HTWT 25-50% | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | SW 0-25% | | SW 25-50% | | SW 50-75% | | SW 75-100% | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 75 | 40.1% | 85 | 38.8% | 80 | 35.2% | 52 | 31.5% | 292 | 36.6% |
| EPS = $2-10K | 89 | 47.6% | 109 | 49.8% | 119 | 52.4% | 87 | 52.7% | 404 | 50.6% |
| EPS ≥ $10K | 23 | 12.3% | 25 | 11.4% | 28 | 12.3% | 26 | 15.8% | 102 | 12.8% |
| Total | 187 | 100.0% | 219 | 100.0% | 227 | 100.0% | 165 | 100.0% | 798 | 100.0% |

Chi-square ($x^2$) = 4.4, $P \leq .623$, n = 798, DF = 6. HTWT and SW normalized.

**Table 12C**
**Earnings Per Start by HTWT and SW**

| | HTWT 50-75% | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | SW 0-25% | | SW 25-50% | | SW 50-75% | | SW 75-100% | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 68 | 36.6% | 72 | 35.3% | 61 | 25.8% | 40 | 22.7% | 241 | 30.0% |
| EPS = $2-10K | 97 | 52.1% | 102 | 50.0% | 141 | 59.8% | 105 | 59.7% | 445 | 55.5% |
| EPS ≥ $10K | 21 | 11.3% | 30 | 14.7% | 34 | 14.4% | 31 | 17.6% | 116 | 14.5% |
| Total | 186 | 100.0% | 204 | 100.0% | 236 | 100.0% | 176 | 100.0% | 802 | 100.0% |

Chi-square ($x^2$) = 14.3, $P \leq 0.026$, n = 802, DF = 6. HTWT and SW normalized.

**Table 12D**
**Earnings Per Start by HTWT and SW**

| | HTWT 75-100% | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | SW 0-25% | | SW 25-50% | | SW 50-75% | | SW 75-100% | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 51 | 30.0 | 54 | 26.7% | 64 | 27.6% | 50 | 25.3% | 219 | 27.3% |
| EPS = $2-10K | 96 | 56.5% | 111 | 55.0% | 130 | 56.0% | 103 | 52.0% | 440 | 54.9% |
| EPS ≥ $10K | 23 | 13.5% | 37 | 18.3% | 38 | 16.4% | 45 | 22.7% | 143 | 17.8% |
| Total | 170 | 100.0% | 202 | 100.0% | 232 | 100.0% | 198 | 100.0% | 802 | 100.0% |

Chi-square ($x^2$) = 5.9, $P \leq 0.429$, n = 802, DF = 6. HTWT and SW normalized.

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**Table 13A**
**Earnings Per Start by HTWT and PS**

| | HTWT 0-25% | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PS 0-25% | | PS 25-50% | | PS 50-75% | | PS 75-100% | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 86 | 42.0% | 70 | 41.4% | 78 | 40.6% | 75 | 41.2% | 309 | 41.3% |
| EPS = $2-10K | 103 | 50.2% | 89 | 52.7% | 98 | 51.1% | 92 | 50.6% | 382 | 51.1% |
| EPS ≥ $10K | 16 | 7.8% | 10 | 5.9% | 16 | 8.3% | 15 | 8.2% | 57 | 7.6% |
| Total | 205 | 100.0% | 169 | 100.0% | 192 | 100.0% | 182 | 100.0% | 748 | 100.0% |

Chi-square ($\underline{x}^2$ ) = 1.0, $P \leq .984$, n = 748, DF = 6. HTWT and PS normalized.

**Table 13B**
**Earnings Per Start by HTWT and PS**

| | HTWT 25-50% | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PS 0-25% | | PS 25-50% | | PS 50-75% | | PS 75-100% | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 71 | 35.7% | 68 | 37.16% | 67 | 34.5% | 86 | 38.7% | 292 | 36.6% |
| EPS = $2-10K | 102 | 51.2% | 96 | 52.5% | 101 | 52.1% | 105 | 47.3% | 404 | 50.6% |
| EPS ≥ $10K | 26 | 13.1% | 19 | 10.4% | 26 | 13.4% | 31 | 14.0% | 102 | 12.8% |
| Total | 199 | 100.0% | 183 | 100.0% | 194 | 100.0% | 222 | 100.0% | 798 | 100.0% |

Chi-square ($\underline{x}^2$ ) = 2.4, $P \leq .879$, n = 798, DF = 6. HTWT and PS normalized.

**Table 13C**
**Earnings Per Start by HTWT and PS**

| | HTWT 50-75% | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PS 0-25% | | PS 25-50% | | PS 50-75% | | PS 75-100% | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 69 | 32.6% | 64 | 31.4% | 54 | 28.1% | 54 | 27.8% | 241 | 30.0% |
| EPS = $2-10K | 111 | 52.3% | 113 | 55.4% | 110 | 57.3% | 111 | 57.2% | 445 | 55.5% |
| EPS ≥ $10K | 32 | 15.1% | 27 | 13.2% | 28 | 14.6% | 29 | 15.0% | 116 | 14.5% |
| Total | 212 | 100.0% | 204 | 100.0% | 192 | 100.0% | 194 | 100.0% | 802 | 100.0% |

Chi-square ($\underline{x}^2$ ) = 2.0, $P \leq .919$, n = 802, DF = 6. HTWT and PS normalized.

**Table 13D**
**Earnings Per Start by HTWT and PS**

| | HTWT 75-100% | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PS 0-25% | | PS 25-50% | | PS 50-75% | | PS 75-100% | | Total | |
| Earnings | f | % | f | % | f | % | f | % | f | % |
| EPS ≤ $2K | 46 | 23.5% | 49 | 28% | 55 | 26.4% | 69 | 20.9% | 219 | 27.3% |
| EPS = $2-10K | 108 | 55.1% | 99 | 56.6% | 113 | 54.3% | 120 | 53.8% | 440 | 54.9% |
| EPS ≥ $10K | 42 | 21.4% | 27 | 15.4% | 40 | 19.2% | 34 | 15.3% | 143 | 17.8% |
| Total | 196 | 100.0% | 175 | 100.0% | 208 | 100.0% | 223 | 100.0% | 802 | 100.0% |

Chi-square ($\underline{x}^2$ ) = 5.4%, $P \leq .490$, n = 802, DF = 6. HTWT and PS normalized.

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**Table 14**
**Distance by Normalized HTWT**

| | HTWT | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0-25% | | 25-50% | | 50-75% | | 75-100% | | Total | |
| Distance | f | % | f | % | f | % | f | % | f | % |
| High Earner Sprint | 36 | 75.0% | 48 | 66.7% | 48 | 49.0% | 48 | 50.0% | 180 | 57.3% |
| High Earner Route | 12 | 25.0% | 24 | 33.3% | 50 | 51.0% | 48 | 50.0% | 134 | 42.7% |
| Total | 48 | 100.0% | 72 | 100.0% | 98 | 100.0% | 96 | 100.0% | 314 | 100.0% |

Chi-square ($\underline{x}^2$ ) = 13.6, $P \leq .004$, n = 314, DF = 3

**Table 15**
**Distance by Normalized LVD**

| | LVD | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0-25% | | 25-50% | | 50-75% | | 75-100% | | Total | |
| Distance | f | % | f | % | f | % | f | % | f | % |
| High Earner Sprint | 49 | 65.3% | 40 | 62.5% | 51 | 58.0% | 40 | 46.0% | 180 | 57.3% |
| High Earner Route | 26 | 34.7% | 24 | 37.5% | 37 | 42.0% | 47 | 54.0% | 134 | 42.7% |
| Total | 75 | 100.0% | 64 | 100.0% | 88 | 100.0% | 87 | 100.0% | 314 | 100.0% |

Chi-square ($\underline{x}^2$ ) = 7.3, $P \leq .064$, n = 314, DF = 3

**Table 16**
**Distance by Normalized LVS**

| | LVS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0-25% | | 25-50% | | 50-75% | | 75-100% | | Total | |
| Distance | f | % | f | % | f | % | f | % | f | % |
| High Earner Sprint | 50 | 70.4% | 41 | 56.2% | 47 | 56.6% | 42 | 48.3% | 180 | 57.3% |
| High Earner Route | 21 | 29.6% | 32 | 43.8% | 36 | 43.4% | 45 | 51.7% | 134 | 42.7% |
| Total | 71 | 100.0% | 73 | 100.0% | 83 | 100.0% | 87 | 100.0% | 314 | 100.0% |

Chi-square ($\underline{x}^2$ ) = 7.9, $P \leq .047$, n = 314, DF = 3

**Table 14**
**Distance by Normalized SW**

| | SW | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0-25% | | 25-50% | | 50-75% | | 75-100% | | Total | |
| Distance | f | % | f | % | f | % | f | % | f | % |
| High Earner Sprint | 38 | 65.5% | 40 | 53.3% | 57 | 62.0% | 45 | 50.6% | 180 | 57.3% |
| High Earner Route | 20 | 34.5% | 35 | 46.7% | 35 | 38.0% | 44 | 49.4% | 134 | 42.7% |
| Total | 58 | 100.0% | 75 | 100.0% | 92 | 100.0% | 89 | 100.0% | 314 | 100.0% |

Chi-square ($\underline{x}^2$ ) = 4.6, $P \leq .208$, n = 314, DF = 3

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**Table 15**
**Distance by Normalized PS**

| | PS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0-25% | | 25-50% | | 50-75% | | 75-100% | | Total | |
| Distance | f | % | f | % | f | % | f | % | f | % |
| High Earner Sprint | 49 | 57.0% | 26 | 48.2% | 52 | 56.5% | 53 | 64.6% | 180 | 57.3% |
| High Earner Route | 37 | 43.0% | 28 | 51.8% | 40 | 43.5% | 29 | 35.4% | 134 | 42.7% |
| Total | 86 | 100.0% | 54 | 100.0% | 92 | 100.0% | 82 | 100.0% | 314 | 100.0% |

Chi-square ($x^2$ ) = 3.7, $P \leq .298$, n = 314, DF = 3

**Table 16**
**Distance by HTWT and LVD**

| | HTWT < Average | | | | HTWT ≥ Average | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | LVD < Average | | LVD ≥ Average | | LVD < Average | | LVD ≥ Average | | Total | |
| Distance | f | % | f | % | f | % | f | % | f | % |
| High Earner Sprint | 40 | 71.4% | 44 | 68.8% | 49 | 59.0% | 47 | 42.3% | 180 | 57.3% |
| High Earner Route | 16 | 28.6% | 20 | 31.2% | 34 | 41.0% | 64 | 57.7% | 134 | 42.7% |
| Total | 56 | 100.0% | 64 | 100.0% | 83 | 100.0% | 111 | 100.0% | 314 | 100.0% |

Chi-square ($x^2$ ) = 18.3, $P \leq .001$, n = 314, DF = 3. HTWT and LVD normalized.

**Table 17**
**Distance by HTWT and LVS**

| | HTWT < Average | | | | HTWT ≥ Average | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | LVS < Average | | LVS ≥ Average | | LVS < Average | | LVS ≥ Average | | Total | |
| Distance | f | % | f | % | f | % | f | % | f | % |
| High Earner Sprint | 41 | 69.5% | 43 | 70.5% | 50 | 58.8% | 46 | 42.2% | 180 | 57.3% |
| High Earner Route | 18 | 30.5% | 18 | 29.5% | 35 | 41.2% | 63 | 57.8% | 134 | 42.7% |
| Total | 59 | 100.0% | 61 | 100.0% | 85 | 100.0% | 109 | 100.0% | 314 | 100.0% |

Chi-square ($x^2$ ) = 18.2, $P \leq 0.001$, n = 314, DF = 3. HTWT and LVS normalized.

**Table 18**
**Distance by HTWT and SW**

| | HTWT < Average | | | | HTWT ≥ Average | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | SW < Average | | SW ≥ Average | | SW < Average | | SW ≥ Average | | Total | |
| Distance | f | % | f | % | f | % | f | % | f | % |
| High Earner Sprint | 39 | 73.6% | 45 | 67.2% | 39 | 48.8% | 57 | 50.0% | 180 | 57.3% |
| High Earner Route | 14 | 26.4% | 22 | 32.8% | 41 | 51.2% | 57 | 50.0% | 134 | 42.7% |
| Total | 53 | 100.0% | 67 | 100.0% | 80 | 100.0% | 114 | 100.0% | 314 | 100.0% |

Chi-square ($x^2$ ) = 13.3, $P \leq 0.004$, n = 314, DF = 3. HTWT and SW normalized.

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**Table 19**
**Distance by HTWT and PS**

| | HTWT < Average | | | | HTWT ≥ Average | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PS < Average | | PS ≥ Average | | PS < Average | | PS ≥ Average | | Total | |
| Distance | f | % | f | % | f | % | f | % | f | % |
| High Earner Sprint | 34 | 68.0% | 50 | 71.4% | 41 | 45.6% | 55 | 52.9% | 180 | 57.3% |
| High Earner Route | 16 | 32.0% | 20 | 28.6% | 49 | 54.4% | 49 | 47.1% | 134 | 42.7% |
| Total | 50 | 100.0% | 70 | 100.0% | 90 | 100.0% | 104 | 100.0% | 314 | 100.0% |

Chi-square ($x^2$ ) = 14.0, $P \leq .003$, n = 314, DF = 3. HTWT and PS normalized.