THE PREDICTION OF HEARTRATE FROM AGE IN FEMALE MINIATURE DACHSHUNDS AGES 0 – 4

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Introduction

Heartbeat is one complete pulsation of the heart (Mish 2003). All mammals have a pulse and dachshunds are mammals (Riddle 2001). Miniature dachshunds are classified as small breed dogs (Salzberg 2005). The normal heart rate for a small breed dog is 70-90 beats per minute (Rice 2002). A dachshund's pulse can be detected in two primary locations (Simon 2000). Heart rate is measured by finding the pulse and counting the number of beats per sixty seconds.

Several variables affect the normal, resting heart rate of miniature dachshunds. One variable is that size affects heart rate (Nielson 1997). Large animals have slower heart rates than small animals (Table 1). Cardiac health can affect heart rate (Adams 1995). If a miniature dachshund has a heart disease or heart worms (Simon 2000), this could cause the heart to beat unusually, as could a heart tremor or other such irregularities. Temporal physical conditions, such as increased respiration (Arteaga et al. 2002) or pregnancy (Simon 2000), can also affect heart rate in miniature dachshunds. There is a close relationship between pulse and respiratory rate (Arteaga et al. 2002). If a dachshund is breathing heavily this indicates that its heart rate is elevated. Age may also affect heart rate. The purpose of this experiment is to determine if female miniature dachshund age can predict heart rate.

Table 1. This table shows the average resting heart rate of the listed mammals from smallest to largest.

Mammal Type	Resting Heart Rate (Beats Per Minute)
1. Pygmy Shrew	<600
2. Baby Dachshund	<200
3. Rabbits	130-160
4. Cats	100-140
5. Adult Small Dogs	70-90
6. Human Child	80-100
7. Adult Humans	60-100
8. Elephant	25

Numbers 1, 7 & 8 (Nielson 1997)
Number 2 (Coile 2004)
Numbers 3, 4 & 6 (Edredge 2003)
Number 5 (Rice 2002)

Methods

The experiment involved exactly thirty female miniature dachshunds. Female miniature dachshunds were selected to control dog gender and size. Any dogs that were not treated for heartworm, were obese, pregnant, and/or had heart diseases were excluded from this experiment.

During the experiment, each dachshund was carried to a designated test room, previously set at 22° C, and was allowed to sufficiently adjust to the environment (5-20 minutes). Some dogs managed to indulge in a short amount of physical activity before the experiment. These dogs were not tested until their breathing was thought to be consistent. Respiration was not officially tested.

Each miniature dachshund's heart rate was counted for sixty seconds. This was done by placing a hand on the left side of the chest, just behind the elbow (Simon 2000), or by pressing a finger inside the thigh slightly above the stifle (Rice 2002). After the heart rate was found, it was recorded, along with the dog's age in days, on the data sheet. Dog age was obtained from breeder's personal records.

The prediction of miniature dachshund heart rate from age was determined by using a regression hypothesis test. This was carried out by using Analyze it, an add-in to Microsoft Excel. This program was used after the testing of the chosen 30 miniature dachshunds. The null hypothesis stated: "$H_{\circ}$: Age cannot predict the heart rate of miniature dachshunds." The alternative hypothesis stated: "H_a: Age can predict the heart rate of miniature dachshunds."

Results

The miniature dachshunds' heart rates ranged between 72 and 208 beats per sixty seconds (Figure 1). Ages ranged between 45 days and 1,698 days. Three different regression lines were tested, including a line, a parabola curve, and a logarithmic curve. The R^2 for the line was only 0.39. Table 2 shows that $F = 18.22$, and $p = 0.0002$. The R^2 for the parabola curve was 0.52. Table 3 shows that $F = 14.79$, and $p < 0.0001$. The logarithmic R^2 was 0.66. Table 4 shows that $F = 54.44$, and $p < 0.0001$. The logarithmic curve successfully rejected the null hypothesis, because it properly predicted that heart rate would continue to decrease with age. The test determined: heart rate=264.26 - 26.078 x LN(age). This log-linear regression test showed that dachshund age can predict miniature dachshund heart rate.

After the experiment, it was thought that dachshunds from certain family lines seemed to display higher heart rates than did members of other family lines. A null hypothesis was formed stating: "$H_○$: Heart rate does not vary between female miniature dachshund family lines." An alternative hypothesis stated: "H_a: Heart rate does vary between female miniature dachshund family lines." Both the mother and father sides of each dog were listed in separate columns, except for those parents who were only used once among the collected offspring. In order to remain consistent to family lines, if the offspring of one parent produced offspring of its own, both the primary and secondary offspring were represented by the originally listed parent. Both mother and father sides were tested independently. This area was tested with an ANOVA hypothesis test, by using Analyze It.

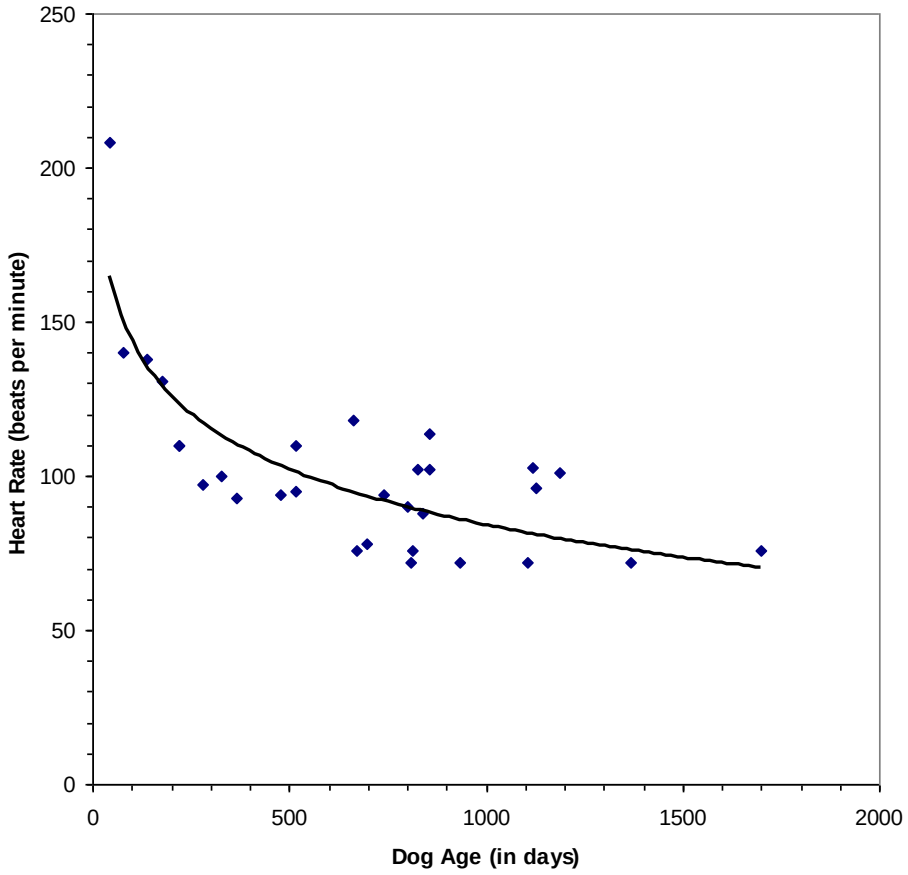

Figure 1. The logarithmic regression curve in this figure shows that female dachshund age increases with lowered heart rate. The regression equation used was: Heart rate= 264.26 – (26.078)(LN x age).

Table 2. This table shows that the linear regression test predicted age from heart rate, but not as effectively as was desired.

Source of variation	SSq	DF	MSq	F	p
Due to regression	8767.491	1	8767.491	18.22	0.0002
About regression	13476.376	28	481.299		
Total	22243.867	29			

Table 3. This table shows that the polynomial regression predicted age from heart rate, but not as effectively as was desired.

Source of variation	SSq	DF	MSq	F	p
Due to regression	11628.412	2	5814.206	14.79	<0.0001
About regression	10615.455	27	393.165		
Total	22243.867	29			

Table 4. This table shows the results of the log-linear regression test used to predict age from heart rate of female Dachshunds.

Source of variation	SSq	DF	MSq	F	p
Due to regression	14689.263	1	14689.263	54.44	<0.0001
About regression	7554.604	28	269.807		
Total	22243.867	29			

On the mother side, F = 0.34 and p = 0.88199 (Table 5). For the father side, F = 0.71 and p = 0.5610 (Table 6). As tables 5 and 6 show, the null hypothesis was not rejected, stating that heart rate does not vary between female miniature dachshund family lines.

Discussion

The primary experiment showed that female miniature dachshund age can predict heart rate (Table 4). Ackerman (2006) states that dogs enter young adulthood at 6 months of age (approximately 184 days). The average heart rate of the adult female miniature dachshunds in this experiment was 76.76 beats per sixty seconds. All miniature female dachshunds in this experiment that were under 184 days old had an average heart rate of 154.25 beats per sixty seconds. These numbers correlate with the baby dachshund and small dog heart rates listed in Table 1. Nielson (1997) found that larger animals have slower heart rates than smaller animals. The older and larger dachshunds in this experiment had a generally slower pulse rate than did the younger and smaller dogs.

Some of the miniature dachshunds that were used in the experiment had uncharacteristically high heart rates. Encyclopedia Britannica (Arteaga et al. 2002) states that there is a close relationship between heart rate and respiratory rate. It was noted that these dogs were breathing more heavily than seemed natural. They were tested later, after their breathing seemed to be less intense, though respiration was not officially tested. After the second heart rate measurement, the dogs with previously high heart rates, showed a heart rate that

Table 5. This table shows that the mother side of family line in female miniature Dachshunds does not cause a notable variation among heart rates.

Source of variation	SSq	DF	MSq	F	p
Mother	1580.894	5	316.179	0.34	0.8819
Within cells	18540.952	20	927.048		
Total	20121.846	25			

Table 6. This table shows that the father side of family line in female miniature Dachshunds does not cause a notable variation among heart rates.

Source of variation	SSq	DF	MSq	F	p
Father	731.264	3	243.755	0.71	0.5610
Within cells	6218.190	18	345.455		
Total	6949.455	21			

was more consistent with the average small dog heart rate of 70-90 beats per minute (Rice 2002).

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