

Stat 104 – Lecture 6

Correlation

- Linear Association
 - How closely do the points on the scatter plot represent a straight line?
 - The correlation coefficient gives the direction of and quantifies the strength of the linear association between two quantitative variables.

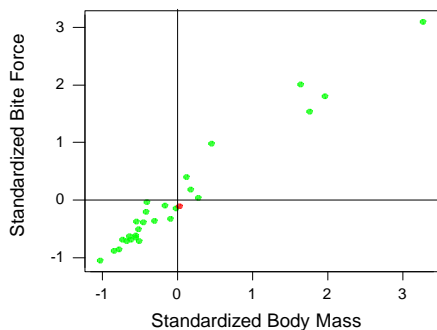
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Correlation

- Standardize y
$$z_y = \frac{y - \bar{y}}{s_y}$$
- Standardize x
$$z_x = \frac{x - \bar{x}}{s_x}$$

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Bite Force vs Body Mass of Canidae



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Correlation Coefficient

$$r = \frac{\sum z_x z_y}{n - 1}$$

$$r = \frac{\sum (x - \bar{x})(y - \bar{y})}{(n - 1)s_x s_y}$$

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Correlation Coefficient

- Body mass and Bite force

$$r = \frac{\sum z_x z_y}{n - 1} = \frac{26.4796}{27}$$

- $r = 0.9807$

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Correlation Coefficient

- There is a very strong positive correlation, linear association, between the body mass and bite force for the various species of *Canidae*.

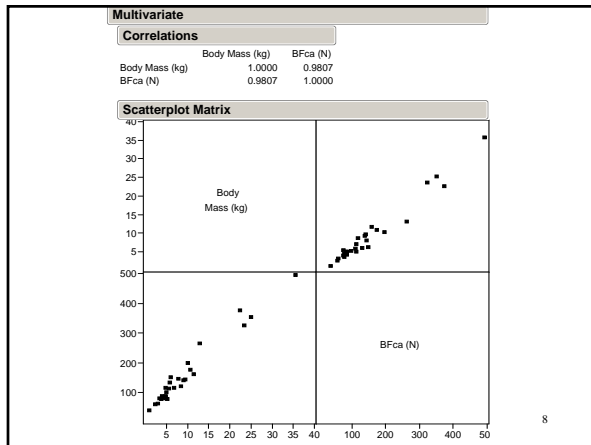
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JMP

- Analyze – Multivariate methods – Multivariate
- Y, Columns
 - ▲ Body mass
 - ▲ BF ca (Bite force at the canine)

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Correlation Properties

- The sign of r indicates the direction of the association.
- The value of r is always between -1 and $+1$.
- Correlation has no units.
- Correlation is not affected by changes of center or scale.

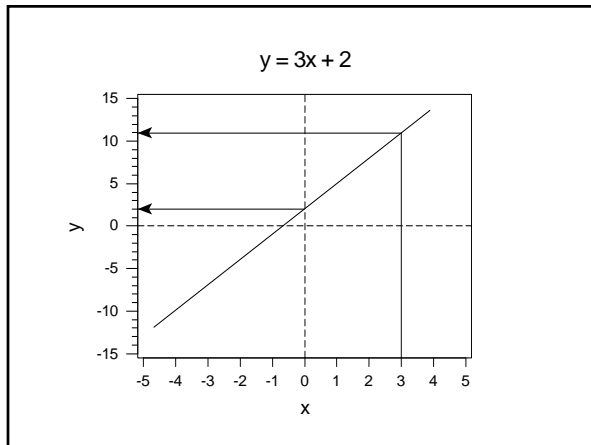
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Algebra Review

- The equation of a straight line
- $y = mx + b$
 - m is the slope – the change in y over the change in x – or rise over run.
 - b is the y -intercept – the value where the line cuts the y axis.

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Review

- $y = 3x + 2$
 - $x = 0$ → $y = 2$ (y -intercept)
 - $x = 3$ → $y = 11$
 - Change in y (+9) divided by the change in x (+3) gives the slope, 3.

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