

Examples

- Height
- Weight
- Physical strength
- Vocabulary
- Reading skills
- General Intelligence
- Any two variables (Traits) showed correlation over age range(common maturity factor)

→Age from 5 to 20 years

If age eliminated, r may be zero

Controlling of Third variable

- There are two methods
- A. Experimentally, by selecting all of whom are of the same age.
- B. Statistically, by holding age variability constant through partial correlation.

Representation

- Let 1 =Height in inches
- 2= Vocabulary score
- And
- 3= age
- r12.3 represent the partial correlation between 1 and 2 (Height and Vocabulary) when 3 (age) has been held constant or " Partialed out".
- 12.3 represent that variable is constant, leaving the net correlation between 1 and 2
- In the same way, r12.34means that 2 variables namely, 3 and 4 are partialed out from the correlation between 1 and 2.
- The numbers to right the decimal point represent variables whose influence is ruled out

Use of partial correlation

- ▶ 1. In analysis in which the effect of some variable or variables are to be eliminated.
- 2. It unable us to setup a multiple regression equation of two or more variables by mean of which we can predict another variables.

Coefficient of multiple correlation

- The correlation between a set of obtained scores and same scores predicted from multiple regression equation is called a coefficient of multiple correlation.
- Represented by R (Multiple Correlation coefficient)
- Ex. R1(234) means score in variable (1) predicted from a multiple regression equation containing variables 2,3 and 4
- → In R1(234) 1 is criterion variable
- Symbol () are independent variables inn regression equation.

Multiple R is always positive.

Example

▶ N =450

▶ r₁₂=.60

- 1 = Academic success (Result)
- 2 = Intelligence
- 3= Average No. of hours spent in study per week
 Q How well can we predict academic success from a
 - knowledge of intelligence and hours spent to study? $M_{1}=18.5 \qquad M_{2}=100.6 \qquad M_{3}=24$
- M1= 18.5
 σ1= 11.2
- σ2=15.8 r13=.32
 - 0
- $M_3=24$ $\sigma_3=6$ $r_{23}=-.35$

Step 1 : Writing of regression equations Equations for multiple regression $\bar{x}_1 = b_{12.3} x_2 + b_{13.2} x_3$ (Deviation form) $\bar{x}_1 = b_{12.3} x_2 + b_{13.2} x_3 + K$ (Scores form)

Computation of partial r's

$$r_{12.3} = \frac{r_{12} - r_{13} \cdot r_{23}}{\sqrt{1 - r_{13}^2} \cdot \sqrt{1 - r_{23}^2}}$$

$$r_{13.2} = \frac{r_{13} - r_{12} \cdot r_{23}}{\sqrt{1 - r_{12}^2} \cdot \sqrt{1 - r_{23}^2}}$$

$$r_{23.1} = \frac{r_{23} - r_{12} \cdot r_{13}}{\sqrt{1 - r_{12}^2} \cdot \sqrt{1 - r_{13}^2}}$$

$$r_{12.3} = \frac{r_{12} - r_{13} \cdot r_{23}}{\sqrt{1 - r_{13}^2} \cdot \sqrt{1 - r_{23}^2}}$$

$$r_{12.3} = \frac{.60 + .112}{\sqrt{1 - .1024} \cdot \sqrt{1 - .1225}}$$

$$r_{12.3} = \frac{.712}{\sqrt{.8976} \sqrt{.877}}$$

$$r_{12.3} = \frac{.712}{.8871} = .80$$

$$r_{13,2} = \frac{r_{13} - r_{12} \cdot r_{23}}{\sqrt{1 - r_{12}^2} \cdot \sqrt{1 - r_{23}^2}}$$
$$r_{13,2} = \frac{.32 - .60(-.35)}{.800 \times .937} = .71$$

$$r_{23.1} = \frac{r_{23} - r_{12} \cdot r_{13}}{\sqrt{1 - r_{12}^2} \cdot \sqrt{1 - r_{13}^2}}$$

$$r_{13.2} = \frac{-.35 - .60 \times .32}{.800 \times .937} = .72$$

Calculation of variability's
Variability's of all variables(Partial
$$\sigma$$
 's)
Computation of Partial σ 's
$$\sigma_{1.23} = \sigma_1 \sqrt{1 - r_{12}^2} \sqrt{1 - r_{13.2}^2} = .63$$
$$\sigma_{2.13} = \sigma_{2.31} = \sigma_2 \sqrt{1 - r_{23}^2} \sqrt{1 - r_{12.3}^2} = 8.9$$
$$\sigma_{3.12} = \sigma_{3.21} = \sigma_3 \sqrt{1 - r_{23}^2} \sqrt{1 - r_{13.2}^2} = 4.0$$

 $\sigma_{1,23} = \sigma_1 \sqrt{1 - r_{12}^2} \sqrt{1 - r_{13,2}^2}$ Calculation $\sigma_{1,23} = 11.2 \sqrt{1 - (.60)^2} \sqrt{1 - (.71)^2}$ $= 11.2 \sqrt{1 - .36} \sqrt{1 - .504}$ $= 11.2 \sqrt{.64} \sqrt{.496}$ $= 11.2 \times .8 \times .704$ = 6.31

$$\sigma_{2.13} = \sigma_{2.31} = \sigma_2 \sqrt{1 - r_{23}^2} \sqrt{1 - r_{12.3}^2} \sigma_{2.13} = \sigma_2 \sqrt{1 - r_{23}^2} \sqrt{1 - r_{12.3}^2} = 15.8 \sqrt{1 - (-.35)^2} \sqrt{1 - (.80)^2} = 15.8 \sqrt{1 - .122} \sqrt{1 - .64} = 15.8 \sqrt{.878} \sqrt{.36} = 15.8 X .937 X.6 = 8.88 = 8.9$$

$$\sigma_{3.12} = \sigma_{3.21} = \sigma_3 \sqrt{1 - r_{23}^2} \sqrt{1 - r_{13.2}^2}$$

$$r_{3.12} = \sigma_3 \sqrt{1 - r_{23}^2} \sqrt{1 - r_{13.2}^2}$$

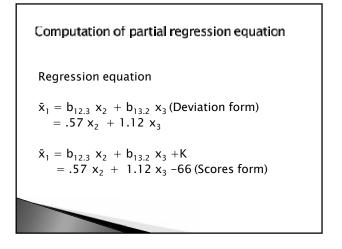
$$r_{3.12} = 6 \sqrt{1 - (.35)^2} \sqrt{1 - (.71)^2}$$

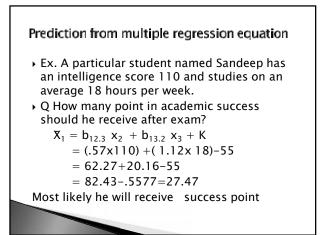
$$r_{3.12} = 6 \times .937 \times .704$$

$$r_{3.12} = 3.95$$

$$= 4.0$$

Computation of partial regression
cofficent
$$b_{12.3} = r_{12.3} X \frac{\sigma_{1.23}}{\sigma_{2.13}} = .80 X \frac{6.3}{8.9} = .57$$
$$b_{13.2} = r_{13.2} X \frac{\sigma_{1.23}}{\sigma_{3.12}} = .71 X \frac{6.3}{4.0} = 1.12$$





Standard error of estimate For a multiple regression $\sigma_{(est} \times_{1) is}$ equal to $\sigma_{1.23}$ without any computation $\sigma_{(est} \times_{1)} = \sigma_{1.23} = 6.3$

