# Stat Review Handbook
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Psych 420

Data

| Subjects | Aggression Difference Scores | Locus of Control | Video Type | Gender | Class Level | Age | Major |
|---|---|---|---|---|---|---|---|
| 1 | -10 | 18 | Non-aggressive | Female | Junior | 20 | Psychology |
| 2 | -13 | 6 | Non-aggressive | Female | Freshman | 18 | Biology |
| 3 | 2 | 9 | Non-aggressive | Female | Freshman | 18 | Biology |
| 4 | -3 | 8 | Aggressive | Female | Sophomore | 20 | Art |
| 5 | 16 | 17 | Aggressive | Female | Freshman | 19 | Child Development |
| 6 | -9 | 8 | Aggressive | Female | Senior | 23 | Psychology/Biology |
| 7 | 0 | 10 | Non-aggressive | Female | Junior | 33 | Health Administration |
| 8 | 3 | 11 | Non-aggressive | Male | Freshman | 18 | Business |
| 9 | 2 | 11 | Non-aggressive | Male | Sophomore | 20 | Journalism |
| 10 | -7 | 9 | Aggressive | Female | Junior | 20 | Psychology |
| 11 | -6 | 11 | Aggressive | Female | Sophomore | 19 | Psychology/Child Development |
| 12 | 2 | 9 | Aggressive | Male | Freshman | 19 | English Literature |
| 13 | 3 | 16 | Non-aggressive | Female | Junior | 20 | Physical Therapy |
| 14 | -21 | 6 | Non-aggressive | Female | Freshman | 18 | Political Science |
| 15 | -4 | 10 | Non-aggressive | Male | Senior | 21 | Computer Science |
| 16 | 3 | 8 | Non-aggressive | Female | Freshman | 18 | Accounting |
| 17 | -5 | 10 | Non-aggressive | Female | Freshman | 18 | Undecided |
| 18 | -9 | 8 | Non-aggressive | Male | Sophomore | 19 | Biology |
| 19 | -9 | 14 | Aggressive | Male | Junior | 20 | Psychology |
| 20 | -6 | 11 | Aggressive | Female | Sophomore | 19 | Health Science |
| 21 | 3 | 10 | Aggressive | Female | Freshman | 19 | Child Development |
| 22 | -10 | 6 | Non-aggressive | Female | Senior | 23 | Biology |
| 23 | 6 | 11 | Non-aggressive | Male | Sophomore | 19 | Criminology |
| 24 | -13 | 14 | Non-aggressive | Female | Sophomore | 19 | Physical Therapy |
| 25 | -5 | 9 | Aggressive | Male | Sophomore | 20 | Undecided |
| 26 | -5 | 5 | Aggressive | Female | Sophomore | 21 | Undecided |
| 27 | -1 | 14 | Aggressive | Male | Junior | 20 | Psychology |
| 28 | -15 | 9 | Aggressive | Female | Junior | 23 | Psychology |
| 29 | 1 | 12 | Aggressive | Female | Freshman | 22 | Biology |
| 30 | 4 | 15 | Aggressive | Female | Freshman | 18.5 | Undecided |

# Mean and Standard Deviation

| Subjects | DV | DV$^2$ |
|---|---|---|
| 1 | -10 | 100 |
| 2 | -13 | 169 |
| 3 | 2 | 4 |
| 4 | -3 | 9 |
| 5 | 16 | 256 |
| 6 | -9 | 81 |
| 7 | 0 | 0 |
| 8 | 3 | 9 |
| 9 | 2 | 4 |
| 10 | -7 | 49 |
| 11 | -6 | 36 |
| 12 | 2 | 4 |
| 13 | 3 | 9 |
| 14 | -21 | 441 |
| 15 | -4 | 16 |
| 16 | 3 | 9 |
| 17 | -5 | 25 |
| 18 | -9 | 81 |
| 19 | -9 | 81 |
| 20 | -6 | 36 |
| 21 | 3 | 9 |
| 22 | -10 | 100 |
| 23 | 6 | 36 |
| 24 | -13 | 169 |
| 25 | -5 | 25 |
| 26 | -5 | 25 |
| 27 | -1 | 1 |
| 28 | -15 | 225 |
| 29 | 1 | 1 |
| 30 | 4 | 16 |
| | Σx = -106 | Σx$^2$ = 2026 |

$$\bar{X} = \frac{\sum x}{N}$$

$$Sample\ SD = \sqrt{\frac{\sum x^2 - \frac{(\sum x)^2}{N}}{N}}$$

$$Estimated\ Population\ SD = \sqrt{\frac{\sum x^2 - \frac{(\sum x)^2}{N}}{N-1}}$$

$N = 30$

$\sum x = -106$

$\sum x^2 = 2026$

$(\sum x)^2 = 11236$

$$\bar{X} = \frac{-106}{30} = -3.5333$$

$$sample\ SD_N = \sqrt{\frac{2026 - \frac{(-106)^2}{30}}{30}} = \sqrt{\frac{2026 - \frac{11236}{30}}{30}} = \sqrt{\frac{2026 - 374.5333}{30}}$$

$$= \sqrt{\frac{1651.4667}{30}} = \sqrt{55.0489} = 7.4195$$

$$estimated\ population\ SD_{N-1} = \sqrt{\frac{2026 - \frac{(-106)^2}{30}}{30-1}} = \sqrt{\frac{2026 - \frac{11236}{30}}{29}}$$

$$= \sqrt{\frac{2026 - 374.5333}{29}} = \sqrt{\frac{1651.4667}{29}} = \sqrt{56.9471} = 7.5463$$

## Percentile Rank

| Subjects | DV | Rank | Percentile |
|---|---|---|---|
| 1 | -10 | 5.5 | 17 |
| 2 | -13 | 3.5 | 10 |
| 3 | 2 | 22 | 72 |
| 4 | -3 | 17 | 55 |
| 5 | 16 | 30 | 98 |
| 6 | -9 | 8 | 25 |
| 7 | 0 | 19 | 62 |
| 8 | 3 | 25.5 | 83 |
| 9 | 2 | 22 | 72 |
| 10 | -7 | 10 | 32 |
| 11 | -6 | 11.5 | 37 |
| 12 | 2 | 22 | 72 |
| 13 | 3 | 25.5 | 83 |
| 14 | -21 | 1 | 2 |
| 15 | -4 | 16 | 52 |
| 16 | 3 | 25.5 | 83 |
| 17 | -5 | 14 | 45 |
| 18 | -9 | 8 | 25 |
| 19 | -9 | 8 | 25 |
| 20 | -6 | 11.5 | 37 |
| 21 | 3 | 25.5 | 83 |
| 22 | -10 | 5.5 | 17 |
| 23 | 6 | 29 | 95 |
| 24 | -13 | 3.5 | 10 |
| 25 | -5 | 14 | 45 |
| 26 | -5 | 14 | 45 |
| 27 | -1 | 18 | 58 |
| 28 | -15 | 2 | 5 |
| 29 | 1 | 20 | 65 |
| 30 | 4 | 28 | 92 |

$$PR = \left(\frac{Rank - .5}{30}\right) * 100$$

$$PR = \left(\frac{5.5 - .5}{30}\right) * 100$$

$$PR = (.1667) * 100$$

$$= 16.67$$

$$\approx 17$$

-21 -15 -13 -13 -10 -10 -9 -9 -9 -7 -6 -6 -5 -5 -5 -4 -3 -1 0 1 2 2 2 3 3 3 3 4 6 16 -> Score
1 2 3.5 3.5 5.5 5.5 8 8 8 10 11.5 11.5 14 14 14 16 17 18 19 20 22 22 22 25.5 25.5 25.5 25.5 28 29 30 -> Rank

Z-scores

| Subjects | DV | z-scores |
|---|---|---|
| 1 | -10 | -0.86 |
| 2 | -13 | -1.25 |
| 3 | 2 | 0.73 |
| 4 | -3 | 0.07 |
| 5 | 16 | 2.59 |
| 6 | -9 | -0.72 |
| 7 | 0 | 0.47 |
| 8 | 3 | 0.87 |
| 9 | 2 | 0.73 |
| 10 | -7 | -0.46 |
| 11 | -6 | -0.33 |
| 12 | 2 | 0.73 |
| 13 | 3 | 0.87 |
| 14 | -21 | -2.31 |
| 15 | -4 | -0.06 |
| 16 | 3 | 0.87 |
| 17 | -5 | -0.19 |
| 18 | -9 | -0.72 |
| 19 | -9 | -0.72 |
| 20 | -6 | -0.33 |
| 21 | 3 | 0.87 |
| 22 | -10 | -0.86 |
| 23 | 6 | 1.26 |
| 24 | -13 | -1.25 |
| 25 | -5 | -0.19 |
| 26 | -5 | -0.19 |
| 27 | -1 | 0.34 |
| 28 | -15 | -1.52 |
| 29 | 1 | 0.60 |
| 30 | 4 | 1.00 |

$$z = \frac{x - \overline{x}}{SD}$$

$$z = \frac{-10 - (-3.5333)}{7.5463}$$

$$z = -.856936512$$

$$z = -.86$$

# Transforming Scores to a Different Scale

| Subjects | DV | z-scores |
|---|---|---|
| 1 | -10 | -0.86 |
| 2 | -13 | -1.25 |
| 3 | 2 | 0.73 |
| 4 | -3 | 0.07 |
| 5 | 16 | 2.59 |
| 6 | -9 | -0.72 |
| 7 | 0 | 0.47 |
| 8 | 3 | 0.87 |
| 9 | 2 | 0.73 |
| 10 | -7 | -0.46 |
| 11 | -6 | -0.33 |
| 12 | 2 | 0.73 |
| 13 | 3 | 0.87 |
| 14 | -21 | -2.31 |
| 15 | -4 | -0.06 |
| 16 | 3 | 0.87 |
| 17 | -5 | -0.19 |
| 18 | -9 | -0.72 |
| 19 | -9 | -0.72 |
| 20 | -6 | -0.33 |
| 21 | 3 | 0.87 |
| 22 | -10 | -0.86 |
| 23 | 6 | 1.26 |
| 24 | -13 | -1.25 |
| 25 | -5 | -0.19 |
| 26 | -5 | -0.19 |
| 27 | -1 | 0.34 |
| 28 | -15 | -1.52 |
| 29 | 1 | 0.60 |
| 30 | 4 | 1.00 |

New scale score = $SD(z) + \bar{x}$

a. SAT

$$SD = 100,\ \bar{x} = 500$$

$$s = 100(-.87) + 500$$

$$s = -87 + 500 = 413$$

b. Stanford-Binet Intelligence Test

$$SD = 16,\ \bar{x} = 100$$

$$s = 16(-.87) + 100$$

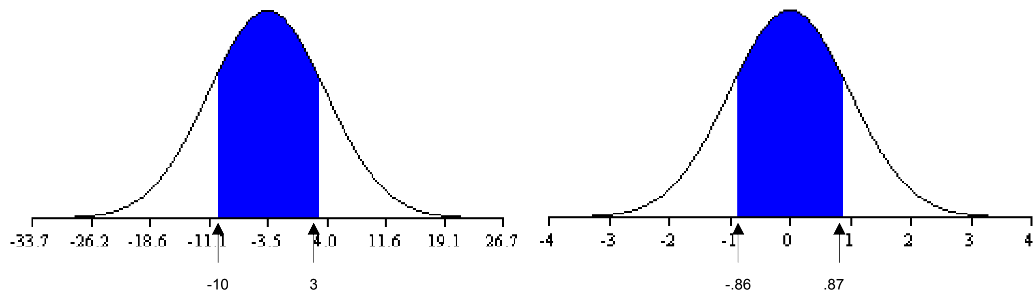
$$s = -13.92 + 100 = 86.08 \approx 86$$

# Area Under a Normal Curve

| Subjects | DV | z-scores |
|---|---|---|
| 1 | -10 | -0.86 |
| 2 | -13 | -1.25 |
| 3 | 2 | 0.73 |
| 4 | -3 | 0.07 |
| 5 | 16 | 2.59 |
| 6 | -9 | -0.72 |
| 7 | 0 | 0.47 |
| 8 | 3 | 0.87 |
| 9 | 2 | 0.73 |
| 10 | -7 | -0.46 |
| 11 | -6 | -0.33 |
| 12 | 2 | 0.73 |
| 13 | 3 | 0.87 |
| 14 | -21 | -2.31 |
| 15 | -4 | -0.06 |
| 16 | 3 | 0.87 |
| 17 | -5 | -0.19 |
| 18 | -9 | -0.72 |
| 19 | -9 | -0.72 |
| 20 | -6 | -0.33 |
| 21 | 3 | 0.87 |
| 22 | -10 | -0.86 |
| 23 | 6 | 1.26 |
| 24 | -13 | -1.25 |
| 25 | -5 | -0.19 |
| 26 | -5 | -0.19 |
| 27 | -1 | 0.34 |
| 28 | -15 | -1.52 |
| 29 | 1 | 0.60 |
| 30 | 4 | 1.00 |

<u>Assuming a normal curve</u>

a. The area between two scores on opposite sides of the distribution

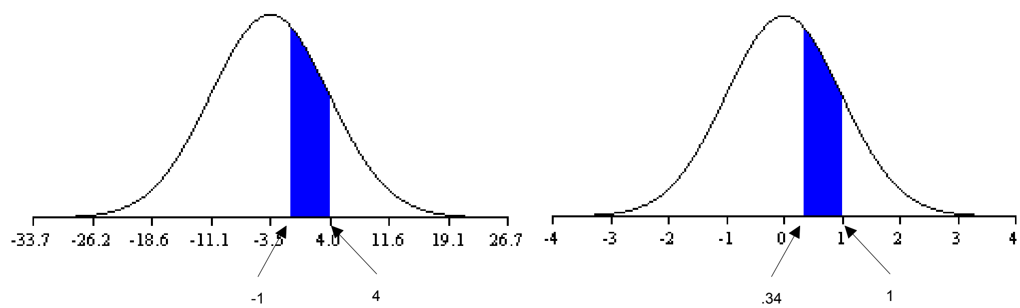



The area from the mean to -.86 is the same as the area from the mean to +.86. The area from the mean to +.86 = .3051.

The area from the mean to .87 = .3078.

The two areas together equals .3051 + .3078 = .6129.

b. The are between two scores on the same side of the distribution.




The area from 0 to 1.00 = .3413.

The area from 0 to .34 = .1331.

The area from .34 to 1.00 = .3413 - .1331 = .2082.

# Correlation Coefficient

| Subjects | (X) LOC | (Y) DV | (X)(Y) | $X^2$ | $Y^2$ |
|---|---|---|---|---|---|
| 1 | 18 | -10 | -180 | 324 | 100 |
| 2 | 6 | -13 | -78 | 36 | 169 |
| 3 | 9 | 2 | 18 | 81 | 4 |
| 4 | 8 | -3 | -24 | 64 | 9 |
| 5 | 17 | 16 | 272 | 289 | 256 |
| 6 | 8 | -9 | -72 | 64 | 81 |
| 7 | 10 | 0 | 0 | 100 | 0 |
| 8 | 11 | 3 | 33 | 121 | 9 |
| 9 | 11 | 2 | 22 | 121 | 4 |
| 10 | 9 | -7 | -63 | 81 | 49 |
| 11 | 11 | -6 | -66 | 121 | 36 |
| 12 | 9 | 2 | 18 | 81 | 4 |
| 13 | 16 | 3 | 48 | 256 | 9 |
| 14 | 6 | -21 | -126 | 36 | 441 |
| 15 | 10 | -4 | -40 | 100 | 16 |
| 16 | 8 | 3 | 24 | 64 | 9 |
| 17 | 10 | -5 | -50 | 100 | 25 |
| 18 | 8 | -9 | -72 | 64 | 81 |
| 19 | 14 | -9 | -126 | 196 | 81 |
| 20 | 11 | -6 | -66 | 121 | 36 |
| 21 | 10 | 3 | 30 | 100 | 9 |
| 22 | 6 | -10 | -60 | 36 | 100 |
| 23 | 11 | 6 | 66 | 121 | 36 |
| 24 | 14 | -13 | -182 | 196 | 169 |
| 25 | 9 | -5 | -45 | 81 | 25 |
| 26 | 5 | -5 | -25 | 25 | 25 |
| 27 | 14 | -1 | -14 | 196 | 1 |
| 28 | 9 | -15 | -135 | 81 | 225 |
| 29 | 12 | 1 | 12 | 144 | 1 |
| 30 | 15 | 4 | 60 | 225 | 16 |
| SUM | 315 | -106 | -821 | 3625 | 2026 |

Correlation between Change in aggression (DV) and Locus of control (LOC)

$$\sum X = 315, \quad \sum Y = -106$$

$$\sum X^2 = 3625, \quad \sum Y^2 = 2026$$

$$\sum XY = -821, \quad N = 30,$$

$$\left(\sum X\right)^2 = 99225, \quad \left(\sum Y\right)^2 = 11236$$

$$r = \frac{\sum XY - \left[\left(\sum X\right)\left(\sum Y\right)\right]/N}{\sqrt{\left[\sum X^2 - \frac{\left(\sum X\right)^2}{N}\right]\left[\sum Y^2 - \frac{\left(\sum Y\right)^2}{N}\right]}}$$

$$r = \frac{(-821) - \left[(315)(-106)\right]/30}{\sqrt{\left[3625 - \frac{(315)^2}{30}\right]\left[2026 - \frac{(-106)^2}{30}\right]}}$$

$$r = \frac{(-821) - (-1113)}{\sqrt{[3625-3307.5][2026-374.53]}}$$

$$r = \frac{292}{\sqrt{(317.5)(1651.47)}}$$

$$r = \frac{292}{724.1144} = .4033$$

Linear Regression with a single predictor

| Subjects | (X) LOC | (Y) DV | Z-scores (X) | Z-scores (Y) |
|---|---|---|---|---|
| 1 | 18 | -10 | 2.27 | -0.86 |
| 2 | 6 | -13 | -1.36 | -1.25 |
| 3 | 9 | 2 | -0.45 | 0.73 |
| 4 | 8 | -3 | -0.76 | 0.07 |
| 5 | 17 | 16 | 1.96 | 2.59 |
| 6 | 8 | -9 | -0.76 | -0.72 |
| 7 | 10 | 0 | -0.15 | 0.47 |
| 8 | 11 | 3 | 0.15 | 0.87 |
| 9 | 11 | 2 | 0.15 | 0.73 |
| 10 | 9 | -7 | -0.45 | -0.46 |
| 11 | 11 | -6 | 0.15 | -0.33 |
| 12 | 9 | 2 | -0.45 | 0.73 |
| 13 | 16 | 3 | 1.66 | 0.87 |
| 14 | 6 | -21 | -1.36 | -2.31 |
| 15 | 10 | -4 | -0.15 | -0.06 |
| 16 | 8 | 3 | -0.76 | 0.87 |
| 17 | 10 | -5 | -0.15 | -0.19 |
| 18 | 8 | -9 | -0.76 | -0.72 |
| 19 | 14 | -9 | 1.06 | -0.72 |
| 20 | 11 | -6 | 0.15 | -0.33 |
| 21 | 10 | 3 | -0.15 | 0.87 |
| 22 | 6 | -10 | -1.36 | -0.86 |
| 23 | 11 | 6 | 0.15 | 1.26 |
| 24 | 14 | -13 | 1.06 | -1.25 |
| 25 | 9 | -5 | -0.45 | -0.19 |
| 26 | 5 | -5 | -1.66 | -0.19 |
| 27 | 14 | -1 | 1.06 | 0.34 |
| 28 | 9 | -15 | -0.45 | -1.52 |
| 29 | 12 | 1 | 0.45 | 0.60 |
| 30 | 15 | 4 | 1.36 | 1.00 |

$$\bar{X} = -3.5333, \quad \bar{Y} = 10.5$$

$$\sum X = 315, \quad \sum Y = -106$$

$$\sum X^2 = 3625, \quad \sum Y^2 = 2026$$

$$\sum XY = -821, \quad N = 30,$$

$$(\sum X)^2 = 99225, \quad (\sum Y)^2 = 11236$$

$$r_{xy} = .4033$$

a. Raw score formula

$$b = \frac{\sum XY - \left[(\sum X)(\sum Y)\right]/N}{\sum X^2 - \frac{(\sum X)^2}{N}}$$

$$b = \frac{(-821) - \left[(315)(\text{-}106)\right]/30}{3625\text{-}\frac{(315)^2}{30}}$$

$$b = \frac{(-821) - (-1113)}{3625\text{-}3307.5} = \frac{292}{317.5} = .9197$$

$$a = \bar{Y} - b\bar{X} = -3.5333 - (.9197)10.5 = -13.1902$$

$$Y' = bx + a = (.9197)18 + (-13.1902) = 3.3655$$

b. Z-score formula

$$rZ_{LOC} = Z_{Aggression}$$

$$.4033(2.27) = .9155$$

Hypothesis Test That a Population Mean is a Certain Value
One-Sample t-test

1. $h_0 : \mu_y = 0$
2. $h_1 : \mu_y \neq 0$

$$S_{\bar{Y}} = \frac{SD_{N-1}}{\sqrt{N}} = \frac{7.5463}{\sqrt{30}} = \frac{7.5463}{5.4772} = 1.3778$$

*or*

$$S_{\bar{Y}} = \frac{SD_N}{\sqrt{N-1}} = \frac{7.4195}{\sqrt{30-1}} = \frac{7.4195}{5.3852} = 1.3778$$

3. $t = \dfrac{\bar{Y} - \mu_Y}{S_{\bar{Y}}} = \dfrac{-3.5333}{1.3778} = -2.5645$
4. Reject $h_0$ if $|t|$ > critical value, otherwise do not reject $h_0$.
   Critical Value: $\alpha = .05$, df = N- 1 = 30 – 1 = 29;
   Critical value from t-table = 2.04
   Since 2.5645 > 2.04, reject $h_0$.
5. There is sufficient evidence that the population mean of aggression scores is non-zero.

T-Test for Correlation

$$r_{xy} = .4033$$

$$t_{correlation} = \frac{r\sqrt{n_{pairs} - 2}}{\sqrt{1 - r^2}}$$

1. $h_0 : \rho_{xy} = 0$
2. $h_1 : \rho_{xy} \neq 0$

3. $$t = \frac{.4033\sqrt{30-2}}{\sqrt{1-.4033^2}} = \frac{.4033\sqrt{28}}{\sqrt{1-.1627}}$$
$$t = \frac{.4033(5.2915)}{\sqrt{.8373}} = \frac{2.1341}{.9150} = 2.3323$$

4. Reject $h_0$ if $|t| >$ critical value, otherwise do not reject $h_0$. The critical value with $\alpha = .05$, df = 28, two-tailed is 2.05. Since 2.3323 > 2.05, reject $h_0$.

5. There is sufficient evidence that the correlation between aggression scores and locus of control is greater than zero.

Two Independent Samples T-Test

| (A) Aggressive | (B) Non-Aggressive |
|---|---|
| -3 | -10 |
| 16 | -13 |
| -9 | 2 |
| -7 | 0 |
| -6 | 3 |
| 2 | 2 |
| -9 | 3 |
| -6 | -21 |
| 3 | -4 |
| -5 | 3 |
| -5 | -5 |
| -1 | -9 |
| -15 | -10 |
| 1 | 6 |
| 4 | -13 |

$$\bar{X}_A = \text{-2.6667, SD}_\text{A} = 7.3062$$

$$\bar{X}_B = \text{-4.4, SD}_\text{B} = 7.9355$$

$$\text{t}=\frac{\bar{X}_A - \bar{X}_B}{s_{\bar{X}_A - \bar{X}_B}}$$

$$s^2_{pooled} = \frac{(n_A - 1)SD_A^2 + (n_B - 1)SD_B^2}{n_A + n_B - 2}$$

$$s_{\bar{X}_A - \bar{X}_B} = \sqrt{\frac{s^2_{pooled}}{n_A} + \frac{s^2_{pooled}}{n_B}}$$

1. $h_0 : \mu_A \leq \mu_B$
2. $h_0 : \mu_A > \mu_B$

$$s^2_{pooled} = \frac{(15-1)7.3062^2 + (15-1)7.9355^2}{30-2} = \frac{747.32 + 881.61}{28} = 58.18$$

$$s_{\bar{X}_1 - \bar{X}_2} = \sqrt{\frac{58.18}{15} + \frac{58.18}{15}} = 2.78$$

3. $$t = \frac{\text{-2.6667-(-4.4)}}{2.78} = \frac{1.7333}{2.78} = .6234$$

4. Reject h0 if |t| > critical value, otherwise do not reject h0. Critical value: α=.05, df=28, one-tailed test. Tabled critical value is 1.70. Since 1.72 is larger than 1.7, reject h0.
5. There is evidence that there is a difference between the aggressive and non-aggressive groups.

Dependent Samples T-test (matched pairs t-test)

| Subjects | Aggression Difference Scores | Locus of Control | Video Type | Gender |
|---|---|---|---|---|
| 1 | -10 | 18 | Non-aggressive | Female |
| 2 | -13 | 6 | Non-aggressive | Female |
| 3 | 2 | 9 | Non-aggressive | Female |
| 4 | -3 | 8 | Aggressive | Female |
| 5 | 16 | 17 | Aggressive | Female |
| 6 | -9 | 8 | Aggressive | Female |
| 7 | 0 | 10 | Non-aggressive | Female |
| 8 | 3 | 11 | Non-aggressive | Male |
| 9 | 2 | 11 | Non-aggressive | Male |
| 10 | -7 | 9 | Aggressive | Female |
| 11 | -6 | 11 | Aggressive | Female |
| 12 | 2 | 9 | Aggressive | Male |
| 13 | 3 | 16 | Non-aggressive | Female |
| 14 | -21 | 6 | Non-aggressive | Female |
| 15 | -4 | 10 | Non-aggressive | Male |
| 16 | 3 | 8 | Non-aggressive | Female |
| 17 | -5 | 10 | Non-aggressive | Female |
| 18 | -9 | 8 | Non-aggressive | Male |
| 19 | -9 | 14 | Aggressive | Male |
| 20 | -6 | 11 | Aggressive | Female |
| 21 | 3 | 10 | Aggressive | Female |
| 22 | -10 | 6 | Non-aggressive | Female |
| 23 | 6 | 11 | Non-aggressive | Male |
| 24 | -13 | 14 | Non-aggressive | Female |
| 25 | -5 | 9 | Aggressive | Male |
| 26 | -5 | 5 | Aggressive | Female |
| 27 | -1 | 14 | Aggressive | Male |
| 28 | -15 | 9 | Aggressive | Female |
| 29 | 1 | 12 | Aggressive | Female |
| 30 | 4 | 15 | Aggressive | Female |

Subjects were matched on gender (each pair is designated by matching color)

Dependent Samples t-test (continued)

| Pair | (A) Aggressive | (B) Non-Aggressive | A-B |
|---|---|---|---|
| 1 | 16 | -10 | 26 |
| 2 | -3 | -13 | 10 |
| 3 | -9 | 2 | -11 |
| 4 | -7 | 0 | -7 |
| 5 | 2 | 3 | -1 |
| 6 | -5 | 2 | -7 |
| 7 | -6 | -21 | 15 |
| 8 | -6 | 3 | -9 |
| 9 | 3 | -5 | 8 |
| 10 | -5 | -10 | 5 |
| 11 | 4 | -13 | 17 |

$$\bar{X}_d = 4.1818,\ SD_d = 12.1967$$

$$t = \frac{\bar{X}_d - 0}{s_{\bar{d}}}$$

1. $h_0 : \mu_A \le \mu_B$
2. $h_0 : \mu_A > \mu_B$

$$s_{\bar{d}} = \frac{SD_d}{\sqrt{n}} = \frac{12.1967}{\sqrt{11}} = 3.91$$

3. $t = \dfrac{4.1818 - 0}{3.91} = 1.07$
4. Reject h0 if |t| > critical value otherwise do not reject h0. Critical value: α = .05, df = 10, two-tailed, tabled value = 2.23. Since, 1.07 < 2.23 do not reject h0.
5. There is not enough evidence that there is a difference between the two groups.

“Goodness of Fit” test

Locus of Control Observed

| Internal | External |
|---|---|
| 23 | 7 |

$$\chi^2 = \sum \frac{(o-e)^2}{e}$$

Locus of Control Expected

| Internal | External |
|---|---|
| 15 | 15 |

$$\chi^2 = \sum \frac{(o-e)^2}{e} = \frac{(7-15)^2}{15} + \frac{(23-15)^2}{15} = \frac{64}{15} + \frac{64}{15} = 4.2667 + 4.2667 = 8.5334$$

1. $h_0 : P_{external} = .5$
2. $h_0 : P_{external} \neq .5$
3. $\chi^2 = \sum \frac{(o-e)^2}{e} = \frac{(7-15)^2}{15} + \frac{(23-15)^2}{15} = \frac{64}{15} + \frac{64}{15} = 4.2667 + 4.2667 = 8.5334$
4. Reject h0 if $\chi^2$ > critical value, otherwise do not reject h0. Critical value: α = .05, df = 1, tabled value = 3.84. Since, 8.5334 > 3.84 reject h0.
5. There is sufficient evidence that the probability of external LOC is not .5 or that the frequencies of internal and external locus of control are not equal.

# Multiway contingency tables

| | LOC: Internal | LOC: External | |
|---|---|---|---|
| Non-Aggressive | 12 | 3 | 15 |
| Aggressive | 11 | 4 | 15 |
| | 23 | 7 | |

$$\chi^2 = \sum \frac{(o-e)^2}{e}$$

$$e = \frac{R*C}{T}$$

| | LOC: Internal | LOC: External | | LOC: Internal | LOC: External |
|---|---|---|---|---|---|
| Non-Aggressive | $\frac{(23)(15)}{30}$ | $\frac{(7)(15)}{30}$ | → | 11.5 | 11.5 |
| Aggressive | $\frac{(23)(15)}{30}$ | $\frac{(7)(15)}{30}$ | → | 3.5 | 3.5 |

1. h0: Video type and LOC are independent
2. h1: Video type and LOC are independent
3. $\chi^2 = \sum \frac{(o-e)^2}{e} = \frac{(12-11.5)^2}{11.5} + \frac{(11-11.5)^2}{11.5} + \frac{(3-3.5)^2}{3.5} + \frac{(4-3.5)^2}{3.5} =$
   $= .0217 + .0217 + .0714 + .0714 = .1862$
4. Reject h0 if $\chi^2$ > critical value, otherwise do not reject h0. Critical value: $\alpha = .05$, df = (#column – 1)(#rows -1) = 1, tabled value = 3.84. Since, .1862 < 3.84 do not reject h0.
5. There is insufficient evidence that LOC and video type are related (dependent).