***REPEATED-MEASURES F TEST (Sleep Deprivation Experiment)***

**Research Problem: On average, are subjects’ aggression scores in a controlled social situation affected by sleep deprivation periods of 0, 24, and 48 hours, where each subject experiences all three periods?**

**Statistical Hypothesis**

**STEP1:** Find each group total, T, each subject total, Tsubject, and the grand total, G, for all combined groups

Group Total(T)

|  |  |  |  |
| --- | --- | --- | --- |
| Zero | Twenty-Four | Forty-Eight | Tsubject |
| 0 | 3 | 6 | 9 |
| 4 | 6 | 8 | 18 |
| 2 | 6 | 10 | 18 |
| 6 | 15 | 24 | 45 |

Grand Total(G)=6+15+24

Grand Total(G)=45

***STEP 2:*** Substitute numbers into computation formula and solve for SSbetween.

**Where:**

->Sum of squares for the between

T->Group total

n->Group sample size; Number of subjects

G->Grand Total

N->Grand(combined) sample size

***STEP 3:*** Substitute numbers into computation formula and solve for SSwithin.

**Where:**

->Sum of squares for the within

X->Score

T->Group Total

n->Group sample size; number of subjects

***STEP 4:*** Substitute numbers into computation formula 4 and solve for SSsubject

**Where:**

->Sum of squares for the subject

T-> Group total

G->Grand total

k->Number of repeated measures

N->Grand(combined) Sample size

***STEP 5:*** Substitute numbers into computation formula and solve for SSerror.

***STEP 6:*** Substitute numbers into computation formula 6 and solve for SStotal.

**Where:**

->Sum of squares for the total

X->Score

G->Grand Total

N->Grand(combined) sample size

***STEP 7:*** Degree of Freedom(df)

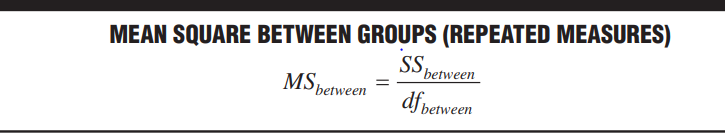
**Check for accuracy**

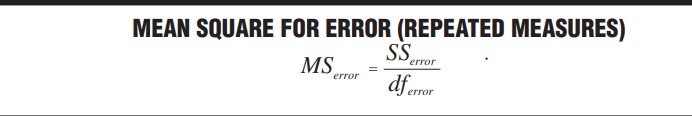
***STEP 8:*** Mean Square Between Groups

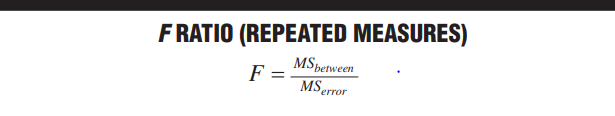
***STEP 9:*** Mean Square for error

***STEP 10:*** F Ratio

***STEP 11:*** ANNOVA TABLE: SLEEP DEPRIVATION EXPERIMENT







|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SOURCE | SS | df | MS | F |
| Between | 54 | 2 |  |  |
| Within | 22 | 6 |
| Subject | 18 | 2 |
| Error | 4 | 4 |  |
| Total | 76 | 8 |

**Decision**

Reject H0 at the .05 level of significance because F = 27 exceeds 6.94

**Interpretation**

Mean aggression scores in a controlled social situation are affected by sleep deprivation when subjects experience all three levels of deprivation.

**Estimating Effect Size**

Where:

->Sum of squares for the between

->Sum of squares for the total

->Sum of squares for the subject

->Sum of squares for the error

**Multiple Comparisons**

**TUKEY’S HSD TEST (REPEATED MEASURES)**

Tukey’s test supplies a single critical value, HSD, for evaluating the significance of each difference for every possible pair of means. The value of HSD can be calculated using the following formula