Homework 5

1. Researchers conduct an experiment to examine if physical contact reduces perceived pain. Subjects are exposed to a repeated mild shock and are randomly assigned to one of three conditions. In one condition they are alone while the shock is administered (Alone condition). In a second condition a stranger is present in the room while the shock is administered (Physical presence condition). In a third condition, a stranger is present in the room and holds the participant’s hand while the shock is administered (Physical contact condition). Participants rate their subjective feeling of pain on a 1 to 10 scale with higher scores indicating more perceived pain. Conduct a one-way ANOVA to determine if condition influences perceived pain (set alpha to .05). Be sure to report the results of your F-test correctly and to conduct post-hoc tests if warranted; note that the critical value for q for this question is 3.95. Based on the results of your test, what recommendation would we make to hospital staff working with patients undergoing painful procedures? Why?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Alone | | Physical Presence | | Physical Contact | |
| x | x2 | x | x2 | x | X2 |
| 10 | 100 | 7 | 49 | 4 | 16 |
| 8 | 64 | 8 | 64 | 5 | 25 |
| 9 | 81 | 7 | 49 | 3 | 9 |
| 6 | 36 | 9 | 81 | 5 | 25 |
|  |  |  |  |  |  |
| 33 | 281 | 31 | 243 | 17 | 75 |

Ho: The population means of all three conditions are equal

Ha: At least two of the populations means differ

Fcrit (alpha = .05, dfn = 2, dfd = 9) = 4.26

SStotal = Σ(x2) – G2/N

= (243 + 75 + 281) - [(31+17+33)2 / 12]

= 599 - 546.75

= 52.25

SSB = [Σ(T2/n)] - (G2/N)

= [312/4)] + [(172/4)] + [332/4)] - 546.75

= 240.25 + 72.25 + 272.25 - 546.75

= 38

SSE = Σ[Σ(x2) - (T2/n)]

= (243-240.25) + (75-72.25) + (281-272.25)

= 2.75 + 2.75 + 8.75

= 14.25

Anova Table

Source SS df MS F

Time 38.00 2 19.00 12.00

Error 14.25 9 1.58

Total 52.25 11

Because Fobs > Fcrit, I would reject the null. This means that at least one of the conditions differs from the others. A Tukey test will be conducted to determine which conditions are different from one another.

HSD = q √(MSE/n)

q (α = .05; k=3, df = 9) = 3.95

= 3.95 √(1.583/4)

= 3.95 √(.40)

= 3.95 (.63)

= 2.49

MAlone = 8.75 MeanPresent = 7.75 MeanContact = 4.25

There is a significant difference in perceived pain ratings based on the condition, F (2, 9) = 12, , p < .05, η2 = .73. Tukey tests revealed that participants able to hold a stranger’s hand reported significantly less pain (M =4.25) than when the stranger was just present in the room (M=7.75) or when the participant was alone (M=8.25); pain rating when alone did not differ from ratings when a stranger was just present in the room, suggesting that physical contact may be necessary to reduce pain.

Recommendation: Given these results we should recommend that healthcare professionals allow patients to have physical contact with a person during painful medical procedures; this may reduce subjective feelings of pain.

1. Below are the results of a one-way ANOVA with three treatments. In each treatment there were 8 participants (n = 8).
   1. Fill in the missing values below (HINT: start by computing the degrees of freedom):

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Source | SS | df | MS | F |
| Between Treatment    Within Treatment (Error)    Total | 40 |  | 4 |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Source | SS | df | MS | F |
| Between Treatment    Within Treatment (Error)    Total | 40    84  124 | 2    21    23 | 20    4 | 5 |

Df: if there are 3 treatments the dfbt = 3-2= 2. If there are 8 participants per group then df total = (8\*3) - 1 = 24 – 1 = 23. This also means that df error will be 24 – 3 = 21.

SS: I can now find SS within because I know what MS within is and what df within is.

MS within = SS within/ df within

4 = SS/21 = 4\*21 = SS = 84 = SS within

If SS total is 40 and SS within is 84, then SS total = 40+84 = 124

MS: I can now find MS treatment because I know SStotal and df total

MS bt = SS bt/df bt

MS bt = 40/2 = 20

Now I can find F:

F = MS bt/ MS within

F = 20/4 = 5

1. A psychologist was interested in how children learn. She conducted an experiment in which 2 year olds learned where an object was hidden by watching a video. The children either watched the video passively (we’ll call this the Watch group), or had the opportunity to advance the video by touching the screen anywhere (General Touch group) or in specific, ‘logical’ locations; that is a location that made sense given the way the video had played out up to that point (Specific touch). Learning was assessed by determining whether the children could find the object shown in the video in a real world version of the video scene; there were 15 trials. Twenty children participated in each group. The data were analyzed and the group means and ANOVA table appear below. Again, the dependent measure was the number of times the child found the hidden object, so higher scores indicate better learning. Interpret the results and make a conclusion about the ANOVA test; conduct post-hoc tests if appropriate. Provide a final write-up of the results using proper statistical notation and report of the means. Set alpha to .05

|  |  |  |
| --- | --- | --- |
| General Touch Mean (n = 20) | Watch Group (n = 20) | Specific Touch Mean (n = 20) |
| 8.70 | 5.90 | 11.20 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Source | SS | df | MS | F | p-value |
| Between Treatment    Within Treatment (Error)    Total | 281.20  273.20  554.40 | 2  57  59 | 140.60  4.793 | 29.34 | .001 |

Because the p-value is less than alpha, we will reject the null. WE therefore need to perform post-hoc tests.

HSD = q √(MSE/n)

q (α = .05; k=3, df error = 57) = 3.40

= 3.40 √(4.793/20)

= 3.40 √(.2396)

= 3.40 (.49)

= 1.66

General vs. Watch: 8.70-5.90 = 2.8 > HSD of 1.66

Watch vs. Specific: 5.90-11.20 = 5.3 > HSD of 1.66

Specific vs. general: 11.20-8.70 = 2.5 > HSD of 1.66

The data indicate that the way the children viewed/interacted with the video influenced their learning: F (2, 57) = 29.34, p = .001, η2 = .51. According to the Tukey test, there were significant differences between all three groups. Children in the watch group had significantly poorer learning (M = 5.90) than those in the general touch group (M = 8.70) or specific touch group (M = 11.20). Children in the general touch group also had significantly poorer learning than children in the specific touch group.