Problem Set #10: Solutions

1. A small study was conducted to examine whether expertise and/or empathy affect helping behavior. A confederate in a computer lab pretended to have trouble getting a computer program to run. The subjects in the experiment were either Novices (Intro to Computer Science students) or Experts (senior Computer Science majors). The subjects were also classified as being low or high in empathy on the basis for a short survey. The dependent measure was how many minutes passed before the subject attempted to help the confederate.
   1. Conduct a Two-Way ANOVA by hand to determine if there is a significant relationship between the variables in question (set alpha = .05). For the omnibus test, Fcrit = 3.24; for the main effects and interaction effect test, Fcrit = 4.49.  Be sure to report the F statistics appropriately and to describe and interpret any significant main effects or interactions.
   2. If an interaction exists, sketch a graph of the effect

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| --- | --- | --- |
|  | Novice | Expert |
| Low Empathy | Σ(x) = 15  Mean = 3  Σ(x2) = 47 | Σ(x) = 20  Mean = 4  Σ(x2) = 86 |
| High Empathy | Σ(x) = 15  Mean = 3  Σ(x2) = 51 | Σ(x) = 5  Mean = 1  Σ(x2) = 7 |

*SST* = Σx2 - G2/N

= (47 + 86 + 51 + 7) - (15 + 20 + 15 + 5)2/20

= 191 - 552/20

= 191 - 151.25 = 39.75

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*SSBT* = Σ(T2/n) - G2/N

= (152/5) + (202/5) + (152/5) + (52/5) - 151.25

= 45 + 80 + 45 + 5 - 151.25

= 175 - 151.25 = 23.75

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*SSError(Within)*= SST - SSBT

= 39.75 - 23.75 = 16

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SSExp = Σ[(TA2/n)] - G2/N

= (15+15)2/10 + (20+5)2/10 - 151.25

= (302/10) + (252/10) - 151.25

= 90 + 62.5 - 151.25

= 152.5 - 151.25 = 1.25

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*SSEmp* = Σ[(TR2/n)] - G2/N

= (15+20)2/10 + (15+5)2/10 - 151.25

= (352/10) + (202/10) - 151.25

= 122.5 + 40 - 151.25

= 162.5 - 151.25 = 11.25

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*SSExE* = SSM - (SSA + SSB)

= 23.75 - (1.25+ 11.25)

= 23.75- 12.5 = 11.25

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Omnibus Test

Source SS df MS Fobs Fcrit

Model 23.75 3 7.92 7.92 3.24

Error 16.00 16 1.00

Total 39.75 19

Tests of Individual Factors

Expertise 1.25 1 1.25 1.25 4.49

Empathy 11.25 1 11.25 11.25 4.49

E\*E 11.25 1 11.25 11.25 4.49

The main effect of expertise was not significant because Fobs was less than Fcrit: F (1, 16) = 1.25, p > .05. This indicates that experts and novices did not differ in terms of how quickly they offered help. The main effect of empathy was significant: F (1, 16) = 11.25, p < .05. People who scored higher on empathy responded more quickly than those who scored lower on empathy. Finally, the interaction effect was also significant: F (1, 16) = 11.25, p < .05. The interaction was observed because whereas novices responded equally quickly whether they were high (M = 3) or low in empathy (M = 3), experts responded more quickly if they were low in empathy (M = 1) than if they were high in empathy (M = 4).

1. Fill in the blanks of this ANOVA table below (1/2 pt each), and answer the questions that follow.

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| --- | --- | --- | --- | --- | --- |
| Source | SS | df | MS | F | p-value |
| Model  Error  Total | 272.00  1728.00  2000.00 | 8  216  224 | 34.00  8.00 | 4.25 | .001 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Source | SS | df | MS | F | p-value |
| A  B  AxB | 84.00  60.00  128.00 | 2  2  4 | 42.00  30.00  32.00 | 5.25  3.75  4.00 | .006  .025  .004 |