Step1. Build Hypotheses

1. Weight (normal/obese)와 number of crackers eaten과의 관계
2. Fullness(empty/full)와 number of crackers eaten 과의 관계
3. Fullness & Weight와 number of crackers eaten의 동시적인 관계

Step2. Locate the critical range for F-ratio. Calculate the df, SS, MS, F

= N – 1 = 20 + 20 + 20 + 20 - 1 = 79



$df_{within}$ = (20 – 1) \* 4 = 76

$df_{between}$ = (Number of groups) – 1 = 4 – 1 = 3

$df_A$ = (Number of levels of A) – 1 = 2 – 1 = 1

$df_B$ = (Number of levels of B) – 1 = 2 – 1 = 1

= $df_{between}$ - ($df_A$ + $df_B$) = 3 – (1 + 1) = 1



$$SS_{total}=\Sigma{X^2}-\frac{G^2}{N}$$ = =31836 - = 5916

$SS_{within}$ = 1540 + 1270 + 1320 + 1266 = 5396

$SS_{between}$ = $SS_{total}$ - $SS_{within}$ = 5396

$SS_A$ = (440+300)^2/40 + (340+360)^2/40 – 25920 = 20

$SS_B$ = (440+340)^2/40 + (300+360)^2/40 – 25920 = 180

$$SS_{A X B} = SS_{between} - SS_A - SS_B $$ = = 520 – 20 - 180

$MS_{A}$= $SS_A$ ÷ $df_A$ = 20 ÷ 1 = 20

$MS_{B}$= $SS_B$ ÷ $df_B$ = 180 ÷ 1 = 180

$MS_{AxB}$= $SS_{AxB}$ ÷ C:\Users\진석\AppData\Local\Microsoft\Windows\INetCache\Content.Word\img3057a4a2a65824f2e4c83f52fb7aed65.png = 320 ÷ 1 = 320

$MS_{Within}$= $SS_{within}$ ÷ $df_{within}$ = 5396 ÷ 76 = 71

$F_{A}$= $MS_{A}$ ÷ $MS_{Within}$ =

$F_{B}$= $MS_{B}$ ÷ $MS_{Within}$ =

$F_{AxB}$ = $MS_{AxB}$ ÷ $MS_{Within}$ =

|  |  |  |  |
| --- | --- | --- | --- |
| Mean number of crackers eaten in each treatment condition | | | |
| M=mean  SD=standard deviation | | Fullness | |
| Empty | Full |
| weight | Normal | M=17, SD=8.34 | M=18, SD=8.16 |
| obese | M=22, SD=9.00 | M=15, SD=8.18 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Result | | | | |
| Source | SS | Df | MS | F |
| Between treatment | 520 | 3 | - | - |
| -Factor A  (weight) | 20 | 1 | 20 | 20/71(0.28) |
| -Factor B  (fullness) | 180 | 1 | 180 | 180/71(2.53) |
| -A x B  interaction | 320 | 1 | 320 | 320/71(4.50) |
| Within  treatment | 5396 | 76 | 71 | - |
| Total | 5916 | 79 | - | - |
| Weight x fullness factorial design | | | | |

Step3. Statistical Decision

(1,71)≈0.2816, (1,71)≈2.5352, $F_{B}$$F_{A}$$F_{AxB}$(1,71)≈4.5070

$F_{AxB}$ 뿐이므로 $F_{AxB}$만 영가설(null hypothesis)를 부정한다.

Step4. Result Explanation

Weight와 Fullness가 각각의 요인으로 작용할 때는 값을 넘지 못했으므로 number of crackers eaten와는 상관관계가 없다. 하지만 두 요인이 동시에 작용했을 때는 값을 넘었으므로 상관관계가 있다고 말할 수 있다.