

SADS-II problem-8**20-03-2024**

The weight and height gain in school children 1-12 classes by Diet A, B, C are given below:

Weight gain (in kg)			Height gain in cm		
Diet A	Diet B	Diet C	Diet A	Diet B	Diet C
6	11	10	0.5	0.2	1.2
7	7	5	1.0	2.0	1.0
3	6	7	1.5	1.8	1.5
8	8	4	1.3	1.1	1.2
5	10	8	0.4	1.0	0.8
9	6	5	0.7	0.6	1.5
8	9	8	1.6	1.2	1.3
5	8	5	1.7	1.8	2.0
4	9	3	1.9	0.5	1.9
9	12	7	1.4	1.4	2.0
	6	3		1.0	1.6
		9			2.0

To test whether Diet A, B and C have same effect on weight and height gain in school children 1-12 classes at 5% level of significance.

Solution:

```
weight=c(6,7,3,8,5,9,8,5,4,9,11,7,6,8,10,6,9,8,9,12,6,10,5,7,4,8,5,8,5,3,7,3,9)
```

```
height=c(0.5,1.0,1.5,1.3,0.4,0.7,1.6,1.7,1.9,1.4,0.2,2.0,1.8,1.1,1.0,0.6,1.2,1.8,0.5,1.4,1.0,1.2,1.0,1.5,1.2,0.8,1.5,1.3,2.0,1.9,2.0,1.6,2.0)
```

```
x=cbind(weight,height)
diet=c(rep("A",10),rep("B",11),rep("C",12))
data=data.frame(weight,height,p)
data
```

```
  weight height p
1      6    0.5 A
2      7    1.0 A
3      3    1.5 A
4      8    1.3 A
5      5    0.4 A
6      9    0.7 A
7      8    1.6 A
8      5    1.7 A
9      4    1.9 A
10     9    1.4 A
11    11    0.2 B
12     7    2.0 B
13     6    1.8 B
14     8    1.1 B
15    10    1.0 B
16     6    0.6 B
17     9    1.2 B
18     8    1.8 B
19     9    0.5 B
20    12    1.4 B
21     6    1.0 B
22    10    1.2 C
23     5    1.0 C
```

```

24      7      1.5 C
25      4      1.2 C
26      8      0.8 C
27      5      1.5 C
28      8      1.3 C
29      5      2.0 C
30      3      1.9 C
31      7      2.0 C
32      3      1.6 C
33      9      2.0 C

```

```

p=factor(diet)
p

```

```

[1] A A A A A A A A A B B B B B B B B B C C C C C C C C
[30] C C C C
Levels: A B C

```

```

mdl=manova(x~p,data=data)
summary.aov(mdl)

```

```

Response weight :
      Df Sum Sq Mean Sq F value Pr(>F)
p        2  32.358  16.1788   3.4034 0.04655 *
Residuals 30 142.612   4.7537
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```

Response height :
      Df Sum Sq Mean Sq F value Pr(>F)
p        2  0.8400  0.42000   1.6476 0.2094
Residuals 30  7.6473  0.25491

```

```

summary(mdl,test="wilks")

```

```

      Df wilks approx F num Df den Df Pr(>F)
p        2 0.7611   2.1206     4    58 0.08974 .
Residuals 30
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```

TukeyHSD(aov(height~p,data=data))
Tukey multiple comparisons of means
95% family-wise confidence level

```

```

Fit: aov(formula = height ~ p, data = data)

```

```

$p
      diff      lwr      upr      p adj
B-A -0.05454545 -0.5983849 0.4892940 0.9668961
C-A  0.30000000 -0.2329397 0.8329397 0.3598933
C-B  0.35454545 -0.1650129 0.8741038 0.2284313

```

```

TukeyHSD(aov(weight~p,data=data))
Tukey multiple comparisons of means
95% family-wise confidence level

```

```

Fit: aov(formula = weight ~ p, data = data)

```

```

$p
      diff      lwr      upr      p adj
B-A  1.9636364 -0.3848909 4.31216366 0.1152462
C-A -0.2333333 -2.5347912 2.06812451 0.9661872
C-B -2.1969697 -4.4406411 0.04670174 0.0558932

```

Conclusion:

After conducting the MANOVA test on the given data, if the p-value is greater than 0.05, we reject the null hypothesis, indicating that there is a significant difference in the effects of the three diets on weight and height gain. If the p-value is less than 0.05, we fail to reject the null hypothesis, that there is not enough evidence to conclude that there is a difference in the effects of the three diets.