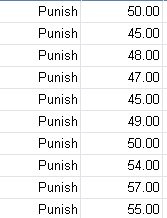
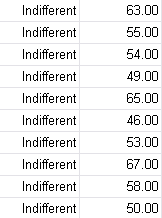
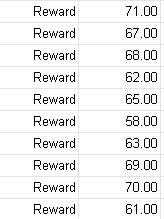
**SPSS Practical 9:**

**Part A**

A professor is interested to know how different teaching methods affected students’ knowledge. Three different methods (punishment, indifferent, and reward) have been applied on three different groups of students and their exam scores are recorded as follow:

Carry out a One-way Independent ANOVA to test the hypotheses that:

1. reward results in better exam scores than either punishment or indifference

// 이 질문을 보고 reward 가 나머지보다 크다. 즉 나머지 두개가 같은 카테고리로 묶일 수 있다는 것을 알고 contrast 모델링을 시작해야함.

이건 one-way anova 에서 contrast 에서 확인 할 수 있음, 0이 들어갈 때 생략하지말것.

>여기서도 levene test 가 이미 진행되어 있어야함. 비교가능시 윗쪽라인, 가능 x 시 아래쪽 사용.

**Normality Test**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Tests of Normality** | | | | | | | |
|  | method | Kolmogorov-Smirnova | | | Shapiro-Wilk | | |
|  | Statistic | df | Sig. | Statistic | df | Sig. |
| Score | Punish | .200 | 10 | .200\* | .929 | 10 | .437 |
| Indifferent | .156 | 10 | .200\* | .949 | 10 | .652 |
| Reward | .145 | 10 | .200\* | .956 | 10 | .741 |
| \*. This is a lower bound of the true significance. | | | | | | | |
| a. Lilliefors Significance Correction | | | | | | | |

**Normality can be assumed.**

**Normality can not be assumed.**

**K-S (Punish)**

**D(10) = 0.200, sig = 0.200(>0.05)**

**This test is nonsignificant.**

**Accept .**

**Conclusion: Punish is a normal distribution.**

**K-S (Indifferent)**

**D(10) = 0.156, sig = 0.200(>0.05)**

**This test is nonsignificant.**

**Accept .**

**Conclusion: Indifferent is a normal distribution.**

**K-S (Reward)**

**D(10) = 0.145, sig = 0.200(>0.05)**

**This test is nonsignificant.**

**Accept .**

**Conclusion: Reward is a normal distribution.**

**Homogeneity of variance Test**

**Homogeneity of variance can be assumed.**

**Homogeneity of variance can not be assumed.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Test of Homogeneity of Variances** | | | |
| Score | | | |
| Levene Statistic | df1 | df2 | Sig. |
| 2.569 | 2 | 27 | .095 |

**F(2,27) = 2.569, sig = 0.095(>0.05)**

**This test is non-significant.**

**Accept**

**Homogeneity of variance can be assumed.**

* **All the variance about the same.**

**One- Way ANOVA Test**

**All means are the same.**

**At least two means are different.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **ANOVA** | | | | | |
| Score | | | | | |
|  | Sum of Squares | df | Mean Square | F | Sig. |
| Between Groups | 1205.067 | 2 | 602.533 | 21.008 | .000 |
| Within Groups | 774.400 | 27 | 28.681 |  |  |
| Total | 1979.467 | 29 |  |  |  |

**F(2,27) = 21.008 ,sig = 0.000(<0.05)**

**This test is significant.**

**Reject**

**Conclusion: At least two means are different.**

Additional Test

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Contrast Tests** | | | | | | | |
|  |  | Contrast | Value of Contrast | Std. Error | t | df | Sig. (2-tailed) |
| Score | Assume equal variances | 1 | -24.8000 | 4.14836 | -5.978 | 27 | .000 |
| 2 | -6.0000 | 2.39506 | -2.505 | 27 | .019 |
| Does not assume equal variances | 1 | -24.8000 | 3.76180 | -6.593 | 21.696 | .000 |
| 2 | -6.0000 | 2.59915 | -2.308 | 14.476 | .036 |

Contrast 2

Since sig = 0.019 (<0.025)

This test is significant.

Reject

**Conclusion: (**

**Contrast 1**

**Since sig = 0.000(<0.025)**

This test is significant.

Reject

**Conclusion: ( <**

**Result: Planned contrast revealed that reward (M=65.4, SE=1.36) produced significant better scores than punishment(M=50, SE=1.31) and indifference(M=56,SE =2.25), t(27) =-5.978, p<0.025 and Indifference produced (M=56, SE=7.102) better scores than Punish(M=50, SE=4.137), t(27) = -2.505, p<0.025**

1. indifference will lead to significantly better exam scores than punishment

**//또한 이것을 보고 뮤 i> 뮤 p 임을 알아야함.**

**Part B**

A medical doctor would like to know the effect of different drugs to a disease. The pain score for each drug is recorded as follows:



Carry out a One-way Independent ANOVA to test the effect of different drugs.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Tests of Normality** | | | | | | | |
|  | Drug | Kolmogorov-Smirnova | | | Shapiro-Wilk | | |
|  | Statistic | df | Sig. | Statistic | df | Sig. |
| Pain\_Score | Diclofenac | .169 | 8 | .200\* | .972 | 8 | .915 |
| Ibuprophen | .182 | 8 | .200\* | .962 | 8 | .825 |
| Paracetamol | .228 | 8 | .200\* | .864 | 8 | .131 |
| Asprin | .151 | 8 | .200\* | .977 | 8 | .946 |
| \*. This is a lower bound of the true significance. | | | | | | | |
| a. Lilliefors Significance Correction | | | | | | | |

**Normality can be assumed.**

**Normality can not be assumed.**

**K-S (Diclofenac)**

**There is no conflict**

**I use Kolomogorov-Smirnov**

**D(8) = 0.169, sig = 0.200(>0.05)**

**This test is nonsignificant.**

**Accept .**

**Conclusion: Diclofenac is a normal distribution.**

**K-S (Ibuprophen)**

**There is no conflict**

**I use Kolomogorov-Smirnov**

**D(8) = 0.182, sig = 0.200(>0.05)**

**This test is nonsignificant.**

**Accept .**

**Conclusion: Ibuprophen is a normal distribution.**

**K-S (Paracetamol)**

**D(8) = 0.228, sig = 0.200(>0.05)**

**This test is nonsignificant.**

**Accept .**

**Conclusion: Paracetamol is a normal distribution.**

**K-S (Asprin)**

**D(8) = 0.151, sig = 0.200(>0.05)**

**This test is nonsignificant.**

**Accept .**

**Conclusion: Asprin is a normal distribution.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Test of Homogeneity of Variances** | | | |
| Pain\_Score | | | |
| Levene Statistic | df1 | df2 | Sig. |
| 4.837 | 3 | 28 | .008 |

**Homogeneity of variance Test**

**Homogeneity of variance can be assumed.**

**Homogeneity of variance can not be assumed.**

**F(3,28) = 4.837, sig = 0.008(<0.05)**

**This test is significant**

**Reject**

**Conclusion: Homogeneity of variance can not be assuemd.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Robust Tests of Equality of Means** | | | | |
| Pain\_Score | | | | |
|  | Statistica | df1 | df2 | Sig. |
| Welch | 32.064 | 3 | 12.171 | .000 |
| Brown-Forsythe | 11.967 | 3 | 18.889 | .000 |
| a. Asymptotically F distributed. | | | | |

**All the means is same.**

**At least two means are different.**

Welch Test:

F(3,12.171) = 32.064, sig = 0.000(<0.05)

This test is sig

Reject

Conclsion: At least two means are different

// 어떤게 다른지 모르므로 확인해야함.

여기서는

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Multiple Comparisons** | | | | | | |
| Dependent Variable: Pain\_Score | | | | | | |
| Games-Howell | | | | | | |
| (I) Drug | (J) Drug | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
| Lower Bound | Upper Bound |
| Diclofenac | Ibuprophen | -8.750 | 6.176 | .513 | -27.05 | 9.55 |
| Paracetamol | -9.500 | 7.548 | .602 | -31.45 | 12.45 |
| Asprin | -33.500\* | 5.194 | .001 | -50.55 | -16.45 |
| Ibuprophen | Diclofenac | 8.750 | 6.176 | .513 | -9.55 | 27.05 |
| Paracetamol | -.750 | 6.485 | .999 | -20.09 | 18.59 |
| Asprin | -24.750\* | 3.471 | .001 | -36.03 | -13.47 |
| Paracetamol | Diclofenac | 9.500 | 7.548 | .602 | -12.45 | 31.45 |
| Ibuprophen | .750 | 6.485 | .999 | -18.59 | 20.09 |
| Asprin | -24.000\* | 5.558 | .014 | -42.26 | -5.74 |
| Asprin | Diclofenac | 33.500\* | 5.194 | .001 | 16.45 | 50.55 |
| Ibuprophen | 24.750\* | 3.471 | .001 | 13.47 | 36.03 |
| Paracetamol | 24.000\* | 5.558 | .014 | 5.74 | 42.26 |
| \*. The mean difference is significant at the 0.05 level. | | | | | | |

Comparison 1

Since sig = 0.513(>0.05)

This test is non-significant.

Aceept

Conclusion:

Comparison 2

Since sig = 0.602(>0.05)

This test is non-significant.

Aceept

Conclusion:

Comparison 3

Since sig = 0.001(<0.05)

This test is significant.

Reject

Conclusion:

**The effect of Diclofenac(M=22.63, SE=5.151), Ibuprophen(M=31.38, SE=3.407)**

**And Paracetamol (M=32.13, SE=5.518) is about the same, but significantly**

**Different from Aspirin(M=56.13,SE=0.666), F(3,12.171) =32.064, p<0.05**

**//여기서 p는 내가 significant인 경우를 정한 기준을 쓰는것임.**