Stat_101_B_Project_Report

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# Q1
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# Q2
#Our research question was whether glucose has an effect on the performance of
#swimming 50 meters with freestyle. We had 4 age groups consisting of people in
#their 10s, 20s, 30s and 40s.  we measured the difference in performance corresponding
#to the different doses. We thought that glucose would enhance the performance
#because in the medical world glucose is used to help sick people.
#Specifically, glucose is administered to people who are suffering from severe
#colds and the patients generally get better. This implies that glucose helps
#people gain energy and from this we thought that glucose would improve a person's
#physical performance. Specifically, we wanted to see if a 5%, and 10% glucose
#dose would shorten the time it would take for a person to finish the 50-meter
#swimming course with freestyle. To investigate this question, we are going to
#conduct a completely randomized experiment with blocking in order to reduce the
#variation in error, which will increase precision of estimates and the power
#of hypothesis testing. In terms of control groups, we are going to set people
#who got injected glucose 5% dosage and 10% dosage and set uncontrolled group
#as people without injected glucose. we are going to collect our data
#by using the island website.
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# We will conduct our experiment with 40 randomly chosen samples with confidence
#level of 95% and then make them swim 50m freestyle without glucose and with a
#5% dose and a 10% dose of glucose. since we are interested in whether glucose
#dosage affects the mean time ofswimming freestyle 50m, our null and
#alternative hypothesis would be:

# Ho:There is no significant difference of swimming time at 50m regardless of
# glucose level.
# H1:At least one of glucose levels will yield the significaly differnt
# mean time of swimming 50m.

# We will use age as a block because we intuitively know age is a nuisance
#factor which can influenceour response variable because a person's
#athletic capability deteriorates with age. We will investigate
# whether blocking age will give us noise deducted effect. In other words,
# we will investigate whether or not blocking is statistically significant.
# We will divide ages into 10~19 as 10's,20~29 as 20's, 30~39 as 30'sand
#40~49 as 40's.
# Our another null and alternative hypothesis would be:

# Ho:There is no sigfinificant difference of swimming time at 50m between age groups.
# H1:There is sigfinificant difference of swimming time at 50m between age groups.
```

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# Q3 Collect your data. Include a small subset of your data in this report.
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```
  #   attch the data.

#First of all, all cities in the Island are numbered in order and only one
#city named Vardo is selected by the sampling function in R studio randomly.
#We searched for 40 people whose ages are from 10 to 49 in the city.
#The ages are divided into 4 groups, which are 10's, 20's, 30's and 40's.
#Each groups have 10 people. We only considered households that had people
#of the desired age groups. (e.g. 10~19) After selecting these specific
#households we randomly selected our dataset from these targeted samples.
#After we collected the data, we made each person swim freestyle 50m without
#glucose and with glucose 5% and 10% step by step
```

```
# Q4
#      draw diagnostic plot and  show that our assumption not violated

data=c(63.57,51.76,51.26,61.42,60.37,51.69,53.38,58.22,61.06,52.65,51.1,58.28)
df<-data.frame
glucose<-c("0%","5%","10%")
ages_blocking<-c("10's","20's","30,s","40's")
df<-data.frame(glucose,data, ages_blocking)
df
```

```
##    glucose  data ages_blocking
## 1       0% 63.57          10's
## 2       5% 51.76          20's
## 3      10% 51.26          30,s
## 4       0% 61.42          40's
## 5       5% 60.37          10's
## 6      10% 51.69          20's
## 7       0% 53.38          30,s
## 8       5% 58.22          40's
## 9      10% 61.06          10's
## 10      0% 52.65          20's
## 11      5% 51.10          30,s
## 12     10% 58.28          40's
```

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summary(aov(data~ages_blocking+glucose, data=df))
```

```
##               Df Sum Sq Mean Sq F value   Pr(>F)
## ages_blocking  3 225.81   75.27  210.69 1.81e-06 ***
## glucose        2  14.04    7.02   19.65  0.00232 **
## Residuals      6   2.14    0.36
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# conduct anova without blocking and show how huge the difference is.


# From ANOVA table, p-value for treatment is equal to 0.00232 which is smaller than
# alpha(0.05). We decide to reject the null hypotheis and conclude that at least
# one of glucose level yield  differnt mean time swimming 50m. Further investigation
# required to see which dosage level significantly different from which.

# We are going to use Turkey method to investigate.
# t1 = mean time swimming 50m without glucose
```

```r
# t2 = mean time swimming 50m with 5% glucose.
# t3 = mean time swimming 50m with 10% glucose.
t12=(55.36-57.75)/(sqrt( 0.36)*sqrt(0.5))
abs(t12)
```

```
## [1] 5.633284
```

```r
# abs(t12) > 3.068274 implies that mean time swimming 50m witout glucose and with 5% is
# significantly different.
t13=(55.57-57.75)/(sqrt( 0.36)*sqrt(1/2))
abs(t13)
```

```
## [1] 5.138309
```

```r
# abs(t13) > 3.068274 implies that mean time swimming 50m witout glucose and with 10% is
# significantly different.
t23=(55.57-55.36)/(sqrt( 0.36)*sqrt(1/2))
abs(t23)
```

```
## [1] 0.4949747
```

```r
# abs(t23) < 3.068274 implies that mean time swimming 50m with 5%glucose and with 10% is
# not significantly different.
(1/sqrt(2))*qtukey(1-0.05,3,6)
```

```
## [1] 3.068274
```

```r
# By looking at the result achieved by turkey method, we can conclude that if
# we injecta dosage of glucose it significantly reduces the mean time of swimming
# 50 meters but the level of dosage (whether it is 5% or 10%) does not have
# a significant impact. In other words, glucose injection does improve physical
# performance but more and more glucose injection does not guarantee us
# to get shorten mean time swimming.
```