Analysis of Human Performance in Stress Activities

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Outline

Initial Analysis

Correlation

	Age	Year	Scores	Normalised_PP	Time	Tai	Sessions
Age	1.00	0.83	0.17	0.14	0.01	0.21	0.00
Year	0.83	1.00	0.20	0.11	0.01	0.11	0.00
Scores	0.17	0.20	1.00	0.17	-0.25	-0.02	0.55
Normalised_PP	0.14	0.11	0.17	1.00	0.04	0.11	0.26
Time	0.01	0.01	-0.25	0.04	1.00	0.05	-0.13
Tai	0.21	0.11	-0.02	0.11	0.05	1.00	0.00
Sessions	0.00	0.00	0.55	0.26	-0.13	0.00	1.00

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	Age	Year	Scores	Normalised_PP	Time	Tai	Sessions
Age	300	300	300	272	300	300	300
Year	300	300	300	272	300	300	300
Scores	300	300	300	272	300	300	300
Normalised_PP	272	272	272	272	272	272	272
Time	300	300	300	272	300	300	300
Tai	300	300	300	272	300	300	300
Sessions	300	300	300	272	300	300	300

P

	Age	Year	Scores	Normalised_PP	Time	Tai	Sessions
Age		0.0000	0.0029	0.0188	0.8849	0.0003	1.0000
Year	0.0000		0.0004	0.0624	0.9214	0.0652	1.0000
Scores	0.0029	0.0004		0.0050	0.0000	0.7491	0.0000
Normalised_PP	0.0188	0.0624	0.0050		0.5141	0.0787	0.0000
Time	0.8849	0.9214	0.0000	0.5141		0.3586	0.0220
Tai	0.0003	0.0652	0.7491	0.0787	0.3586		1.0000
Sessions	1.0000	1.0000	0.0000	0.0000	0.0220	1.0000	

Figure: Correlation Matrix

Quality Control

Biographic data

- By referring to the Bar plot of gender distribution we can infer that the number of male subjects more than the number of female subjects
- Number of female subject is half as number of male subjects

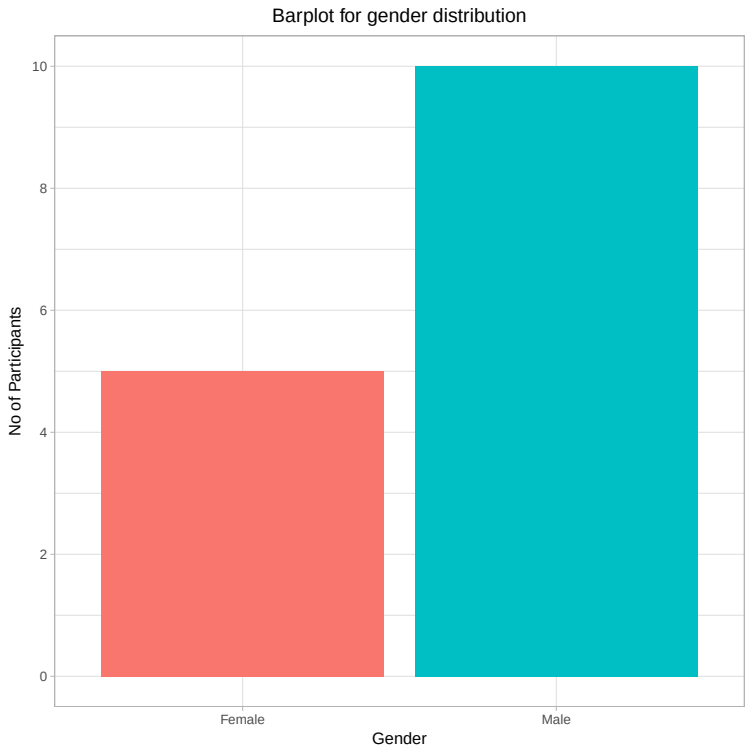
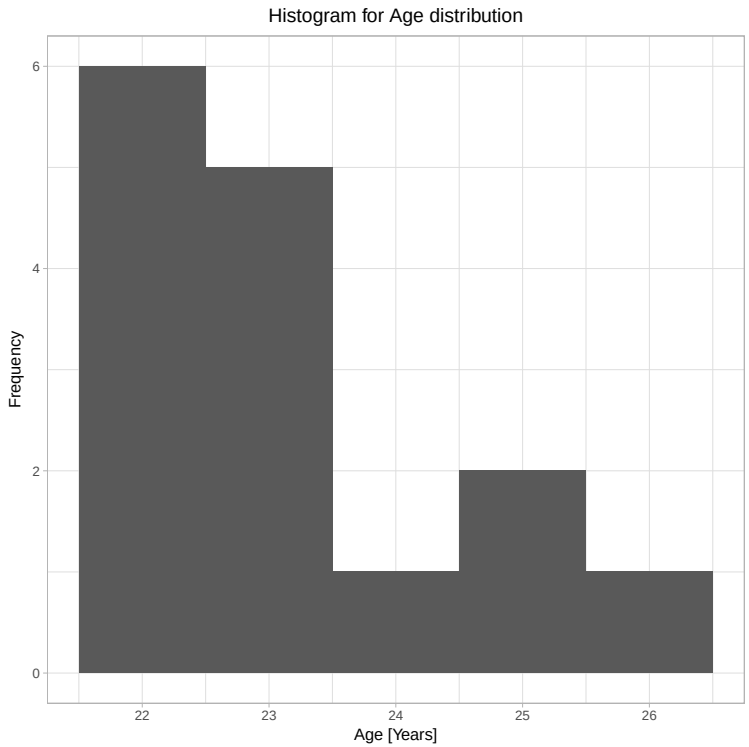


Figure: Gender Distribution

Quality Control

Biographic data Contd.

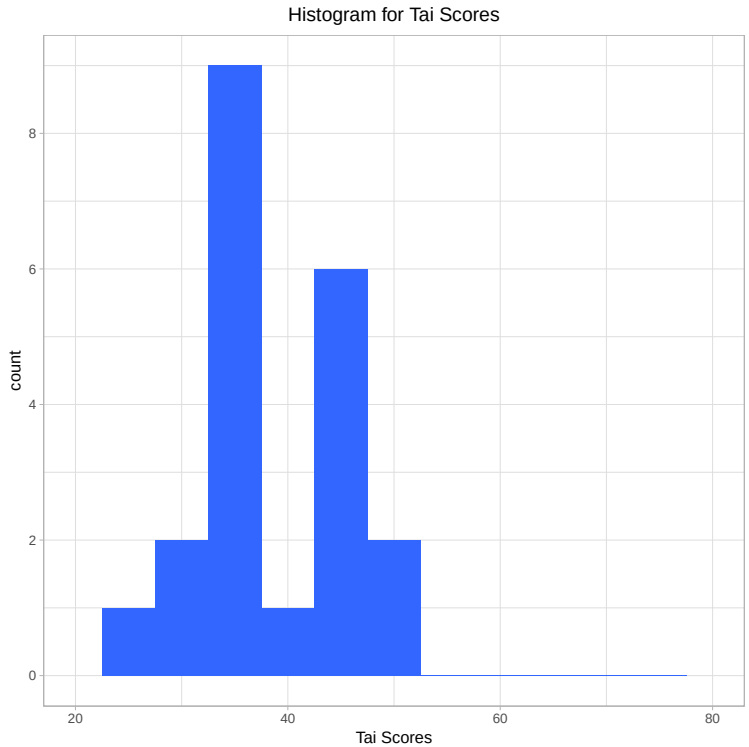
- By referring to the Bar plot of Age distribution , we can infer that more number of subjects are in the age group 22 and 23
- Also we can see from the dataset that few subjects age has been changed over the period of study



Quality Control

Trait Psychometric Data

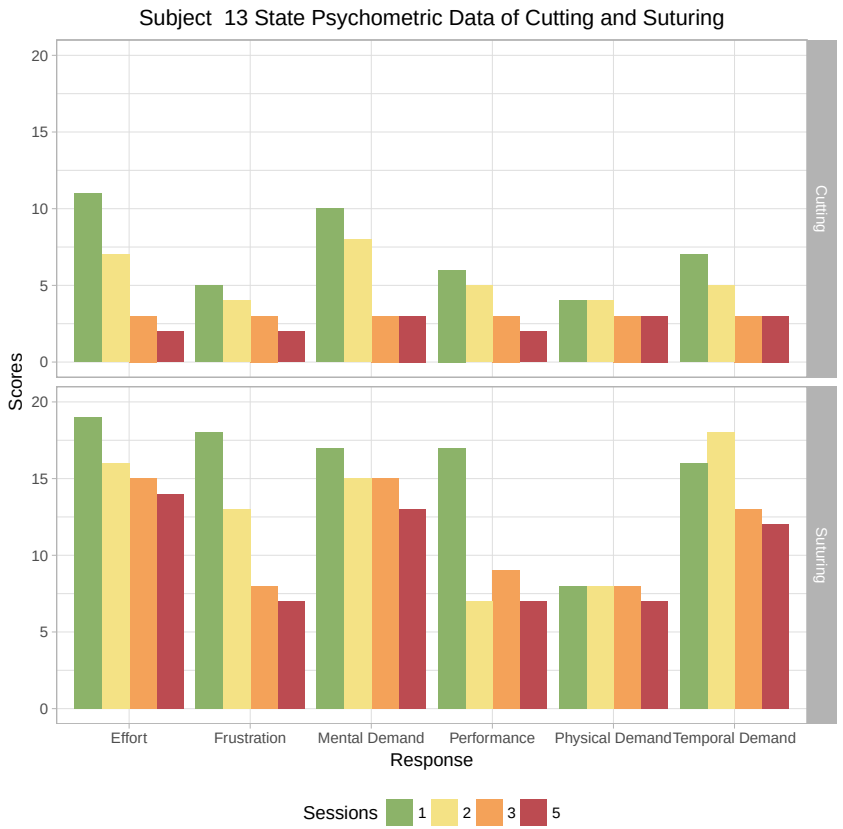
- Trait Anxiety Inventory(TAI) scores
- Range 20-80
- Higher value of Tai indicates over anxious individuals
- Most of the subjects had TAI scores in the range 25-55



Quality Control

State Psychometric data

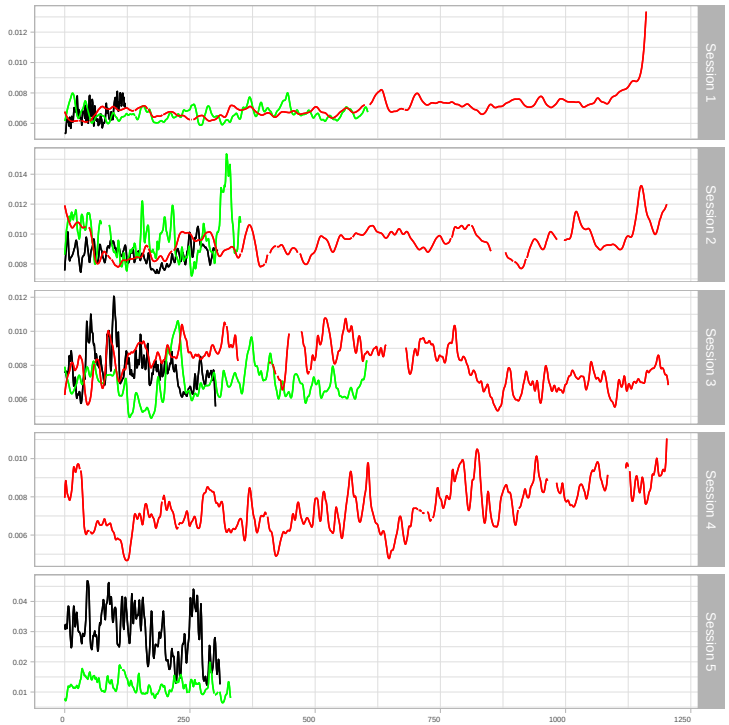
- Downward Trend
- As we can see from the plot the effort , frustration , mental demand , performance and physical demand , temporal demand are all maintaining a downward trend



Quality Control

Perinasal Perspiration (Stress) Signal Data

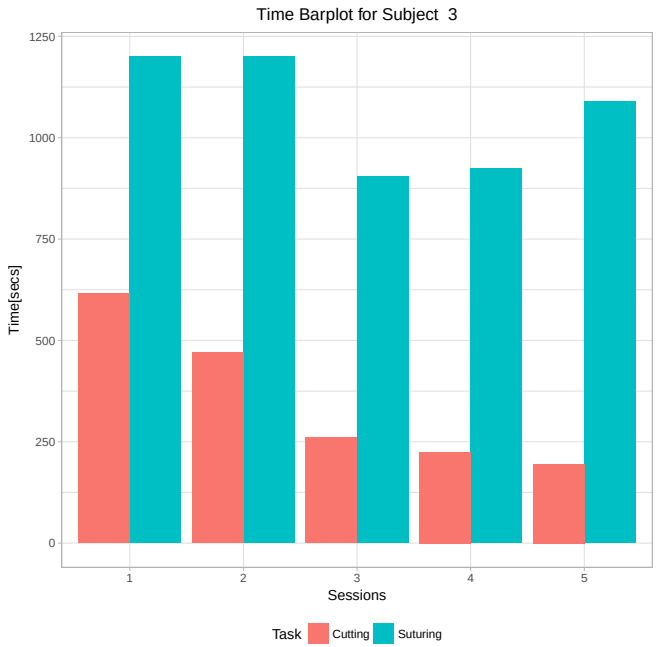
- While performing Suturing Stress signals were observed for more duration
- Suturing is more strenuous task
- Baseline is at the lower level
- Down sampling of data - Averaged data will give smoother signals



Quality Control

Performance Data

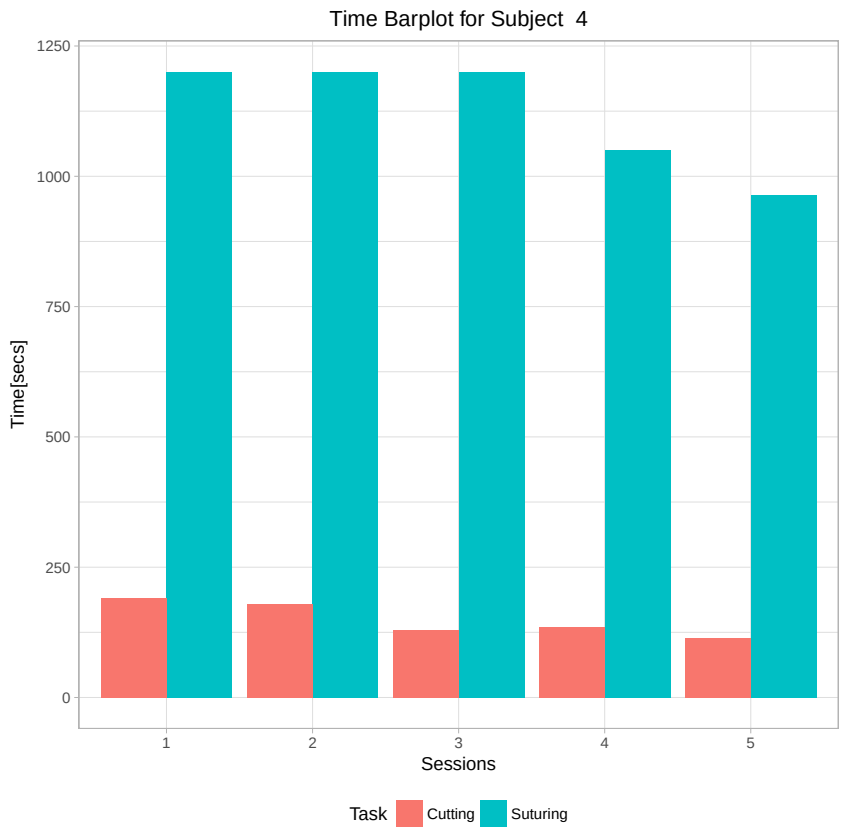
- Time taken by subject to perform cutting is decreasing session by session and Downward trend for Cutting task
- The Subject has mastered the task of cutting and can do it faster after each session, It is not the same in case of suturing, as we have already observed from peri nasal perspiration data
- suturing is more strenuous task so It takes more time to finish



Quality Control

Performance Data Contd.

- We can observe Ascending trend
- The scores obtained for cutting and suturing is increasing for each session
- The subject is becoming more adept in the tasks



Linear Model

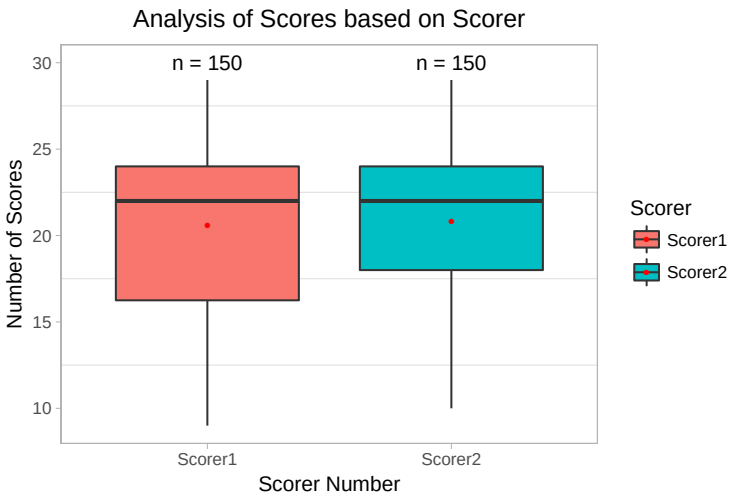
Score with all Other attributes

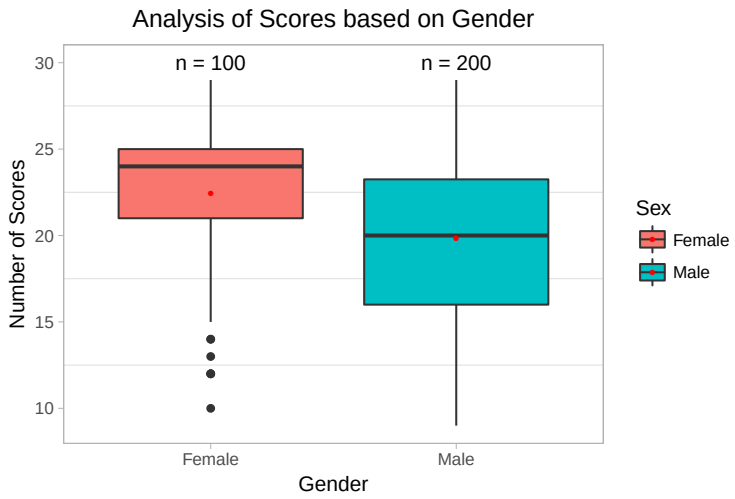
Null Hypothesis : H_0 = The score obtained does not depend on the demographics of the subject , session , age , year , sex and perspiration.
Alternate Hypothesis : H_1 = The score obtained depends on the demographics of the subject , session , age , year , sex and perspiration.

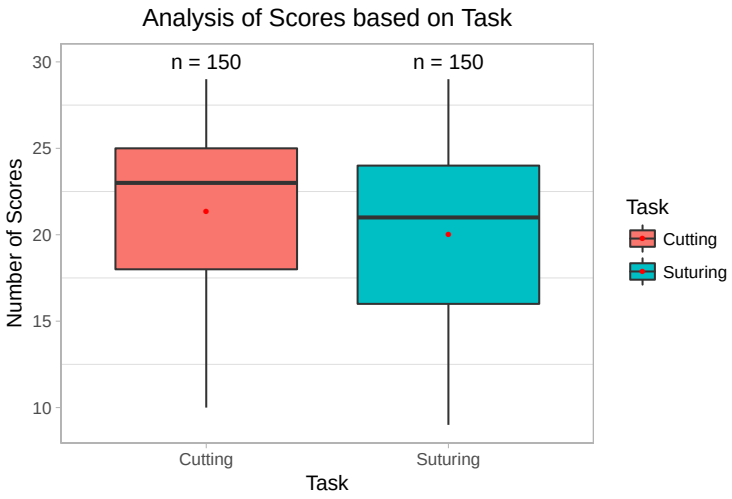
```
Call:
lm(formula = Scores ~ log(Normalised_PP) + Age + Sex + Task +
    Scorer + Session, data = data)

Residuals:
    Min      1Q  Median      3Q     Max
-9.0904 -2.0812  0.1778  2.4703  8.4800

Coefficients:
                  Estimate Std. Error t value             Pr(>|t|)
(Intercept)        0.43830    5.71336   0.077              0.93891
log(Normalised_PP) -1.13961    0.74582  -1.528              0.12772
Age                 0.49486    0.17195   2.878              0.00433 **
SexMale            -2.17630    0.47007  -4.630       0.00000576827 ***
TaskSuturing       -0.97517    0.42795  -2.279              0.02349 *
ScorerScorer2       0.02941    0.42648   0.069              0.94507
SessionSession2     4.26300    0.69164   6.164       0.00000000267 ***
SessionSession3     6.38075    0.69130   9.230 < 0.0000000000000002 ***
SessionSession4     7.68358    0.70093  10.962 < 0.0000000000000002 ***
SessionSession5     8.17553    0.71138  11.492 < 0.0000000000000002 ***

Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
---
Residual standard error: 3.517 on 262 degrees of freedom
  (28 observations deleted due to missingness)
Multiple R-squared:  0.4606,    Adjusted R-squared:  0.442
F-statistic: 24.86 on 9 and 262 DF,  p-value: < 0.00000000000000022
```

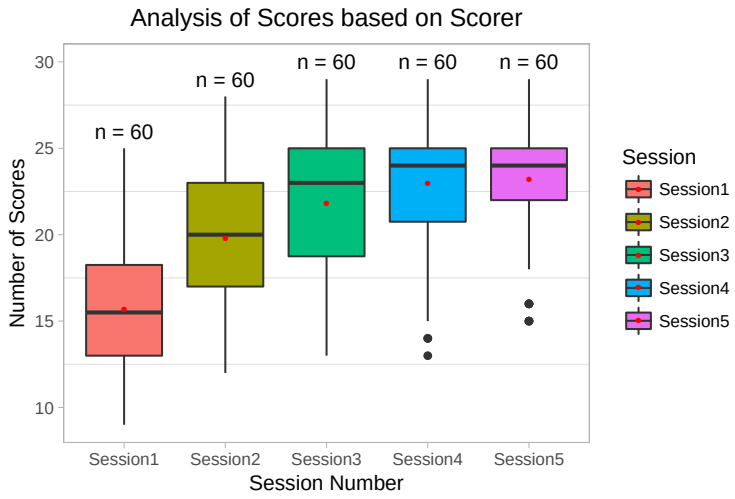
Linear Model

Score with all Other attributes Contd,









Linear Model

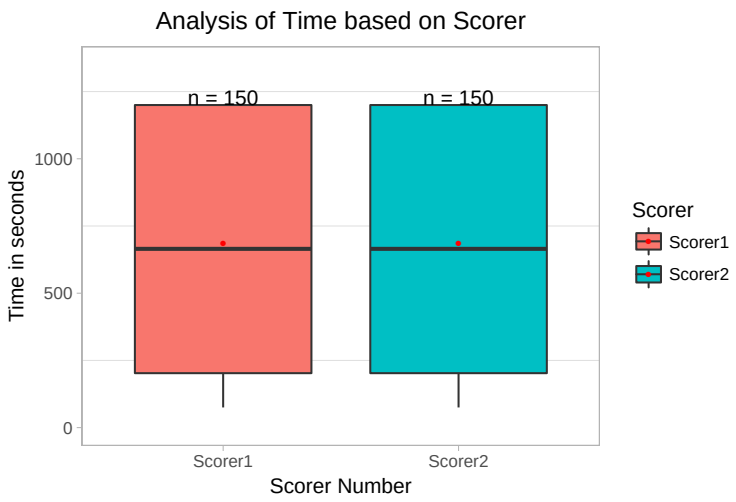
Time with all Other attributes

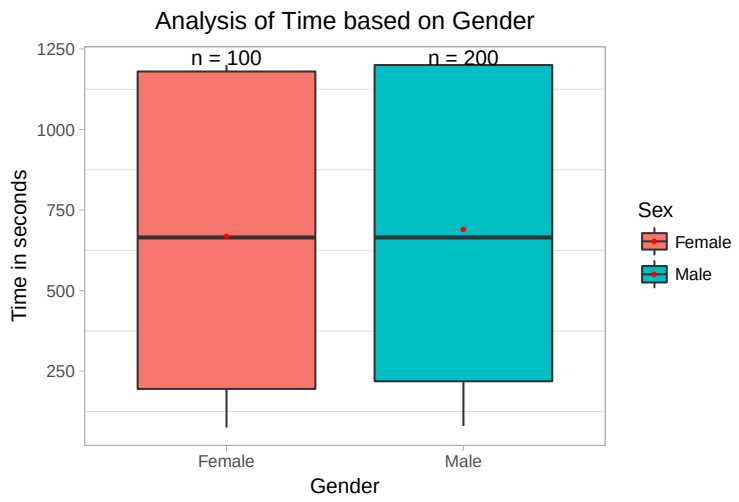
Null Hypothesis : H_0= The time taken to do a task is not dependent of age, session, sex, Perspiration.
Alternate Hypothesis : H_1 = he time taken to do a task depends on age, session, sex, Perspiration.

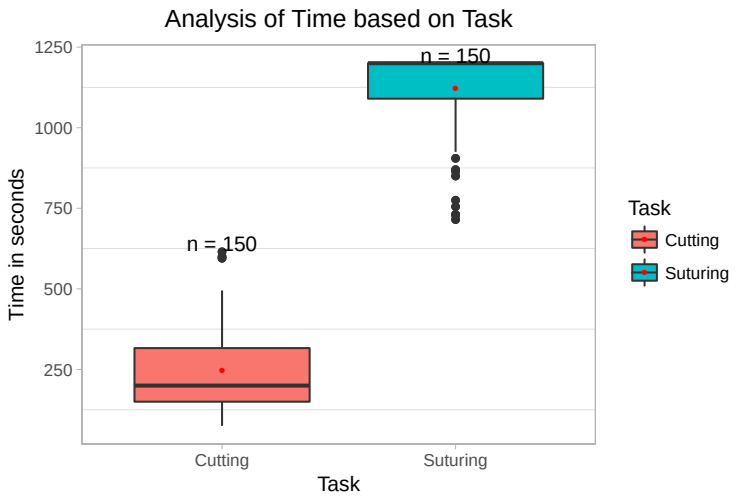
```
Call:
lm(formula = Time ~ log(Normalised_PP) + Age + Sex + Task + Session,
    data = data)

Residuals:
    Min      1Q  Median      3Q     Max
-340.68  -66.10    4.40   78.19  302.39

Coefficients:
                  Estimate Std. Error t value             Pr(>|t|)
(Intercept)         90.273    189.620   0.476                0.634
log(Normalised_PP) -15.595     24.770  -0.630                0.530
Age                  7.915      5.711   1.386                0.167
SexMale             18.922     15.612   1.212                0.227
TaskSuturing       872.331     14.213  61.375 < 0.0000000000000002 ***
SessionSession2   -105.645     22.971  -4.599   0.0000065992793776 ***
SessionSession3   -113.626     22.959  -4.949   0.0000013335710345 ***
SessionSession4   -185.969     23.279  -7.989   0.0000000000000429 ***
SessionSession5   -170.059     23.626  -7.198   0.0000000000064042 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 116.8 on 263 degrees of freedom
  (28 observations deleted due to missingness)
Multiple R-squared:  0.9365,    Adjusted R-squared:  0.9345
F-statistic: 484.7 on 8 and 263 DF,  p-value: < 0.00000000000000022
```

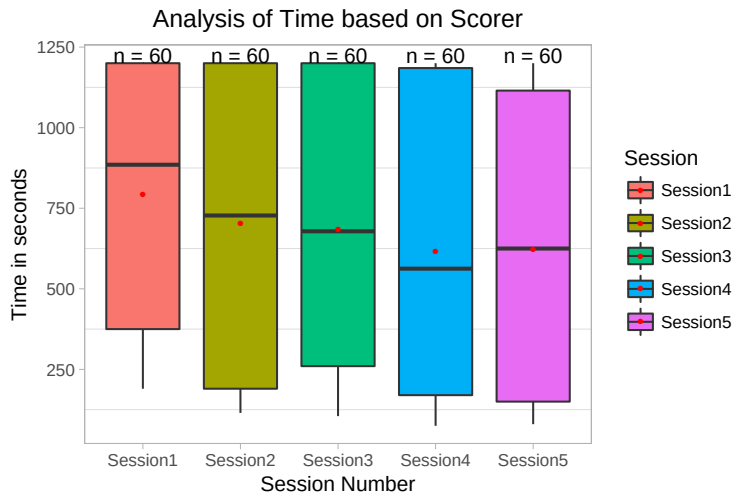
Linear Model

Time with all Other attributes Contd,





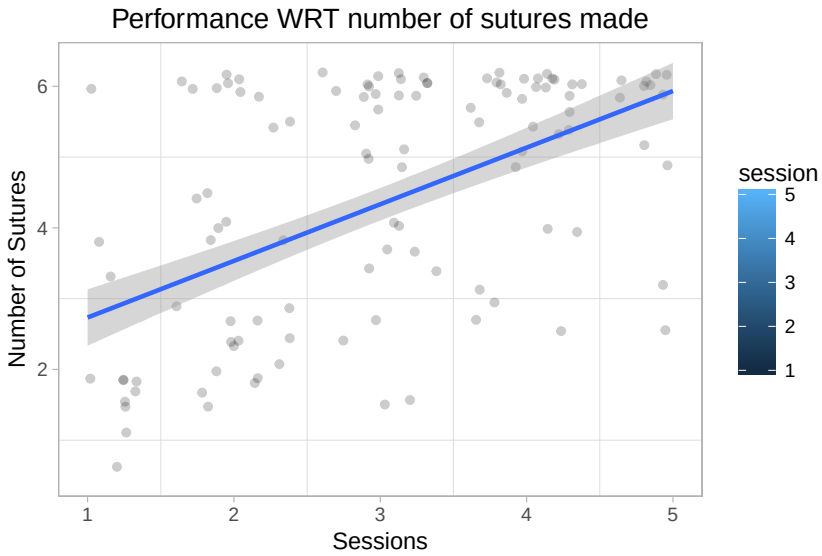


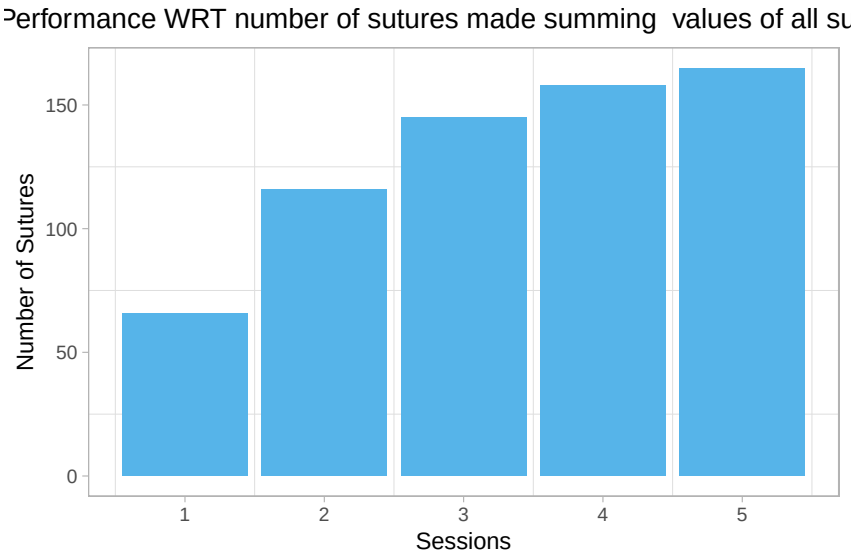


Linear Model

Performance Analysis of Suturing Task

- The number of sutures increases with each session.

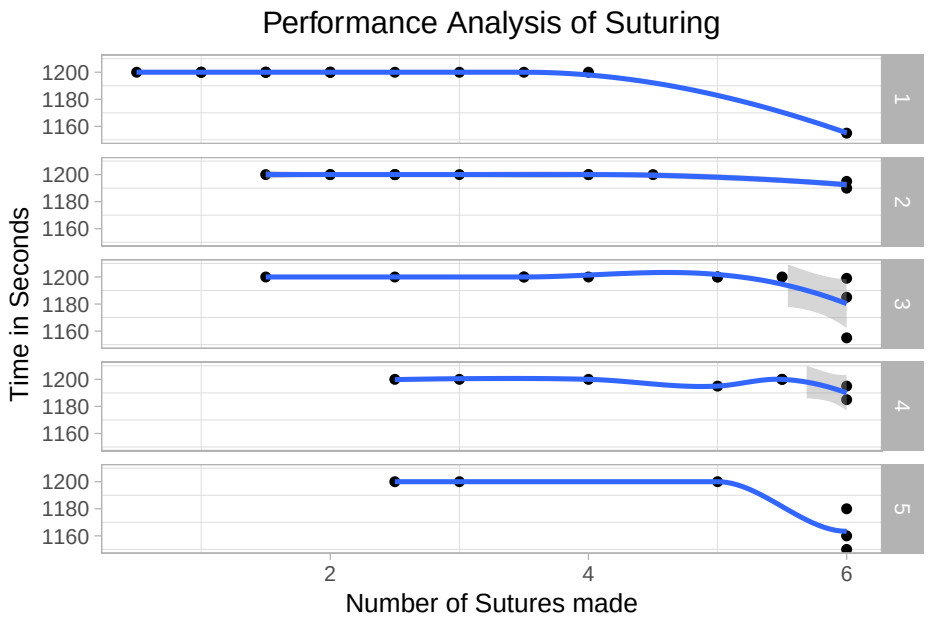




Linear Model

Performance Analysis of Suturing Task Contd.

- The number of sutures increase with decrease in time across session.
- This indicates the better performance of the subjects with increase in sessions.



Hypothesis Testing

Analysis of Scorers on Task

- There is effect of Scorer on Suturing not Cutting

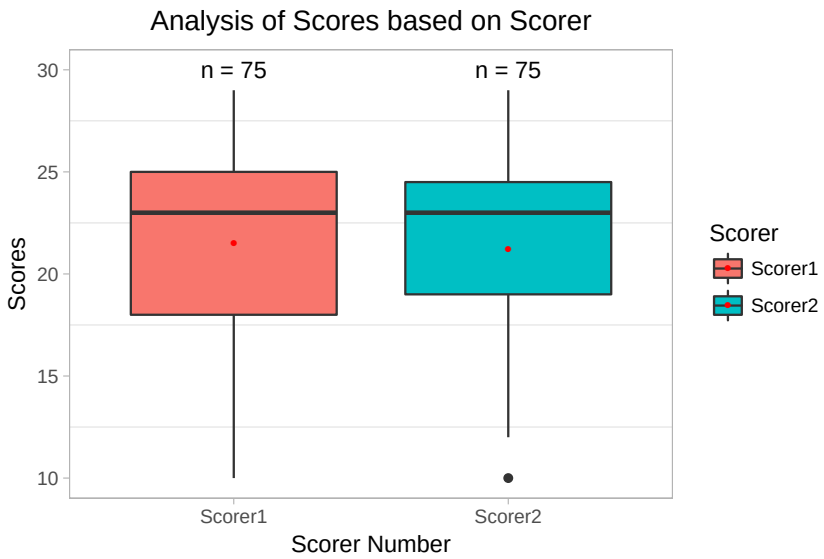


Figure: Cutting Task

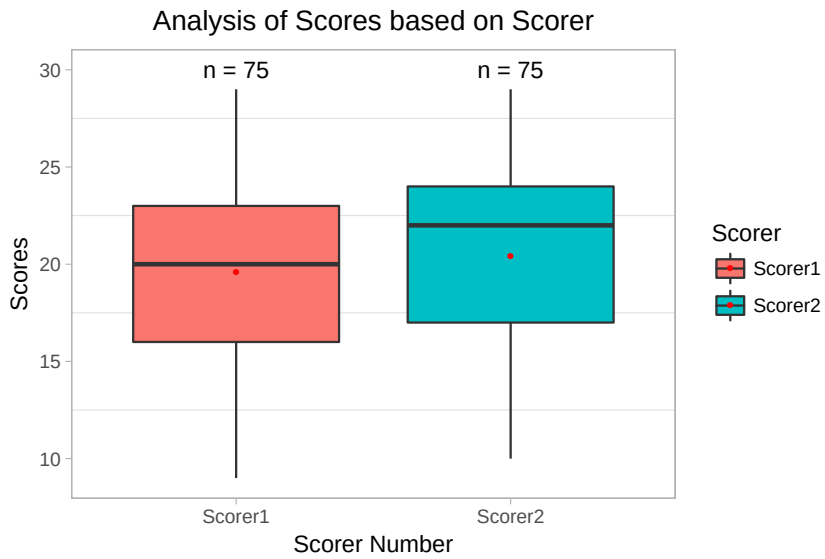


Figure: Suturing Task

Blocks

Block Title

You can also highlight sections of your presentation in a block, with it's own title

Theorem

There are separate environments for theorems, examples, definitions and proofs.

Example

Here is an example of an example block.

Summary

- The first main message of your talk in one or two lines.
- The second main message of your talk in one or two lines.
- Perhaps a third message, but not more than that.

- Outlook
  - Something you haven't solved.
  - Something else you haven't solved.

For Further Reading I

A. Author.
Handbook of Everything.
Some Press, 1990.

S. Someone.
On this and that.
Journal of This and That, 2(1):50–100, 2000.