

# Predicting Player Performance with a Better Fatigue Quantification Model

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## Data Selection

player#2 missed too many values

player#6,9,14,15,16,17 participated in lower than 21.3(average) games



# Data Wrangling

Y: total running time in each game for each player (from gps.csv)

	GameID	PlayerID	GameClock	Speed
0	1	2	00:00:00	0.658334
1	1	2	00:00:00	0.594445
2	1	2	00:00:00	0.363889
3	1	2	00:00:00	0.444445
4	1	2	00:00:00	0.400000
5	1	2	00:00:00	0.000000
6	1	2	00:00:00	0.000000
7	1	2	00:00:00	0.000000
8	1	2	00:00:00	0.000000
9	1	2	00:00:01	0.000000
10	1	2	00:00:01	0.000000
11	1	2	00:00:01	0.000000

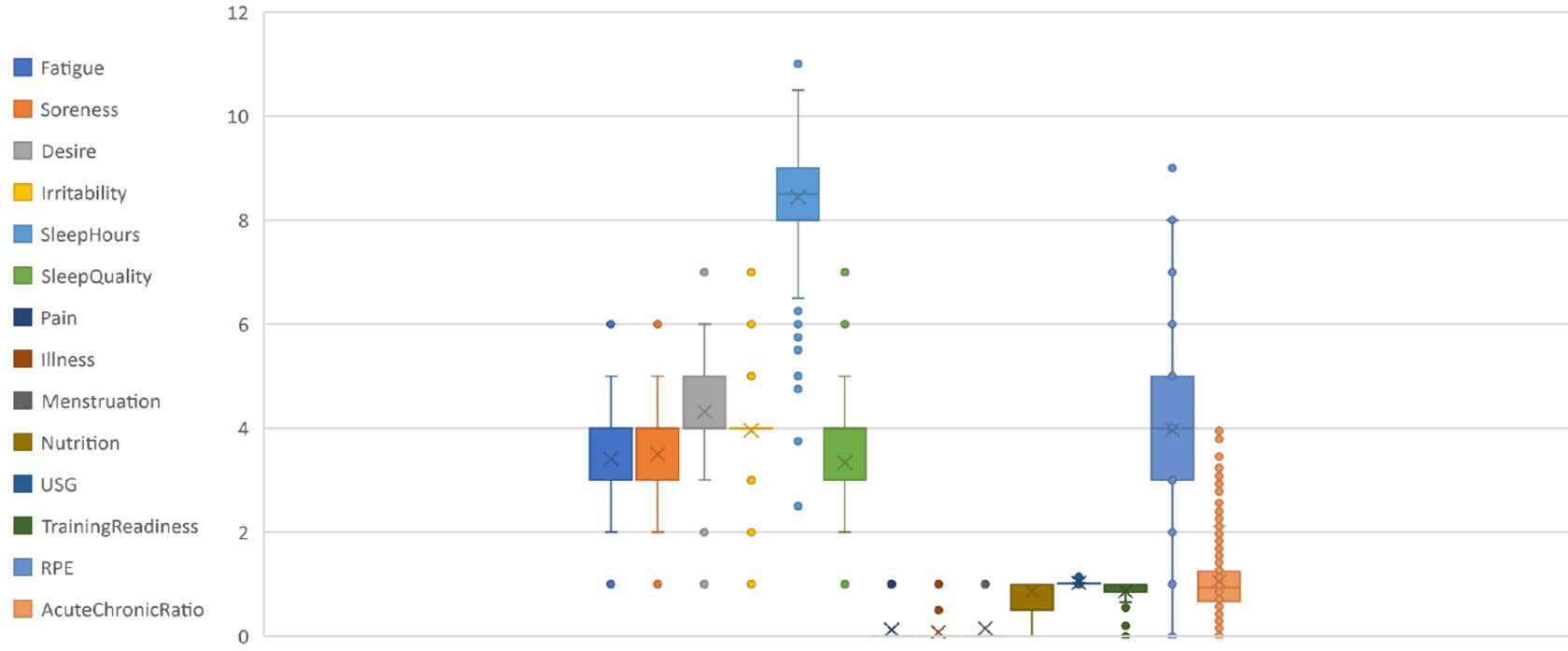
	GameID	PlayerID	Total Running Time
0	11	1	446
1	12	1	320
2	13	1	279
3	14	1	222
4	15	1	223
5	16	1	202
6	17	1	491
7	18	1	336
8	19	1	449
9	20	1	331
10	21	1	478
11	22	1	426
12	23	1	358

	PlayerID	mean_running_time	game_played
0	1	387.107143	28
1	2	264.026316	38
2	3	307.423077	26
3	4	314.459460	37
4	5	224.750000	28
5	7	302.323529	34
6	8	315.500000	34
7	10	326.923077	26
8	11	310.052632	38
9	12	268.607143	28
10	13	245.236842	38
11	16	246.964286	28

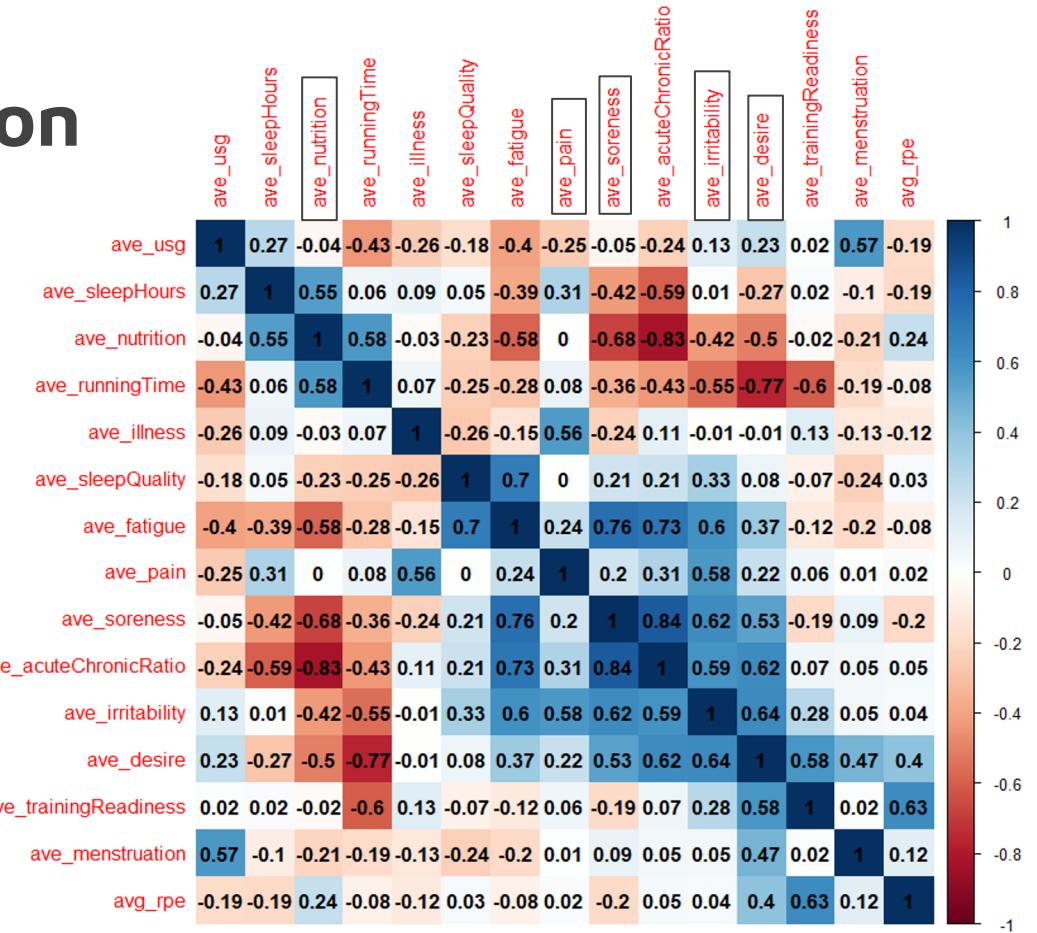


# Data Wrangling

Box plot of various variables considered



# Feature Selection



LIVE

1,1 тыс.

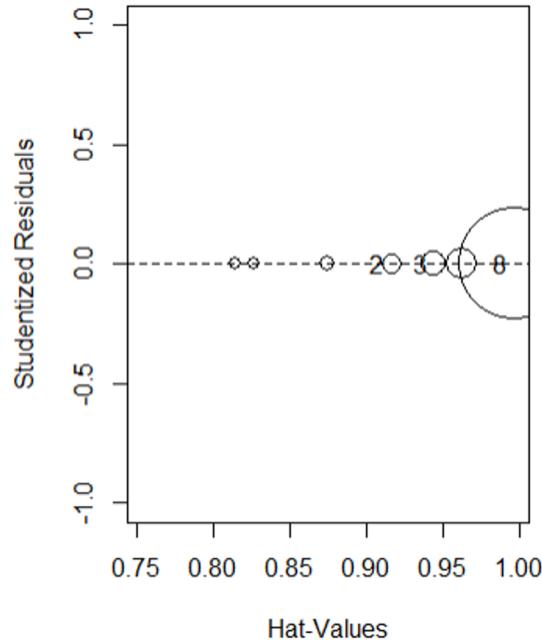
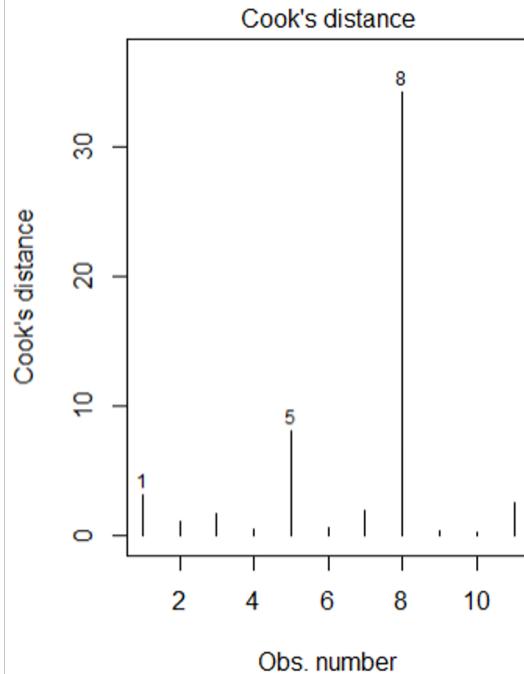
CAN

0 4:18

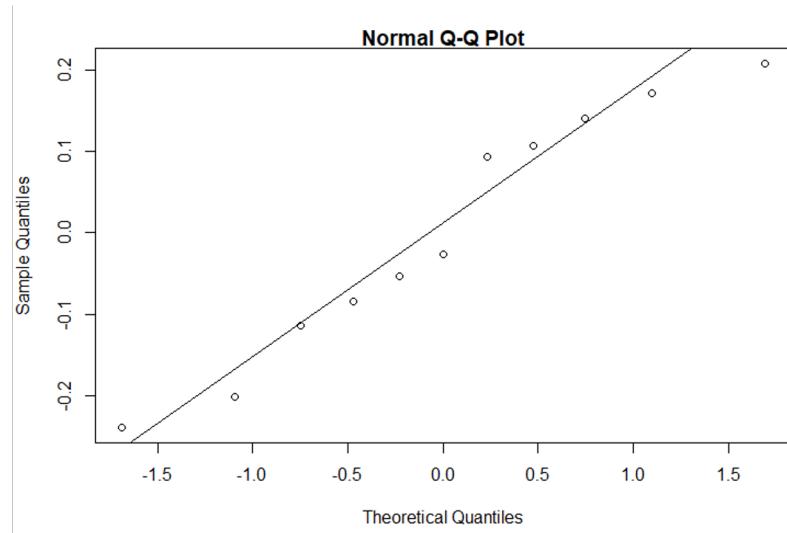
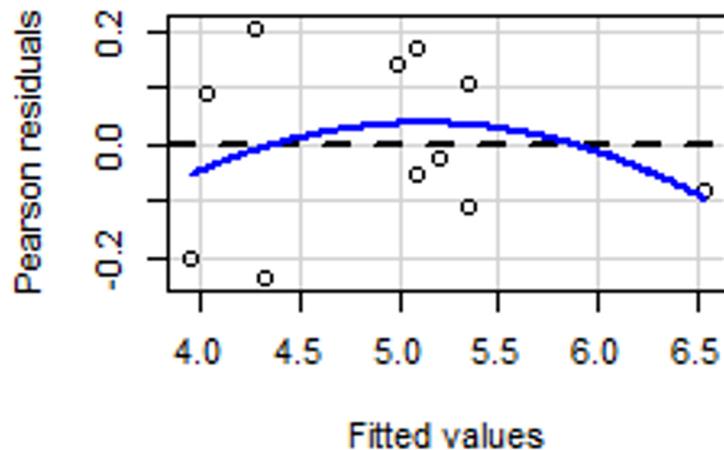
7



# Outlier Detection



# Regression Assumptions



shapiro-wilk normality test

```
data: resid(fatigue.mod1)
W = 0.94165, p-value = 0.54
```

# Transformation on Y

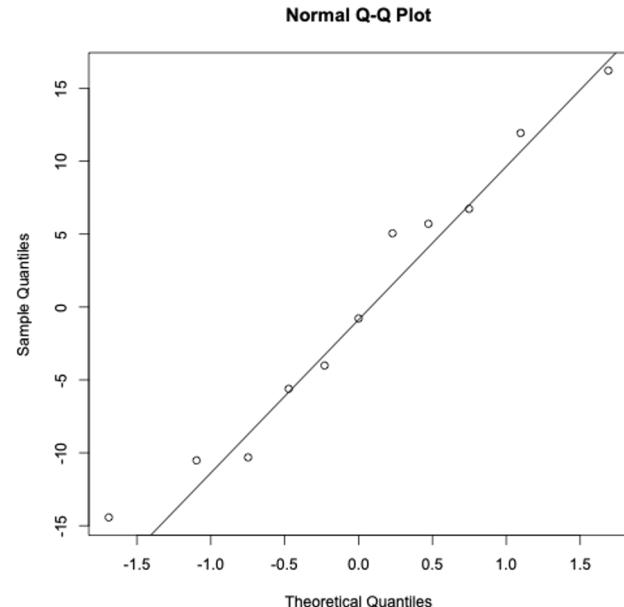
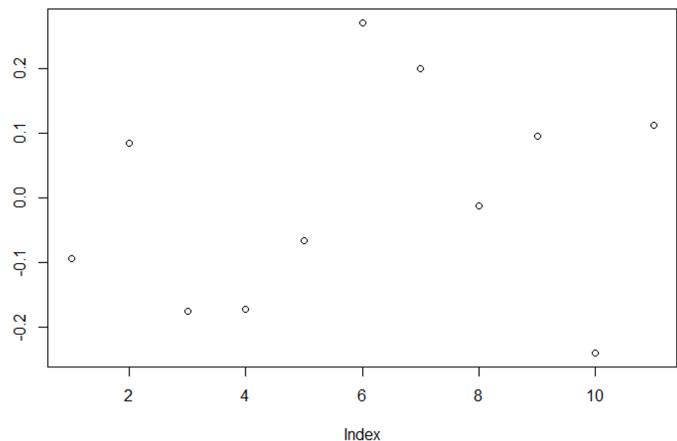
```
Call:  
lm(formula = (ave_runningTime)^2 ~ ave_sleepquality + ave_usg +  
    ave_trainingReadiness + avg_rpe + ave_acutechronicRatio,  
    data = final2)  
  
Residuals:  
     1      2      3      4      5      6      7      8      9      10     11  
-0.74390  0.58988 -1.54624 -1.22611 -0.73819  2.30942  1.90196 -0.01972  0.35993 -1.80274  0.91569  
  
Coefficients:  
              Estimate Std. Error t value Pr(>|t|)  
(Intercept) 59.4376   6.9868  8.507 0.000369 ***  
ave_sleepQuality -5.5431   1.5675 -3.536 0.016630 *  
ave_usg        -6.3440   1.1319 -5.605 0.002499 **  
ave_trainingReadiness -6.1543   0.7279 -8.455 0.000380 ***  
avg_rpe         10.1868   2.9354  3.470 0.017844 *  
ave_acutechronicRatio -33.0798   6.5115 -5.080 0.003834 **  
---  
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1  
  
Residual standard error: 1.924 on 5 degrees of freedom  
Multiple R-squared:  0.9688,    Adjusted R-squared:  0.9377  
F-statistic: 31.1 on 5 and 5 DF,  p-value: 0.0008996
```

# Transformation on X

```
Call:  
lm(formula = ave_runningTime ~ ave_sleepquality + (ave_usg)^2 +  
    ave_trainingReadiness + avg_rpe + ave_acutechronicRatio,  
    data = final2)  
  
Residuals:  
     1      2      3      4      5      6      7      8      9      10     11  
-0.09344  0.08429 -0.17529 -0.17185 -0.06687  0.27034  0.19894 -0.01303  0.09520 -0.24052  0.11223  
  
Coefficients:  
              Estimate Std. Error t value Pr(>|t|)  
(Intercept)  8.60424   0.84837 10.142  0.00016 ***  
ave_sleepquality -0.60224   0.19034 -3.164  0.02498 *  
ave_usg        -0.67852   0.13744 -4.937  0.00433 **  
ave_trainingReadiness -0.56786   0.08839 -6.425  0.00136 **  
avg_rpe         1.01849   0.35643  2.857  0.03551 *  
ave_acutechronicRatio -3.49760   0.79065 -4.424  0.00687 **  
---  
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1  
  
Residual standard error: 0.2336 on 5 degrees of freedom  
Multiple R-squared:  0.9535, Adjusted R-squared:  0.9071  
F-statistic: 20.53 on 5 and 5 DF,  p-value: 0.002402
```



# Model Diagnostic



Shapiro-Wilk normality test

```
data: resid(tran_fatigue.mod3)
W = 0.95258, p-value = 0.6771
```



# VIF of final model

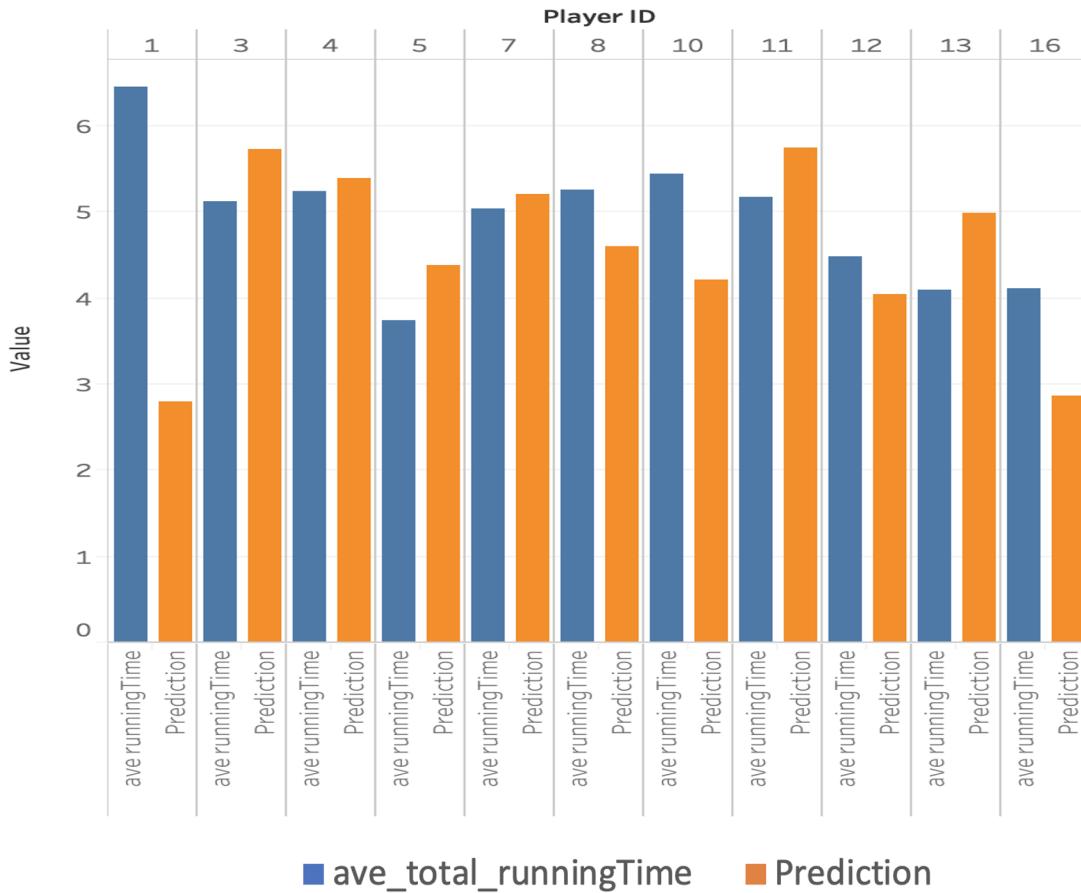
```
> sqrt(vif(tran_fatigue.mod2))>2  
ave_sleepQuality ave_usg ave_trainingReadiness avg_rpe ave_acutechronicRatio  
      FALSE        FALSE       FALSE      FALSE      FALSE  
> |
```

Final model:

*Total Running Time = 8.60404 + 0.60224(Sleep Quality) -  
0.67852(USG)<sup>2</sup> + 0.56786(Training Readiness) +  
1.01849(RPE) - 3.49760(Acute Chronic Ratio)*

# Prediction

ave_total_runningTime	Prediction	Ratio
6.451785715	2.804224209	43.46%
5.123717948	5.722786921	111.69%
5.240990992	5.396702712	102.97%
3.745833333	4.385975298	117.09%
5.03872549	5.213909327	103.48%
5.258333333	4.597492893	87.43%
5.448717948	4.219147895	77.43%
5.16754386	5.745004572	111.17%
4.476785715	4.037920535	90.20%
4.087280702	4.98635615	122.00%
4.116071428	2.858088372	69.44%





# Discussion

- Overall, there seem to be no surprising coefficients.
- One suggestion

Final model:

*Total Running Time*

$$\begin{aligned} &= 8.60404 + 0.60224(\text{Sleep} \\ &\quad \text{Quality}) - 0.67852(\text{USG})^2 + \\ &\quad 0.56786(\text{Training Readiness}) \\ &\quad + 1.01849(\text{RPE}) - \\ &\quad 3.49760(\text{Acute Chronic Ratio}) \end{aligned}$$

# Limitation

- Some variables are very subject and every player has her own standard.
- The size of our final dataset is somehow small.





# Reference

<https://en.wikipedia.org/wiki/Walking>

<https://www.youtube.com/watch?v=pwClxmCE8ZI>

HSBC  
SEVENS SERIES

HSBC  
SEVENS SERIES



# Questions?



# Thanks for listening :)

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