MA3518 Applied Statistics
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Regress Analysis on the Weight for Undergraduate Student in China

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Abstract

Weight is an important parameter that reflects and measures a person's health. Excessive obesity and thinness are harmful to health. There is a phenomenon among contemporary Chinese college students, the higher the grade, the heavier the weight. In order to study the weight of college students, our group started with factors such as height, weight, age, energy intake, and used regression analysis to try to predict the weight model.

Data Collection

In order to get the most time-sensitive data, our group uses questionnaires to obtain data. We create a questionnaire within 5 questions which ask for respondent’s height, age, sleeping hour, weekly exercise time and energy intake. The questionnaire is distributed via WeChat, and the filling period is from December 1, 2020 to December 12, 2020. Finally, a total of 43 responses were received, of which 42 were valid responses. Respondents are from 16 provincial-level administrative regions including Beijing, Shanghai and Hong Kong. To a certain extent, it can represent the general situation of college students in most parts of China. The results are shown in the appendix

Methodology

We try different regression model and we want to find the most accurate model to describe the relationship between weight and other variables.

Model 1

By applying R, first we get results below.

```
Call:
lm(formula = W ~ H + E + S + C)

Residuals:
    Min      1Q  Median      3Q     Max 
-11.362  -5.639  -1.323   2.986  26.127 

Coefficients:
              Estimate Std. Error t value Pr(>|t|)    
(Intercept) -1.149e+02  2.458e+01  -4.676 3.82e-05 ***
H            9.767e-01  1.610e-01   6.065 5.13e-07 ***
E           -9.840e-02  3.233e-01  -0.304   0.7626    
S           -8.838e-01  1.004e+00  -0.881   0.3842    
C            8.941e-03  4.946e-03   1.808   0.0788 .  
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 8.643 on 37 degrees of freedom
Multiple R-squared:  0.6674,    Adjusted R-squared:  0.6315 
F-statistic: 18.57 on 4 and 37 DF,  p-value: 1.905e-08
```

From the data, the result of the estimating model is:

$$W = 0.9767H - 0.0984E - 0.838S + 0.008941C - 114.9.$$

The result shows that with one-centimeter increase in height, weight will increase by 0.9767kg. When increasing one exercise hour each week, weight will decrease 0.0984kg. When increasing one hour sleep each day, weight will decrease 0.838kg. When increasing 1 Calorie absorbed each day, weight will increase 0.008941.

R test:

From the result, we get R-squared = 0.6674 and Adjusted R-squared = 0.6315, indicating a rather good fit to the data.

F test:

H0: a = b = c = d = 0, and we set significance level alpha=0.05. From F distribution table, we check the critical value when the degree of freedom is k-1=4 and n-k=37. Since $2.09=F_{0.05}(4,40)<F_{0.05}(4,37)<F_{0.05}(4,30)=2.14$ and $F=18.57>2.14>F_{0.05}(4,37)$, so reject H0 and we can say that the regression equation is significant. So people's weight is related to people's 'height', 'exercise hours each week', 'sleep hours each day' and 'calorie intake each day'.

T test:

H0: k=0 (k=a, b, c, d) respectively. Give significant level alpha=0.05, degree of freedom n-k=37. From the t distribution table, $t_{0.025}$; 37=2.03. From t-value in the table, $t_a=6.065>2.03$, $t_b=-0.304<2.03$, $t_c=-0.881<2.03$, $t_d=1.808<2.03$. Observing these results, we find that the coefficients of E, S and C are not significant for the t test. One possible explanation is Multicollinearity.

Multicollinearity:

In statistics, multicollinearity (also collinearity) is a phenomenon in which one predictor variable in a multiple regression model can be linearly predicted from the others with a substantial degree of accuracy.

Test: We need to find the correlation between each two of 'Height', 'Exercise hours per week', 'Sleep hours per day' and 'Calorie intake per day'. Here is the matrix:

	H	E	S	C
H	1			
E	0.10604	1		
S	0.04647	-0.0444	1	
C	0.51778	-0.1499	-0.0125	1

We discover there probably exists Multicollinearity.

Elimination:

Respectively do the linear regression of W to H, E, S, C. And we collect the result in a chart.

Variable	H	E	S	C
Coefficient	1.118	0.05251	-0.5588	0.02464
t Value	8.16	0.101	-0.336	4.385
R-Square	0.6247	0.01022	0.002807	0.3246

According to R^2, we rank the 4 variables in the sequence of H, C, E, S. Set H as basis, we get formula W=1.118H-130.054, where t value of H is $8.16>t_{0.025}$;40=2.02. So H is obviously significant. Then we add C, getting the formula W=0.9575H+0.009485C, where t value of H and C are 6.201 and 2.009 respectively. Remark: $2.009<t_{0.025}$;39=2.02. So C is not significant.

Finally, we get the formula:

$$W=1.118H-130.054.$$

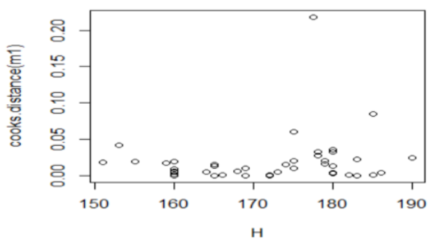
The final R result and its test are shown in the appendix (data set 1).

Now we check the model W=1.118H-130.054 with diagnostics tools. We use standard residuals and get the result below. Data 5, 9 is outside the interval (-2, 2).

```
> rstandard(m1)
          1           2           3           4           5           6 
-0.29432697  0.78478552 -0.88124620  1.38506332  2.10941593 -0.62447410 
          7           8           9          10          11          12 
-1.26421070  0.73325168  3.63524294  0.83662391 -0.87468199 -0.79853847 
         13          14          15          16          17          18 
-1.04923196  0.43796055  0.05053583 -0.10463662 -0.34354623  0.64374730 
         19          20          21          22          23          24 
-1.29616432 -0.56534888  1.24721882  0.13421991 -0.44875408  0.42570690 
         25          26          27          28          29          30 
-0.64543951 -0.66519762 -0.93384989  0.25081470  1.54690152  0.94051254 
         31          32          33          34          35          36 
-1.08990807 -0.90766463 -0.85742645  0.08406719 -0.37129772  0.31330357 
         37          38          39          40          41          42 
-0.21126075 -1.21900098  0.51073172  0.06459354 -0.16818632 -0.49894685 
```

Then we use cook's distance to identify the influential point. The cutoff is 4/(42-2)=0.1.

```
> cooks.distance(m1)
           1            2            3            4            5 
1.412202e-03 1.299270e-02 2.245734e-02 3.317696e-02 6.048264e-02 
           6            7            8            9           10 
1.947092e-02 2.763988e-02 1.792695e-02 2.182169e-01 4.229397e-02 
          11           12           13           14           15 
1.039936e-02 1.914694e-02 2.098097e-02 4.046386e-03 7.385207e-05 
          16           17           18           19           20 
1.434646e-04 4.660673e-03 5.145252e-03 3.544194e-02 9.597118e-03 
          21           22           23           24           25 
3.281577e-02 5.409307e-04 6.046786e-03 5.441632e-03 2.434296e-02 
          26           27           28           29           30 
6.155225e-03 1.662021e-02 1.888921e-03 8.528844e-02 1.582758e-02 
          31           32           33           34           35 
1.529645e-02 1.079514e-02 1.315464e-02 8.627874e-05 2.908318e-03 
          36           37           38           39           40 
1.198344e-03 1.590752e-03 2.019828e-02 1.893478e-02 7.465581e-05 
          41           42 
7.359568e-04 4.917780e-03 
```



From the result, we delete data 9 and redo the model again.

```
> m2<-lm(W~H,subset=(1:42)[-c(9)])
> summary(m2)

Call:
lm(formula = W ~ H, subset = (1:42)[-c(9)])

Residuals:
     Min       1Q   Median       3Q      Max 
-10.0543  -6.2715  -0.4163   4.0455  19.3078 

Coefficients:
            Estimate Std. Error t value Pr(>|t|)    
(Intercept) -122.979     19.595  -6.276 2.14e-07 ***
H              1.072      0.114   9.404 1.42e-11 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' '

Residual standard error: 7.318 on 39 degrees of freedom
Multiple R-squared:  0.694,	Adjusted R-squared:  0.6861 
F-statistic: 88.44 on 1 and 39 DF,  p-value: 1.416e-11
```

Here, R-squared, Adjusted R-squared and F are all greater than the former one's. P-value(m2)=1.416e-11<4.804e-10. All parameters indicate that model after deleting data 9 fits better.

In conclusion, **Weight = 1.072Height-122.979.**

<u>Model 2</u>

At last part, we found that weight just has strong correlation with height and other variables are weekly correlated. And through common sense, weight could have relationship with sports and energy absorbed. Therefore, in order to complete our project we introduce a concept called BMI (BMI=Weight/Height^2 the unit of height is meter) and we suppose a new Y value called health level to estimate the relationship of them. We estimate health lever = 0.08137weight +0.06703height+ 0.01956sporttime + 0.03283sleeptime + 0.01937cal + 0.04925bmi. An explanation about this formula has been discussed in last part, and they are similarly. From the result, we get R-squared = 0.8575 and Adjusted R-squared = 0.833 indicating a rather good fit to the data.

```
myfit=lm(health_level~.,data=data)
summary(myfit)

##
## Call:
## lm(formula = health_level ~ ., data = data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.03550 -0.18349  0.02153  0.21835  0.62716
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept) -1.449e+01  9.370e+00  -1.546   0.1310
## weight      -8.137e-02  7.945e-02  -1.024   0.3128
## height       6.703e-02  5.328e-02   1.258   0.2167
## sporttime    1.956e-02  1.578e-02   1.239   0.2234
## sleeptime    3.283e-03  4.344e-02   0.076   0.9402
## cal          1.937e-05  2.267e-04   0.085   0.9324
## bmi          4.925e-01  2.436e-01   2.022   0.0509 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.3701 on 35 degrees of freedom
## Multiple R-squared:  0.8575, Adjusted R-squared:  0.833
## F-statistic: 35.09 on 6 and 35 DF,  p-value: 2.109e-13
```

In this part, we introduce a concept called AIC (Akaike information criterion) to figure out the relationship of them. AIC is a standard to measure the goodness of fit of statistical models and its formula can explained to AIC=2k-2ln(L). Increasing the number of free parameters improves the goodness of fitting. AIC encourages the goodness of data fitting, but tries to avoid over fitting. So the priority model should be the one with the lowest AIC value. Assuming that a choice is made among n models, the AIC value of N models can be calculated at one time, and the model corresponding to the minimum AIC value can be selected as the selection object. Each of them of AIC is – 77.14, -79.13, -81.13, -81.85 and -82.9. (The code and date are shown in the appendix figure 1%2). And after estimating data, we choose a smallest AIC to represent our formula which is health level = 0.013502height + 0.239830bmi. From F distribution table, we check the critical value when the degree of freedom is k-1=2 and n-k=39. Since F=18.5$F_{0.05}$(2,39), so we can say that the regression equation is significant. So people's health level is related to people's height and relationship between height and weight(bmi). After stepwise regression, height and BMI coefficient were selected as model variables to measure health level, and the explanatory coefficient increased to 0.842. And p value is smaller then $2.2*10^{-16}$.

```
summary(tstep)

##
## Call:
## lm(formula = health_level ~ height + bmi, data = data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.06639 -0.14859  0.06345  0.23509  0.67279
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -4.942417   0.963952  -5.127 8.38e-06 ***
## height       0.013502   0.006266   2.155   0.0374 *
## bmi          0.239830   0.019779  12.125 8.34e-15 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.3601 on 39 degrees of freedom
## Multiple R-squared:  0.8497, Adjusted R-squared:  0.842
## F-statistic: 110.2 on 2 and 39 DF,  p-value: < 2.2e-16
```

Formula above is about linear regression, and then we do polynomial regression.

We choose health level = I(weight^2) +I(height^2) + (weight + height + sprottime + sleeptime + cal + bmi).

```
myfit2<-lm(health_level~I(weight^2)+I(height^2)+.,data=data)
summary(myfit2)

##
## Call:
## lm(formula = health_level ~ I(weight^2) + I(height^2) + ., data = da
ta)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.59675 -0.16926  0.01734  0.18932  0.55083
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept) 30.3477227 15.5289785   1.954 0.059187 .
## I(weight^2) -0.0016155  0.0004284  -3.771 0.000642 ***
## I(height^2)  0.0005293  0.0006375   0.830 0.412307
## weight       0.4163716  0.1711442   2.433 0.020564 *
## height      -0.3294319  0.1836339  -1.794 0.081987 .
## sporttime    0.0170871  0.0129020   1.324 0.194478
## sleeptime    0.0226310  0.0358024   0.632 0.531671
## cal          0.0000585  0.0001879   0.311 0.757482
## bmi         -0.3229898  0.3647447  -0.886 0.382282
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.3021 on 33 degrees of freedom
## Multiple R-squared:  0.9105, Adjusted R-squared:  0.8888
## F-statistic: 41.95 on 8 and 33 DF,  p-value: 4.112e-15
```

And each of them of AIC are -92.68, -94.55, -96.05, -97.18 and -97.26. (The code and date are shown in the appendix figure 3&4). And we also estimate AIC to figure out this question in which we found health lever=-0.001737 I(weight^2) + 0.5298994weight - 0.2130988 height - 0.618103weight/(height/100)^2(bmi). And p value is smaller then $2.2*10^{-16}$ as well. Adjusted R-squared is 0.8924 bigger than 0.842 of linear regression. (The code and date are shown in the appendix figure 5). And we do correlation check that found out he correlation coefficient between weight and height was 0.79, the correlation coefficient between weight and calorie intake was 0.57, and the correlation coefficient between height and calorie intake was 0.51.

```
cor(data)

##                   weight    height    sporttime   sleeptime      
cal
## weight        1.00000000 0.7903881  0.015985745 -0.05298350  0.56976
100
## height        0.79038807 1.0000000  0.106044197  0.04647230  0.51777
732
## sporttime     0.01598575 0.1060442  1.000000000 -0.04443473 -0.14993
266
## sleeptime    -0.05298350 0.0464723 -0.044434732  1.00000000 -0.01252
785
## cal           0.56976100 0.5177773 -0.149932658 -0.01252785  1.00000
000
## bmi           0.90140719 0.4524060 -0.087661606 -0.10570095  0.46001
909
## health_level  0.87746892 0.5319128 -0.001109306 -0.08020184  0.44728
211
##                      bmi health_level
## weight        0.90140719  0.877468919
## height        0.45240602  0.531912819
## sporttime    -0.08766161 -0.001109306
## sleeptime    -0.10570095 -0.080201845
## cal           0.46001909  0.447282114
## bmi           1.00000000  0.912013709
## health_level  0.91201371  1.000000000

corrplot(cor(data))
```

But in conclusion, weight still has significant correlation with height and formula is:

health lever=-0.001737 I(weight^2) + 0.5298994weight - 0.2130988 height - 0.618103weight/(height/100)^2 (bmi).

Conclusion

After a simple linear regression analysis of factors such as height, energy intake, exercise time, and rest time, we found that the factor that has the greatest influence on weight is height. Other factors have little effect on weight, and the resulting model is not very good. Meet our expectations. After introducing BMI index and health index and performing polynomial regression calculation, the result obtained is that the health level has a certain correlation with BMI, height, and weight. The correlation coefficient between body weight and energy intake reached 0.57, which also showed a certain correlation.

Research Gap & Recommendation

Although the analysis methods and processes used in this survey are very scientific and rigorous, there are still some flaws in this survey. First, the experimental samples are small, and the influence of extreme values has a greater impact on the experimental results. Secondly, part of the data obtained comes from the estimates of the respondents, and the lack of accuracy has a greater impact on the experiment. In the future, relevant research should be improved in terms of data accuracy and sample size.

Appendix

Figure 1: R result and T test

```
> m2<-lm(W~H)
> summary(m2)

Call:
lm(formula = W ~ H)

Residuals:
    Min      1Q  Median      3Q     Max 
-11.212  -6.585  -1.625   4.108  31.584 

Coefficients:
             Estimate Std. Error t value Pr(>|t|)    
(Intercept) -130.054     23.564  -5.519 2.24e-06 ***
H              1.118      0.137   8.160 4.80e-10 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 8.83 on 40 degrees of freedom
Multiple R-squared:  0.6247,	Adjusted R-squared:  0.6153 
F-statistic: 66.59 on 1 and 40 DF,  p-value: 4.804e-10
```

Figure 2

```
tstep<-step(myfit)

## Start:  AIC=-77.14
## health_level ~ weight + height + sporttime + sleeptime + cal + 
##     bmi
## 
##             Df Sum of Sq    RSS     AIC
## - sleeptime  1   0.00078 4.7961 -79.134
## - cal        1   0.00100 4.7963 -79.132
## - weight     1   0.14369 4.9390 -77.901
## - sporttime  1   0.21047 5.0058 -77.337
## - height     1   0.21689 5.0122 -77.283
## <none>                   4.7953 -77.141
## - bmi        1   0.56000 5.3553 -74.502
## 
## Step:  AIC=-79.13
## health_level ~ weight + height + sporttime + cal + bmi
## 
```

Figure3

```
##              Df Sum of Sq    RSS     AIC
## - cal        1   0.00098 4.7971 -81.126
## - weight     1   0.14418 4.9403 -79.890
## - sporttime  1   0.20969 5.0058 -79.337
## - height     1   0.21809 5.0142 -79.266
## <none>                   4.7961 -79.134
## - bmi        1   0.56035 5.3565 -76.493
##
## Step:  AIC=-81.13
## health_level ~ weight + height + sporttime + bmi
##
##              Df Sum of Sq    RSS     AIC
## - weight     1   0.14737 4.9445 -81.855
## - sporttime  1   0.22038 5.0175 -81.239
## - height     1   0.22053 5.0176 -81.238
## <none>                   4.7971 -81.126
## - bmi        1   0.57880 5.3759 -78.341
##
## Step:  AIC=-81.85
## health_level ~ height + sporttime + bmi
##
##              Df Sum of Sq     RSS     AIC
## - sporttime  1    0.1131  5.0576 -82.905
## <none>                    4.9445 -81.855
## - height     1    0.5046  5.4490 -79.774
## - bmi        1   19.0672 24.0117 -17.483
##
## Step:  AIC=-82.9
## health_level ~ height + bmi
##
##           Df Sum of Sq     RSS     AIC
## <none>                  5.0576 -82.905
## - height  1    0.6022  5.6598 -80.180
## - bmi     1   19.0666 24.1242 -19.287
```

Figure4

```
tstep2<-step(myfit2)

## Start:  AIC=-92.68
## health_level ~ I(weight^2) + I(height^2) + (weight + height + 
##     sporttime + sleeptime + cal + bmi)
## 
##               Df Sum of Sq    RSS     AIC
## - cal          1   0.00885 3.0206 -94.553
## - sleeptime    1   0.03647 3.0482 -94.171
## - I(height^2)  1   0.06293 3.0747 -93.808
## - bmi          1   0.07157 3.0833 -93.690
## <none>                     3.0118 -92.676
## - sporttime    1   0.16008 3.1718 -92.501
## - height       1   0.29372 3.3055 -90.768
## - weight       1   0.54019 3.5519 -87.747
## - I(weight^2)  1   1.29774 4.3095 -79.628
## 
## Step:  AIC=-94.55
## health_level ~ I(weight^2) + I(height^2) + weight + height + 
##     sporttime + sleeptime + bmi
## 
##               Df Sum of Sq    RSS     AIC
## - sleeptime    1   0.03629 3.0569 -96.051
## - bmi          1   0.07077 3.0914 -95.580
## - I(height^2)  1   0.07226 3.0929 -95.560
## <none>                     3.0206 -94.553
## - sporttime    1   0.15183 3.1724 -94.493
## - height       1   0.31886 3.3395 -92.338
## - weight       1   0.53480 3.5554 -89.707
## - I(weight^2)  1   1.29159 4.3122 -81.601
## 
## Step:  AIC=-96.05
```

Figure5

```
## health_level ~ I(weight^2) + I(height^2) + weight + height +
##     sporttime + bmi
##
##                Df Sum of Sq    RSS     AIC
## - I(height^2)  1   0.06371 3.1206 -97.185
## - bmi          1   0.06875 3.1256 -97.117
## - sporttime    1   0.14508 3.2020 -96.104
## <none>                     3.0569 -96.051
## - height       1   0.29683 3.3537 -94.159
## - weight       1   0.52372 3.5806 -91.410
## - I(weight^2)  1   1.26799 4.3249 -83.478
##
## Step:  AIC=-97.18
## health_level ~ I(weight^2) + weight + height + sporttime + bmi
##
##                Df Sum of Sq    RSS     AIC
## - sporttime    1   0.14649 3.2671 -97.258
## <none>                     3.1206 -97.185
## - bmi          1   0.24473 3.3653 -96.014
## - height       1   0.60012 3.7207 -91.797
## - weight       1   1.00544 4.1260 -87.455
## - I(weight^2)  1   1.67650 4.7971 -81.126
##
## Step:  AIC=-97.26
## health_level ~ I(weight^2) + weight + height + bmi
##
##                Df Sum of Sq    RSS     AIC
## <none>                     3.2671 -97.258
## - bmi          1   0.43870 3.7058 -93.966
## - height       1   0.86157 4.1287 -89.428
## - weight       1   1.28078 4.5479 -85.366
## - I(weight^2)  1   1.75040 5.0175 -81.239
```

Figure 6

```
summary(tstep2)

## 
## Call:
## lm(formula = health_level ~ I(weight^2) + weight + height + bmi, 
##     data = data)
## 
## Residuals:
##      Min       1Q   Median       3Q      Max 
## -0.63470 -0.23111  0.03847  0.20815  0.54142 
## 
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)    
## (Intercept) 26.183653  10.387127   2.521  0.01615 *  
## I(weight^2) -0.001737   0.000390  -4.452 7.55e-05 ***
## weight       0.528994   0.138898   3.809  0.00051 ***
## height      -0.213988   0.068505  -3.124  0.00346 ** 
## bmi         -0.618103   0.277306  -2.229  0.03197 *  
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 
## Residual standard error: 0.2972 on 37 degrees of freedom
## Multiple R-squared:  0.9029, Adjusted R-squared:  0.8924 
## F-statistic:    86 on 4 and 37 DF,  p-value: < 2.2e-16
```

Table 1: Questionnaire Data

1	53	166	8	8	1600
2	78	180	4	9	2300
3	67	183	6	7	2200
4	81	178	2	8	1900
5	84	175	7	8	1742
6	38	155	24	7	1000
7	58	178	4	7	1900
8	54	159	1	6	2000
9	100	177.5	3	7.5	2500
10	48	153	2	6	1800
11	58	175	3-	8	1800
12	42	160	0	10	1800
13	61	179	5	9	2000
14	75	180	4	5.5	2000
15	75	183	1	8	2000
16	58	169	4	7	1800

17	75	186	3	8	2200
18	69	173	1	7.5	1500
19	60	180	5	8	2000
20	44	160	1	7	1800
21	82	180	6	7	1900
22	50	160	0	8	2000
23	45	160	6	5	1500
24	52.5	160	1	7.5	1600
25	77	190	12	8	2000
26	52kg	168cm	0	8	2300
27	62	179	7	11	1600
28	51	160	3	12	1600
29	90	185	5	7	2400
30	62.6	165	0	7.30	1200
31	55	174	2	7	1000
32	51	169	2	10	1600
33	47	165	3	8	1500
34	63	172	5	8	2000
35	68	180	6	5	2000
36	65	172	10	8	1900
37	75	185	6	8	2000
38	55	175	0	7.5	1900
39	43	151	2	7.5	1600
40	55	165	0	7	1500
41	72	182	8	8	2100
42	49	164	10	8	2000