

# Educational Interação

Katelyn Patricio

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**Goal:** Ensure your son maintains a balanced lifestyle by dedicating 5–10 hours weekly to study, managing personal relationships wisely, and receiving consistent family support to succeed academically while pursuing his soccer career in Brazil.

```
port <- read.csv('student_portuguese_clean.csv')
math <- read.csv('student_math_clean.csv', all = TRUE)
```

```
both <- rbind(math, port)
```

Does having a romantic relationship hurt your grades?

```
romance <- lm(final_grade ~ romantic_relationship, data = both)
summary(romance)
```

Students in romantic relationships do see a slight decrease in their grades. According to the model, those in a romantic relationships score about 0.79 points lower on average. This is statistically significant due to a p-value less than 0.05.

```
##
## Call:
## lm(formula = final_grade ~ romantic_relationship, data = both)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -11.6241  -1.6241   0.1698   2.3759   8.3759
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      11.6241     0.1483  78.369 < 2e-16 ***
## romantic_relationships -0.7939     0.2488  -3.191  0.00146 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.848 on 1042 degrees of freedom
## Multiple R-squared:  0.009675, Adjusted R-squared:  0.008725
## F-statistic: 10.18 on 1 and 1042 DF, p-value: 0.001462
```

Does this vary by gender?

```
romance_sex <- lm(final_grade ~ romantic_relationship * sex , data = both)
summary(romance_sex)
```

Modeling the interaction between romantic relationships and gender, it seems that female students score about 0.97 points lower on average. For men, it is slightly higher at 0.63 points lower on average, but this is not statistically significant. Furthermore, there is not enough evidence to support that the impact of romantic relationships differs by gender. Overall, we can conclude that romantic relationships only have a small impact on grades (R-squared 0.012).

```
##
## Call:
## lm(formula = final_grade ~ romantic_relationship * sex, data = both)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -11.8362  -1.8362   0.1638   2.2388   8.6113
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      11.8362    0.2045  57.884 < 2e-16 ***
## romantic_relationshipyes -0.9670    0.3229  -2.995  0.00281 **
## sexM             -0.4474    0.2970  -1.507  0.13224
## romantic_relationshipyes:sexM  0.3394    0.5110   0.664  0.50667
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.847 on 1040 degrees of freedom
## Multiple R-squared:  0.0119, Adjusted R-squared:  0.009045
## F-statistic: 4.173 on 3 and 1040 DF,  p-value: 0.005986
```

How does studying at home impact grades?

```
study <- lm(final_grade ~ study_time, data = both)
summary(study)
```

All groups who studied more than 2 hours saw positive impacts on their grades. The group who saw the most significance were those who studied 5 to 10 hours as they scored 1.91 points higher on their final grade than those who studied two hours or less.

```
##
## Call:
## lm(formula = final_grade ~ study_time, data = both)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
```

```
## -12.4938 -1.4938 0.4196 2.5062 8.4196
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      10.5804    0.2142  49.395 < 2e-16 ***
## study_time>10 hours      1.6938    0.5296   3.198 0.00142 **
## study_time2 to 5 hours    0.7555    0.2735   2.763 0.00584 **
## study_time5 to 10 hours   1.9134    0.3683   5.195 2.46e-07 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.814 on 1040 degrees of freedom
## Multiple R-squared:  0.02906,    Adjusted R-squared:  0.02626
## F-statistic: 10.37 on 3 and 1040 DF,  p-value: 9.92e-07
```

Does it matter if you have a parent who you might expect to be more able to help you while you're there?

```
parents <- lm(final_grade ~ mother_education + father_education + family_support + family_relationship +
summary(parents)
```

This model reveals that several family related factors impact student grades. Students who have mothers with higher education saw a 1.14 point increase on average in their final grades. Those with better family relationships and smaller family sizes (less than or equal to three) saw positive impacts on their grades as well (about 0.26 and 0.60 points increase respectively). The most interesting outcome of this model would be that categories with fathers had no significant impact at all.

```
##
## Call:
## lm(formula = final_grade ~ mother_education + father_education +
##     family_support + family_relationship + mother_job + father_job +
##     family_size, data = both)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -12.9541  -1.4907   0.2485   2.3521   8.4163
##
## Coefficients:
##              Estimate Std. Error t value
## (Intercept)      9.69408    0.76565  12.661
## mother_educationhigher education      1.13674    0.45089   2.521
## mother_educationnone      1.39000    1.30025   1.069
## mother_educationprimary education (4th grade) -0.51902    0.38139  -1.361
## mother_educationsecondary education    0.11655    0.35205   0.331
## father_educationhigher education    0.02362    0.42352   0.056
## father_educationnone      1.37712    1.30039   1.059
## father_educationprimary education (4th grade) -0.50966    0.33750  -1.510
## father_educationsecondary education    0.11359    0.34885   0.326
## family_supportyes      -0.13343    0.24501  -0.545
## family_relationship    0.25577    0.12611   2.028
```

```
## mother_jobhealth      1.05083    0.58716    1.790
## mother_jobother       0.21216    0.34571    0.614
## mother_jobservices    0.59168    0.40612    1.457
## mother_jobteacher     0.05509    0.55554    0.099
## father_jobhealth      0.13935    0.80532    0.173
## father_jobother       0.07785    0.51406    0.151
## father_jobservices    -0.20143    0.54236   -0.371
## father_jobteacher     0.97556    0.73798    1.322
## family_sizeLess than or equal to 3    0.59794    0.26073    2.293
## Pr(>|t|)
## (Intercept)          <2e-16 ***
## mother_educationhigher education      0.0118 *
## mother_educationnone      0.2853
## mother_educationprimary education (4th grade) 0.1739
## mother_educationsecondary education 0.7407
## father_educationhigher education      0.9555
## father_educationnone      0.2898
## father_educationprimary education (4th grade) 0.1313
## father_educationsecondary education 0.7448
## family_supportyes      0.5861
## family_relationship    0.0428 *
## mother_jobhealth      0.0738 .
## mother_jobother       0.5396
## mother_jobservices    0.1455
## mother_jobteacher     0.9210
## father_jobhealth      0.8627
## father_jobother       0.8797
## father_jobservices    0.7104
## father_jobteacher     0.1865
## family_sizeLess than or equal to 3    0.0220 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.766 on 1024 degrees of freedom
## Multiple R-squared:  0.06758,    Adjusted R-squared:  0.05028
## F-statistic: 3.906 on 19 and 1024 DF,  p-value: 3.877e-08
```

## All factors

```
all_factors <- lm(final_grade ~ romantic_relationship + study_time + mother_education + father_education + family_size + family_support + family_relationship)
summary(all_factors)
```

Modeling all factors together, we can see that romantic relationships, study time, mother's education, mother's occupation (health), and family size (less than or equal to three) significantly impact students grades. Other factors such as those including father characteristics and family support don't have a significant impact according to these outcomes.

```
##
## Call:
## lm(formula = final_grade ~ romantic_relationship + study_time +
##     mother_education + father_education + family_support + family_relationship +
```

```
##      mother_job + father_job + family_size, data = both)
##
## Residuals:
##      Min        1Q      Median        3Q        Max
## -13.3005  -1.5502   0.3596   2.2524   8.8163
##
## Coefficients:
##                                     Estimate Std. Error t value
## (Intercept)                       9.38129    0.77772  12.062
## romantic_relationshipyes           -0.84798    0.24553  -3.454
## study_time>10 hours                 1.66137    0.52994   3.135
## study_time2 to 5 hours              0.76851    0.27046   2.841
## study_time5 to 10 hours            1.99949    0.36658   5.454
## mother_educationhigher education    1.02824    0.44406   2.316
## mother_educationnone               1.16574    1.28424   0.908
## mother_educationprimary education (4th grade) -0.44185    0.37607  -1.175
## mother_educationsecondary education  0.06709    0.34583   0.194
## father_educationhigher education    0.15587    0.41928   0.372
## father_educationnone               1.73193    1.28455   1.348
## father_educationprimary education (4th grade) -0.35954    0.33320  -1.079
## father_educationsecondary education  0.18347    0.34327   0.534
## family_supportyes                  -0.29742    0.24343  -1.222
## family_relationship                0.20705    0.12462   1.662
## mother_jobhealth                   1.26360    0.57842   2.185
## mother_jobother                    0.23979    0.33957   0.706
## mother_jobservices                 0.57451    0.39980   1.437
## mother_jobteacher                  0.03827    0.54728   0.070
## father_jobhealth                   -0.16488    0.79783  -0.207
## father_jobother                    0.12644    0.50718   0.249
## father_jobservices                -0.18613    0.53420  -0.348
## father_jobteacher                  1.12838    0.72652   1.553
## family_sizeLess than or equal to 3  0.67743    0.25734   2.632
##                                     Pr(>|t|)
## (Intercept)                       < 2e-16 ***
## romantic_relationshipyes           0.000576 ***
## study_time>10 hours                 0.001768 **
## study_time2 to 5 hours              0.004580 **
## study_time5 to 10 hours            6.17e-08 ***
## mother_educationhigher education    0.020782 *
## mother_educationnone               0.364237
## mother_educationprimary education (4th grade) 0.240306
## mother_educationsecondary education 0.846223
## father_educationhigher education    0.710143
## father_educationnone               0.177869
## father_educationprimary education (4th grade) 0.280814
## father_educationsecondary education 0.593128
## family_supportyes                  0.222063
## family_relationship                0.096916 .
## mother_jobhealth                   0.029147 *
## mother_jobother                    0.480243
## mother_jobservices                 0.151028
## mother_jobteacher                  0.944266
## father_jobhealth                   0.836312
## father_jobother                    0.803180
```

```

## father_jobservices          0.727591
## father_jobteacher          0.120702
## family_sizeLess than or equal to 3      0.008605 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.698 on 1020 degrees of freedom
## Multiple R-squared:  0.1049, Adjusted R-squared:  0.08469
## F-statistic: 5.196 on 23 and 1020 DF,  p-value: 4.612e-14

```

### Conclusion:

From this analysis, your son has a bright future in Brazil, but there are some factors he needs to keep in mind if you want him to succeed (crash at one of his beach houses). Romantic relationships can have a negative impact on his grades, but won't affect him if he balances his time well. Also, study time is very important so make sure he is studying between 5 to 10 hours a week. And most importantly, your support will be very beneficial to his success. In conclusion, your son will become a great soccer player in Brazil keeping these factors in mind for his academic success.