

HOURS OF TV VS. GPA

By Isaac Barnhill and Will Steiner

Ap Stat P.3

Mr. Selvaag

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Introduction

The millennial generation is often criticised for being lazy, self-absorbed, and unmotivated. We wanted to see if this “lazy” lifestyle was actually affecting the school lives of Washburn students by distracting them from their work.

We want to know if there is a relationship between the average number of hours that a person spends watching TV per night (this includes services like Netflix, Amazon, Hulu, etc.) and their school performance. We used GPA as a good estimate for school performance.

We are hoping to find a negative relationship between these two variables, as it would prove that the “Millennial” lifestyle is actually affecting our ability to do well in school.

Research Question

Is there a relationship between the average number of hours a Washburn student spends watching TV per night and their GPA?



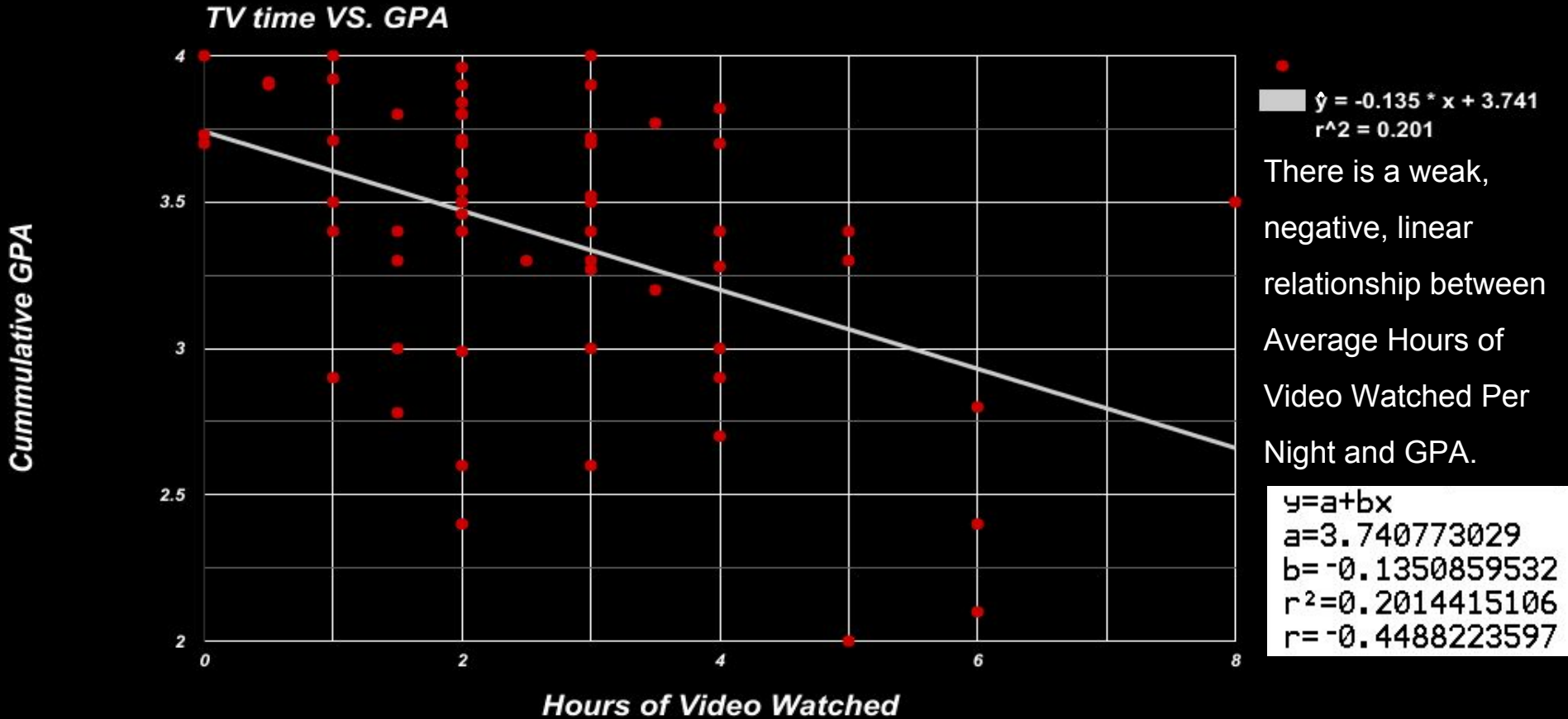
Data Collection

We decided that an observational study would be most appropriate for answering our research question. To begin collecting our data, we took a cluster sample of classes at Washburn. we randomly selected one 3rd hour class from each of 6 subjects (Math, English, Science, Social Studies, Language, Elective). We did this by assigning all the 3rd hours from each subject a number and using randInt on the calculator to randomly select 1 class from each subject. From there, we randomly selected 10 students from each class using the same method. In total, we selected 60 students, and recorded the average hours of TV that each student watched per night, along with their GPA.

Raw Data

Avg. Hours of TV per night	GPA	Avg. Hours of TV per night	GPA	Avg. Hours of TV per night	GPA	Avg. Hours of TV per night	GPA	Avg. Hours of TV per night	GPA	Avg. Hours of TV per night	GPA
5	2	6	2.8	1	4	3	4	1.5	3.3	1.5	2.78
4	2.9	0	3.73	1.5	3.4	2	3.6	2	3.96	2	3.8
3	3.72	1	3.92	3	3.5	4	3.7	1.5	3	5	3.3
2	2.6	3	3.52	2	3.9	3	3.9	3.5	3.2	6	2.4
8	3.5	4	3.4	3	3	2	3.5	2	3.8	1.5	3.8
4	3	2	2.4	2	3.54	2	3.7	3	3.3	4	3.82
1	3.71	2	3.7142	3	3.27	2	3.4	1	3.4	3.5	3.77
6	2.1	2	2.9895	1	2.9	5	3.4	3	3.7	4	3.28
4	2.7	2	3.4585	2.5	3.3	1	3.5	0	3.7	3	2.6
0.5	3.91	2	3.84	0.5	3.9	3	3.4	0	4	1.5	2.78

Data Analysis and Description



Summary Statistics for the LSRL

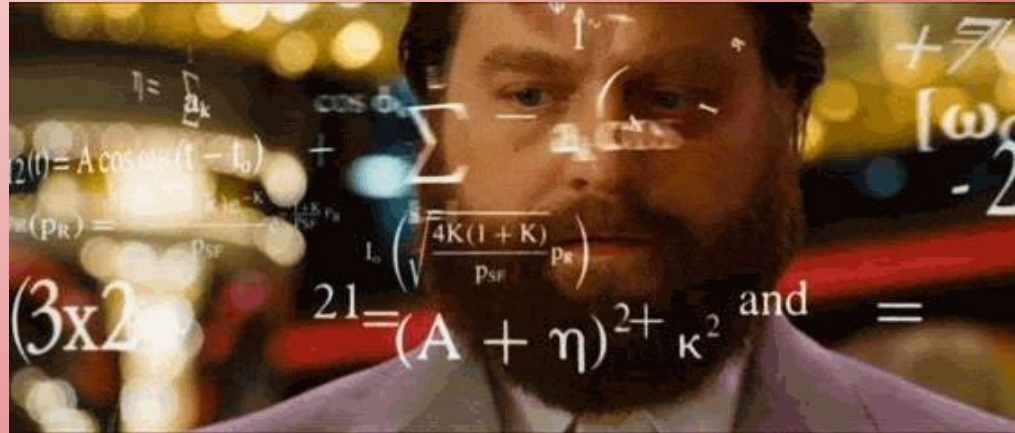
Slope: -0.135085953

Y intercept: 3.740773029

Std dev slope: 0.035624735

Std dev y int: 0.110388948

Correlation Coefficient: 0.201441511



Inference Procedure: Linear Reg. t Test for Slope

Parameter: We are interested in the true slope of the line of GPA (Y) vs Average Hours of TV Watched Per Night (X) for all Washburn Students

Hypothesis:

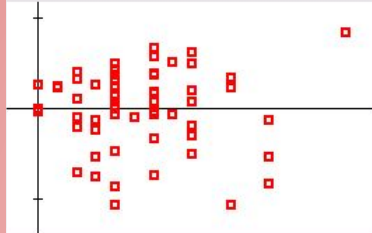
H_0 : There is no relationship between X and Y: $\beta = 0$

H_a : There is a negative relationship between X and Y: $\beta < 0$



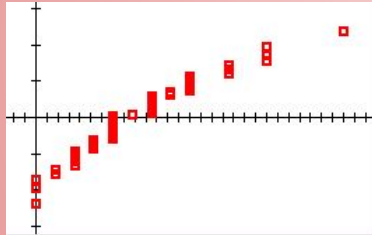
Inference Procedure: Linear Reg. t Test for Slope: Assumptions and Conditions

Linear: A residual plot shows no clear pattern



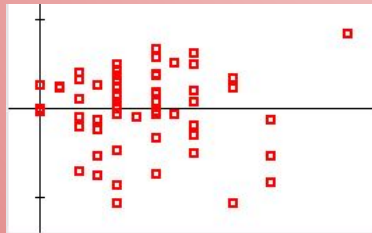
Independant: $n \leq 1/10N > 600$ ✓
Safe to assume there are more than 600 Washburn students

Normal: A Normal Probability plot of the data is linear



Random: We took a cluster sample of classes and an SRS of 10 from each class

Equal Stdev: Variation in the residual plot is fairly even



Inference Procedure: Linear Reg. t Test for Slope

Test Statistic:

$$t = (b - \beta) / SE_b \text{ with } df = (n - 2)$$

$$t = (-0.135085953 - 0) / 0.035624735 \text{ with } df = (60 - 2)$$

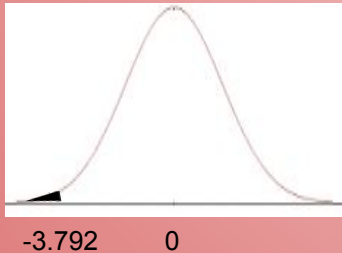
$$t = -3.792 \text{ with } df = 58$$

P-Value:

$$tcdf(-1E99, -3.792, 58) = 0.0001793$$

Because the P-Value is significant at the $\alpha = 0.05$ level, we reject H_0 .

We have significant evidence that there is a relationship between the average number of hours a Washburn student spends watching TV per night and their GPA.



PANIC!!!



Inference Procedure: Linear Reg. t Interval for Slope

Parameter: We are interested in the true slope of the line of GPA (Y) vs Average Hours of TV Watched Per Night (X) for all Washburn Students

Assumptions and Conditions: Already checked

Interval: $b \pm t^*(SE_b)$ with $df=n-2$

$$t^* = \text{invT}(.99925, 58) = 3.56$$

$-0.135085953 \pm 3.56(0.035624735)$ with $df=58$



Inference Procedure: Linear Reg. t Interval for Slope

We are 99.925% confident that the interval from -0.2579 to -0.0013 captures the true slope of the line of GPA (Y) vs Average Hours of TV Watched Per Night (X) for all Washburn Students.

Because the entire confidence interval is negative this tells us that 99.925% of confidence intervals constructed from similar random samples of Washburn Students will show that there is a negative relationship between your GPA and how much TV you watch per night.

Conclusion

There is very strong evidence that there is a relationship between the average number of hours a Washburn student spends watching TV per night and their GPA. Both a t test for slope and a 99.925% confidence interval show that there is a relationship between the two.

There are a few major sources of error that could be accounted for in future studies. Participants were asked to estimate their average hours of TV per night, and may have given an incorrect estimate for a variety of reasons. We also let participants record their own GPA, rather than looking at their transcript and recording their GPA ourselves. Finally, we only sampled 3rd hour classes, which may have introduced a confounding variable.

Conclusion

To remove potential sources of error, future studies may wish to...

- Track participants' hours of TV over the course of a week to accurately measure their avg. hours of TV per night
- Record participants' GPAs by looking at their transcript, rather than asking them to record their own GPA
- Sample all Washburn classes, rather than just 3rd hours
- Sample other MPLS schools to examine a broader range of students

