Jason Murphy

The truth about tall people

Introduction

In a recent report by fakenews.com[1] it was said that tall people enjoy a happier life with several advantages, namely higher happiness ratings and increased pocket money. While this may be true in certain scenarios there are significant notable exceptions e.g. Jacinda Ahern (1.65 metres)[2] compared to Justin Trudeau (1.88 metres)[3] This investigation seeks to determine the accuracy of such claims and if there exists additional benefits afforded to taller people.

Research Question

Does your height confer any advantage in life?

Research Design

[1] Insert a reference in the style recommended by your school e.g. MLA, Harvard etc.
[2] Reference required
[3]

This research is a mixed methods design that incorporates both discrete and continuous data. The sample was collected by a method of convenience, specifically, I asked participants of Y13 Maths AI class to complete an online survey and the data was recorded in a spreadsheet. A full list of questions can be found in the appendix. It is acknowledged that the sample of convenience will limit the extent to which we can analyse our data but since our analysis does not pertain to choices of mathematics class it has been assumed that students selected are representative of the entire year group. Additional studies would need to be undertaken to determine if choice of mathematics in Y12/13 class offers advantage in life,

Data collection

The response rate (n=69) was 97% and is sufficient to continue with our statistical analysis. Initially I will present a summary of the data and in subsequent sections I will perform various tests for independence and discuss the significance of any findings. The data was collected in a way that allows me to separate respondents by gender, mathematics class and crucially, height. Additional data was collected in order to ascertain other factors that might contribute to happiness, for example favourite music, sport and time spent on a mobile device. There is a limit to our definition of happiness but a 4 point scale was used, they were: Often Feel Sad, Neutral, Happy, Very Happy.

It is important to discuss research ethics and it should be noted that none of the participants were required to answer all of the questions and the data will be entirely anonymised and stored in accordance with the EUs GDPR requirements. Where respondents omitted a response data was analysed accordingly, in most cases the response was not included in analysis. More detailed discussions are presented below with my analysis. Finally a full list of data can be found in the appendix and by following this link.

Data Analysis

The following are a series of two-tables that summarise the findings. Emerging questions are:

1. Is gender a factor of happiness, given that males are on average taller than females?

2. Does the number of pets impact happiness and is gender independent of the number of pets a respondent has?
3. Do the number of siblings have an impact on happiness and does one gender appear happier with a greater number of siblings?

Such additional quests allows us to critically analyse and reflect properly on the supposed findings of the article in fakenews.com.

AVERAGE of What is your height in centimetres?	*Are you female or male?*		
Which math class are you in?	Female	Male	Grand Total
Mr Collinson	167	186	173
Mr Murphy	167	182	172
Mrs Rattray	165	184	177
Mrs Thompson	168	181	175
Grand Total	**167**	**183**	**174**

COUNTA of Timestamp	*How many brothers and sisters do you have altogether?*					
Which math class are you in?	0	1	2	3	4	Grand Total
Mr Collinson	1	10	3	1		15
Mr Murphy		10	6	4		20
Mrs Rattray		8	5		2	15
Mrs Thompson	6	3	2	3		14
Grand Total	**7**	**31**	**16**	**8**	**2**	**64**

COUNTA of Timestamp	*How many pets do you have altogether?*								
Which math class are you in?	0	1	2	3	4	6	8	9	Grand Total
Mr Collinson	5	6	3	1					15
Mr Murphy	4	8	5	2			1		20
Mrs Rattray	5	2	5	1	1	1			15
Mrs Thompson	4	6	2		1			1	14
Grand Total	**18**	**22**	**15**	**4**	**2**	**1**	**1**	**1**	**64**

In figure 5. Below we can see the distribution of heights by mathematics ~~height~~ and in figure 6. shows a breakdown of happiness rating by mathematics class. While the median height of class Rattray appears the greatest, it is important to establish the independence of chosen mathematics class and the happiness rating, this is undertaken in a subsequent section. It is noteworthy that I am using the median to counter any effect of outliers in my data particularly since the data appears skewed when separated by class.[4]

Figure 5. Comparative boxplots of respondent height.

[4] An opportunity for you to discuss skew, which requires some independent research as it lies just outside the scope of our course.

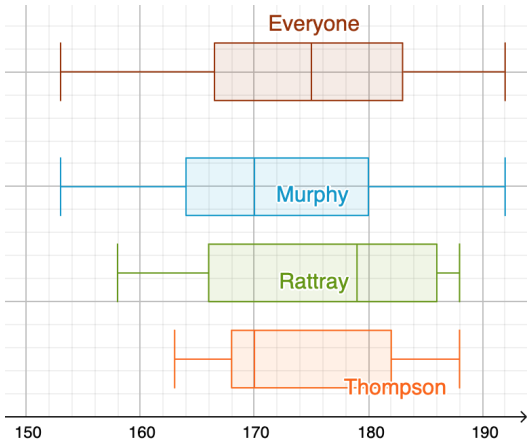
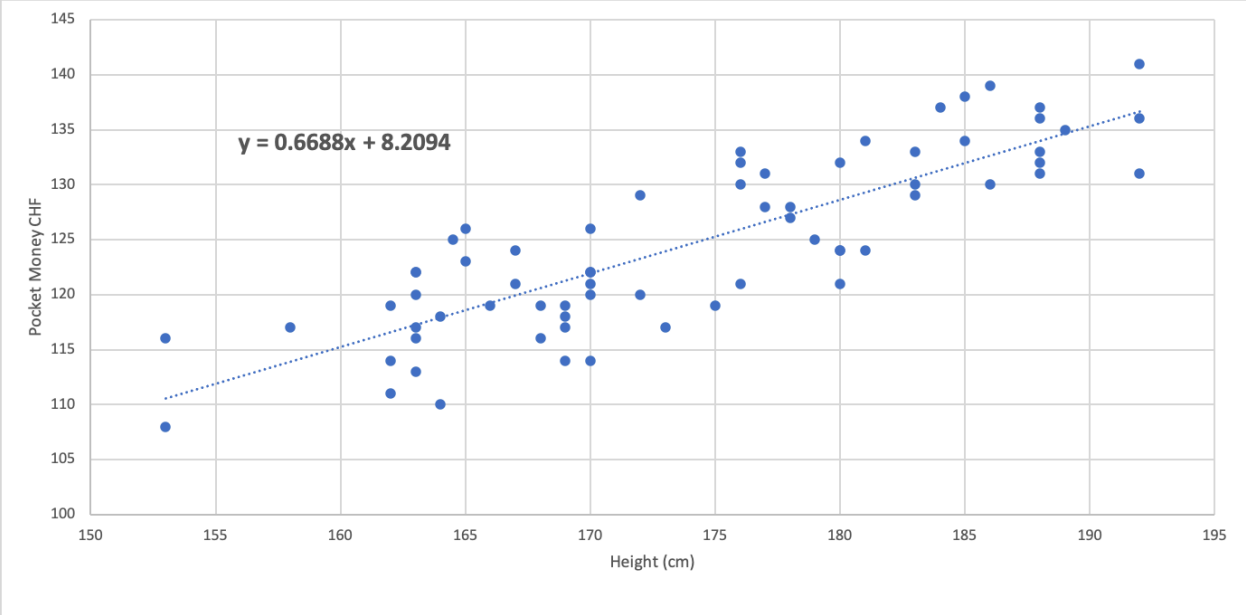


Figure 6. A Two-way comparison of Mathematics class and Happiness

COUNTA of Timestamp	*Happiness*				
Which math class are you in?	Happy	Neutral	Often Feel Sad	Very Happy	Grand Total
Mr Collinson	7	5	2	1	15
Mr Murphy	6	4	2	8	20
Mrs Rattray	2	5	4	4	15
Mrs Thompson	2	5	5	2	14
Grand Total	**17**	**19**	**13**	**15**	**64**

A comparison of Height (cm) and pocket money (CHF)



The chart above appears to show that taller people receive more pocket money, that is, it appears to show a positive correlation between height and pocket money (r= .84). Crucially in the analysis, and in support of my conclusion, is that all students are in Y13 and thus of similar age, otherwise we might conclude that as one grows older they receive more pocket money and growing older might be a better determinant of the amount of pocket money received than height. As the data is presented we are surprised to find that taller people receive more pocket money[5]. There appears to be a 3CHF increase in pocket money for a 5cm increase in height. Stated another way, for each cm in height you might expect to receive approximately 0.67 CHF extra in pocket money[6]. As yet we do not have an explanation for this but additional analysis does offer alternative explanations.

Next I will explore the connection between gender and pocket money, while this is not directly related to my research question we do know that males tend to be taller than females and thus perhaps the significant factor here is gender differences.

[5] **Please Note:** I made this data up to show this 'surprising result' in a real data report this is unethical and inappropriate for our exploration! This sentence does show how you can weave in critical thinking and reflection with accurate vocabulary into your written work.
[6] Additionally you could calculate this by hand but this rarely results in demonstrated understanding.

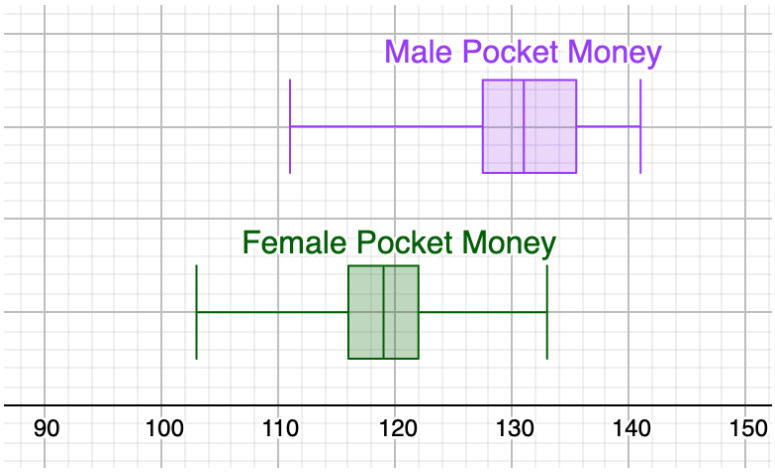


Figure 7. A Boxplot of the pocket money earnings (CHF)

The figure above appears to show that males receive more pocket money than females thus offering a possible alternative explanation to height conferring societal benefits. Might the difference in pocket money be explained by the number of siblings? We might hypothesise that the increase in the number of siblings results in less pocket money.

Below you can see a box plot that compares the pocket money of students with 0,1,2 and 2+ siblings.

An exercise for students

I also present a two table with the sum of pocket money earnings for each siblings

An exercise for students

Finally an additional scatter plot demonstrates students with more siblings do/do not receive more pocket money…(write a mini-conclusion)

An exercise for students

Tests for independence

Analysis thus far demonstrated that the conclusion in the article by fakenews.com is simplistic at best. There are a number of hidden factors that should be considered and the

article fails to address these. The final test I will present is a χ2 (chi-square)[7] test for independence which compares the expected numbers between two categories with the observed and concludes the with likelihood of a null hypothesis (the independence of our variables) occurring by random chance. A low p-value demonstrates a low probability of the null hypothesis occurring by pure chance and thus concludes that the variables may not be independent after all. Another way of saying this is that there is a very low probability that our variables are independent. We will use a p-value of 0.05 as our level of significance[8].

Gender versus Pocket Money

H_0 = Pocket money and gender are independent

H_1 = Pocket money and gender are not independent

		Observed		
		pocket money		
	< 120	120 - 125	125 - 140	Total
Male	2	3	24	**29**
Female	19	13	6	**38**
Total	**21**	**16**	**30**	**67**
		Expected		
		pocket money		
	115 - < 120	120 - 125	125 - 130	Total
Male	9.089552239	6.925373134	12.98507463	29
Female	11.91044776	9.074626866	17.01492537	38
Total	21	16	30	67

χ2 = 30.1 (3 s.f.)

[7] Using the correct symbols is important, you can copy and paste from somewhere like wikipedia and format it to match your text.

[8] An opportunity to demonstrate understanding. Do not just copy my words but insert your own variables and null hypothesis in here,

p = 0.0000002842357204

Our calculated p-value is significantly less than our stated significance level (0.05) thus I reject the null hypothesis and conclude that gender and the amount of pocket money are not independent. We have not yet established a causal relationship between the gender and pocket money and limitations of this study may prevent us from doing so. Since height and gender are also associated, further tests will need to be conducted to establish if height (or other variables) are factors that contribute to increased pocket money.

Happiness of Females and Males

To facilitate analysis I will conduct a t-test, at a 5% significance level to compare the mean happiness of females and males. The null hypothesis is that there is no difference between the means of the two groups, the alternative hypothesis is that there is a difference between the means. The calculations can be found below, the resulting p-value is 0.5323581111 thus we fail to reject, that is, we accept our null hypothesis and conclude that the means of the two groups are not significantly different.

T-Test Calculations

An exercise for students

Conclusion

The conclusions I can draw so far is gender and pocket money are independent and that gender and happiness show no difference. The boxplot clearly shows the distribution of the pocket money for males is higher than the females, but my scatter graph shows that height and pocket money show a strong correlation. I was not able to establish if this was as a result of age, gender or some other factor. Given that the respondents are all the same age (the survey was of 16-18 year olds) we might be able to disregard this as a factor, but for certainty additional statistical tests should be conducted with a larger sample size. I have discussed the limiting factors of my study throughout the paragraphs and maintain that a larger study needs to be conducted if we are to establish convincing links between the height of a person and any advantages they may have in life. Finally, the article by

fakenews.com needs further scrutiny and a critical analysis before the contents can be trusted.