Experiment 8

Objective

1) To study the heritability of height in Humans.
2) To study the effect of height on Darwinian fitness.

Procedure

1. About 80 students from various parts of the country were asked to collect pedigree data for their families. The data included height (only if the family member is above 18 years of age), date of birth, date of marriage and region.
2. The data was collated into a single file, hiding the identity of people involved.

Various things could be analyzed from this data as follows.

Observations and Analysis

1. Heritability of height:

Offspring height was plotted against the mid-parent height and the slope of the best fit line yielded the heritability. Heritability measures the *proportion of observable differences in a trait between individuals within a population that is due to genetic differences.*[1] It should be understood that heritability is defined as genetic component of variation over the total phenotypic variance.

Here is what was obtained:
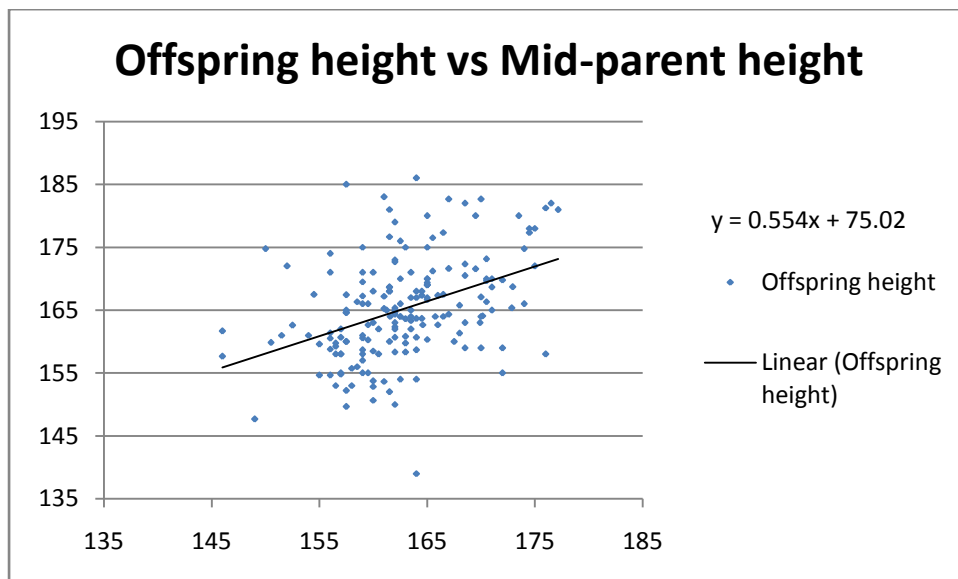

The heritability of 0.554 is of a good magnitude!

2. Effect of height on number of offspring:

The idea of doing this study did not become clear to me until I analyzed the data. Since, I was of the opinion that no. of offspring in the present world is dominated to an extremely large extent on family planning and such issues. However, we were not looking for a causal relation between height

and number of offspring, but a correlation. And the correlation does hold as visible by the following graph:

## No of offspring vs Mother's height
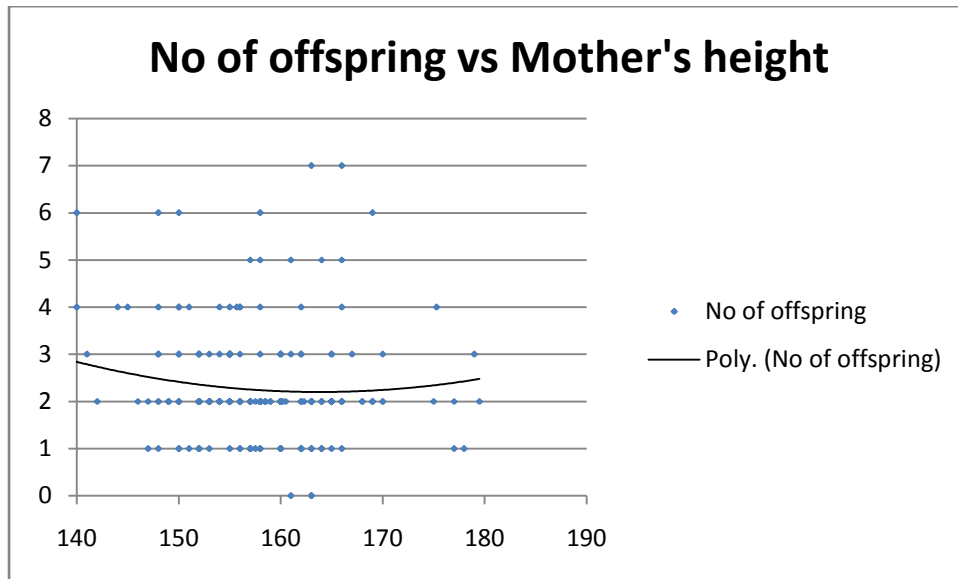
On the basis of this data, it seems that it is good for a female to be either very short or very tall. Intermediate women tend to have lower Darwinian fitness.

No. of offsprings vs Father's height
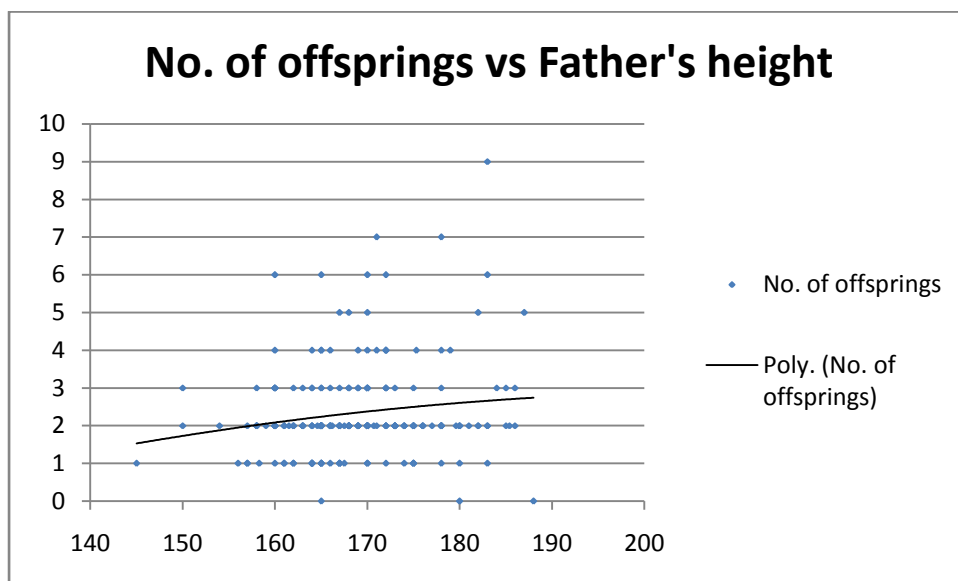
This is in contrast to the previous experiment. Males necessarily need to be tall if they are to be considered fit.

3. **Distribution of month of birth of first offspring:**

The month of birth of first offspring was recorded and a graph of frequency vs month of birth was plotted. A 2nd degree polynomial curve was fitted and this is something that was obtained:

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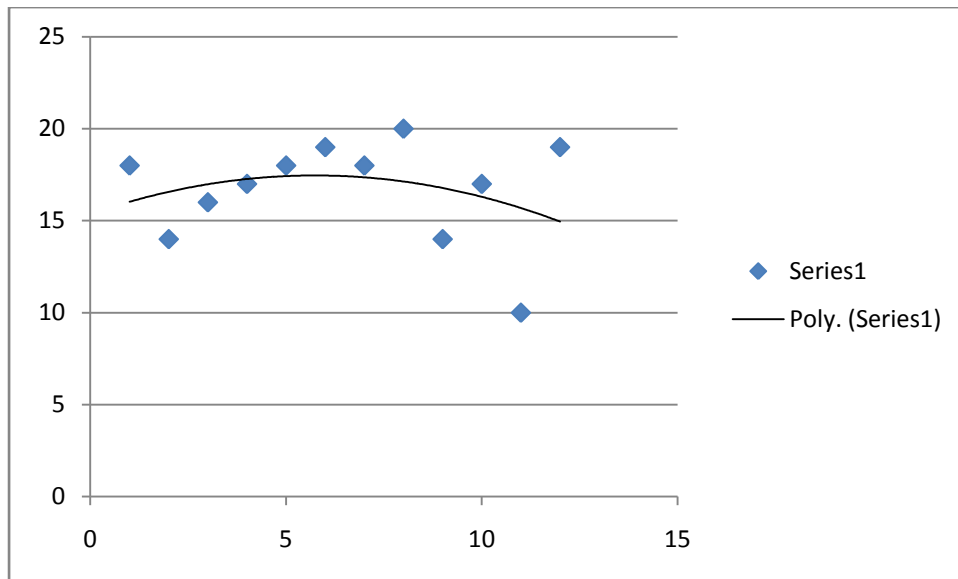
Frequency vs month of birth of the first offspring

A Chi square test was done with the null hypothesis that all the months have same probability for birth. The expected probability (E) for 200 entities is 16.6667

Month of birth	Frequency (O)	$(O-E)^2/E$
1	18	0.106666
2	14	0.426668
3	16	0.026667
4	17	0.006667
5	18	0.106666
6	19	0.326666
7	18	0.106666
8	20	0.666665
9	14	0.426668
10	17	0.006667
11	10	2.666669
12	19	0.326666

The Chi square value is 5.2 and for the α value of 0.05; the null hypothesis cannot be rejected.

Note:

It should be noted that the above study is done for a data from extremely diverse geography, culture, temperatures and lifestyle. In strict sense, to establish a correlation in all the studies, data from all the regions should be analyzed separately.