

Math Studies Project

*A Study into Stress levels in _____ College in Second
Year*

MATH PROJECT

A Study into Stress levels in College in Second Year

Introduction

Statement of the Task:

The idea of this project came from the observation that students at College go through dramatic ups and downs of stress during second year.

The purpose of this project is to investigate the stress levels of students at significant points during the second year. It will be interesting to discover the nature of the rise and decline of stress when comparing males and females, evaluating if gender has any effect.

I will need to establish at which points during the term to measure stress. I will then collect data by means of a questionnaire. This will ask, on a scale of 1-lowest to 10-highest, their stress levels at each given time. The data collected will then be translated and analyzed using tables, chi-squared testing, graphs and statistics. I hope to find out the relationship between stress levels compared to time and gender.

By the end of the project I aim to be able to rank the time periods in order of low to high stress. I intend also to look into whether stress levels in the different periods (using data from males and females) are in general correlated in any way. I also hope to show whether there is a difference in stress between males and females. Lastly, I will look into whether there is a difference in how drastically stress levels of males and females change during the periods.

One factor to consider when drawing conclusions is the subjective nature of stress making it very difficult to measure universally and accurately.

A2

How the data was collected:

I asked a group of 70 second year students, 35 males/35 females, to record on a scale of 1(lowest) to 10(highest) their stress levels at 5 points during the year.

Selecting the times to measure:

When trying to gain a general understanding of stress throughout the year I felt it important to try and predict points at which stress would be high or low. I also thought it important to find a time that could act as measure of how *generally* stressed each person is to act as a control.

Therefore these times were chosen:

CONTROL: *Term 2:* This is the second term of the *first* year; this is not considered as a particularly stressful or non-stressful time during the two years and therefore serves as a good general indication of stress.

LOW-STRESS: *August Period:* This is the month the second years return from the summer vacation and is spent without first years; this is seen as a period of low stress as only half the population of the college is there, the focus of the month is on service rather than academics (no homework is set) and the weather is good.

HIGH-STRESS: *Pre-London Week:* This is the period, after the first years have arrived, normal academic routine is resumed, many humanitarian subjects have course work deadlines, the Extended Essay is due and students applying to the US are sitting SATs.

: End of Term 3: The end of third term holds deadlines for a range of coursework and many language oral exams, student are also expected to have finished their UCAS and US applications as well as continuing to sit SATs.

: Pre-Mocks: The period previous to the mock exams is stressful due the pressure of revision.

Collected Data

Term 2	August Period	Pre-London Week	End of Term 3	Pre- Mocks	Male/ Female
4	2	8	8	7	M
5	4	9	8	8	M
5	2	9	9	7	M
3	6	10	10	9	M
6	5	8	8	7	M
4	3	9	8	8	M
7	4	10	10	9	M
5	3	7	6	7	M
5	2	8	8	9	M
7	3	9	7	8	M
6	4	8	9	9	M
4	5	9	8	9	M
6	4	7	7	8	M
7	3	10	8	7	M
3	1	9	8	9	M
5	3	8	8	6	M
4	3	10	9	8	M
3	2	7	8	6	M
5	3	7	9	7	M
7	2	8	8	8	M
2	3	10	8	7	M
3	4	7	8	7	M
4	5	8	7	8	M
5	2	8	9	9	M
7	1	8	8	8	M
6	3	9	9	6	M
5	4	10	10	7	M
7	5	7	9	8	M
7	2	7	8	9	M
4	4	8	10	10	M
5	1	9	9	8	M
6	3	9	9	9	M
6	3	10	8	10	M
3	4	9	8	7	M
4	4	8	8	8	M
6	4	10	9	9	F
4	2	9	9	8	F
6	4	8	9	9	F
5	3	8	9	8	F
6	2	8	7	8	F
3	3	9	7	8	F
3	2	9	9	9	F
4	3	9	8	9	F

4	2	10	9	8	F
3	3	9	8	9	F
5	2	9	8	7	F
6	4	7	8	9	F
6	3	8	8	8	F
4	2	9	8	7	F
5	3	8	9	7	F
7	5	9	8	8	F
5	2	9	9	9	F
4	3	9	7	8	F
7	1	8	7	7	F
4	3	7	7	8	F
5	4	8	8	9	F
4	1	9	7	9	F
7	5	10	7	9	F
6	2	9	9	9	F
5	6	9	10	10	F
7	5	9	7	7	F
5	4	8	8	8	F
4	2	7	9	9	F
4	2	8	9	10	F
3	1	8	8	8	F
4	3	7	9	9	F
5	6	9	9	7	F
4	5	10	10	6	F
5	4	10	8	8	F
6	3	10	8	9	F

Cumulative Frequency Graph:

For my first analysis of all the data I will use cumulative frequency to gain an understanding of the spread of data.

Cumulative Frequency Table					
Stress Levels ↓	Term Two	August Period	Pre-London Week	End of Term 3	Pre-Mocks
1	0	6	0	0	0
2	1	24	0	0	0
3	10	45	0	0	0
4	28	59	0	0	0
5	46	67	0	0	0
6	59	70	0	1	4
7	70	70	11	12	20
8	70	70	32	42	43
9	70	70	57	64	66
10	70	70	70	70	70

B3

Box Plots

To gain an understanding of what the cumulative frequency graph is telling us, one can look to Box Plots for analysis.

Essentially we learn five things from looking at the box plots that can be represented like this:

Least stressed → **Most stressed**

	August Period	Term 2	Pre-Mocks	End of Term 3	Pre-London Week
the minimum value (Min_x)	1	2	6	6	7
the lower quartile (Q_1)	1.6	3.4	6.85	7.25	7.35
the median (Q_2)	2.5	4.35	7.65	7.75	8.1
the upper quartile (Q_3)	3.5	5.5	8.25	8.45	8.75
the maximum value (Max_x)	6	7	10	10	10

F2

From observing the Box Plots, one can see how it orders the Periods from least to most stressful. This order starts with August Period being least stressed with $Q_1 \approx 1.6$ and $Q_3 \approx$

3.5; followed by Term 2 with $Q1 \approx 3.4$ and $Q3 \approx 5.5$; then Pre-Mocks with $Q1 \approx 6.85$ and $Q3 \approx 8.25$; then second to highest stress is shown in End of Term 3 with $Q1 \approx 7.25$ and $Q3 \approx 8.45$; finally and highest stress Pre-London Week with $Q1 \approx 7.35$ and $Q3 \approx 8.75$.

This appears to put Periods in order from lowest to highest without overlap of the individual quartiles (reading from left to right across each row), as demonstrated in the table above.

It is also notable that End of Term 3 and Pre-Mocks have identical minimums (6) and maximums (10). Showing slight difference, Pre-London Week shows a higher minimum of (7). Proving Pre-London Week, End of Term 3 and Pre-Mock period to all show very high results. Conversely, August Period shows a lower maximum and minimum, showing the period to be of relatively low stress. Lastly we can see that Term 2 will work well as a measure of general stress as the maximum and minimum encapsulate the wide midrange (2, 3, 4, 5, 6, and 7) of the scale and exclude the extremes of 1, 9 and 10.

Remaining Calculated Statistics

In the table shown below I have an overall calculation of statistics for all data, male and female, in order to assess the general trends of stress. This will help me to know whether the times I have chosen show stress as I predicted.

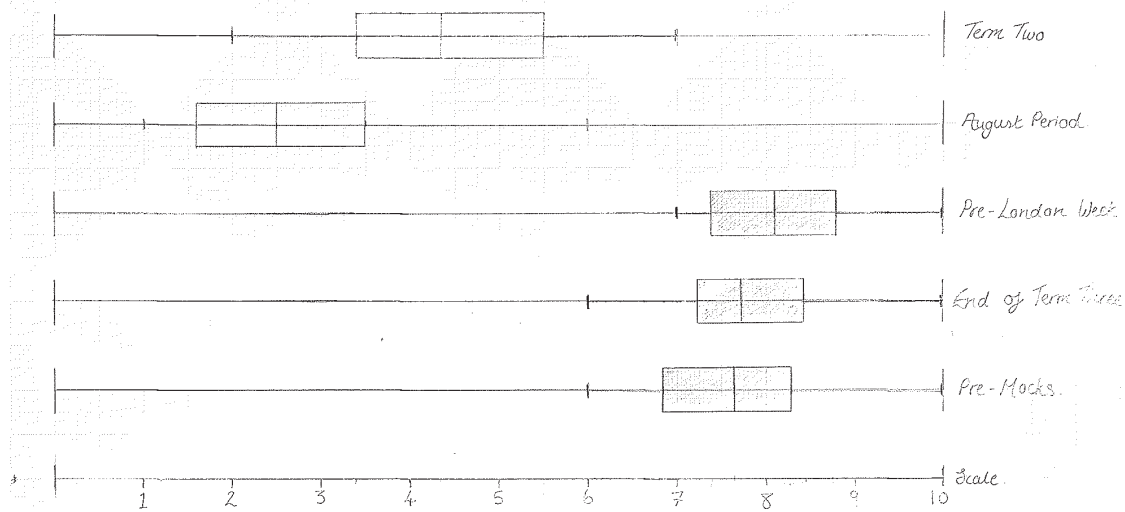
	Term 2	August Period	Pre-London Week	End of Term 3	Pre-Mocks
Number of Observations	70	70	70	70	70
Range	5	5	3	4	4
Mean	4.94	3.16	8.57	8.30	8.10
Mode	4/5	3	9	8	8/9
Standard Deviation σ	1.31	1.27	0.96	0.88	1

Analysis:

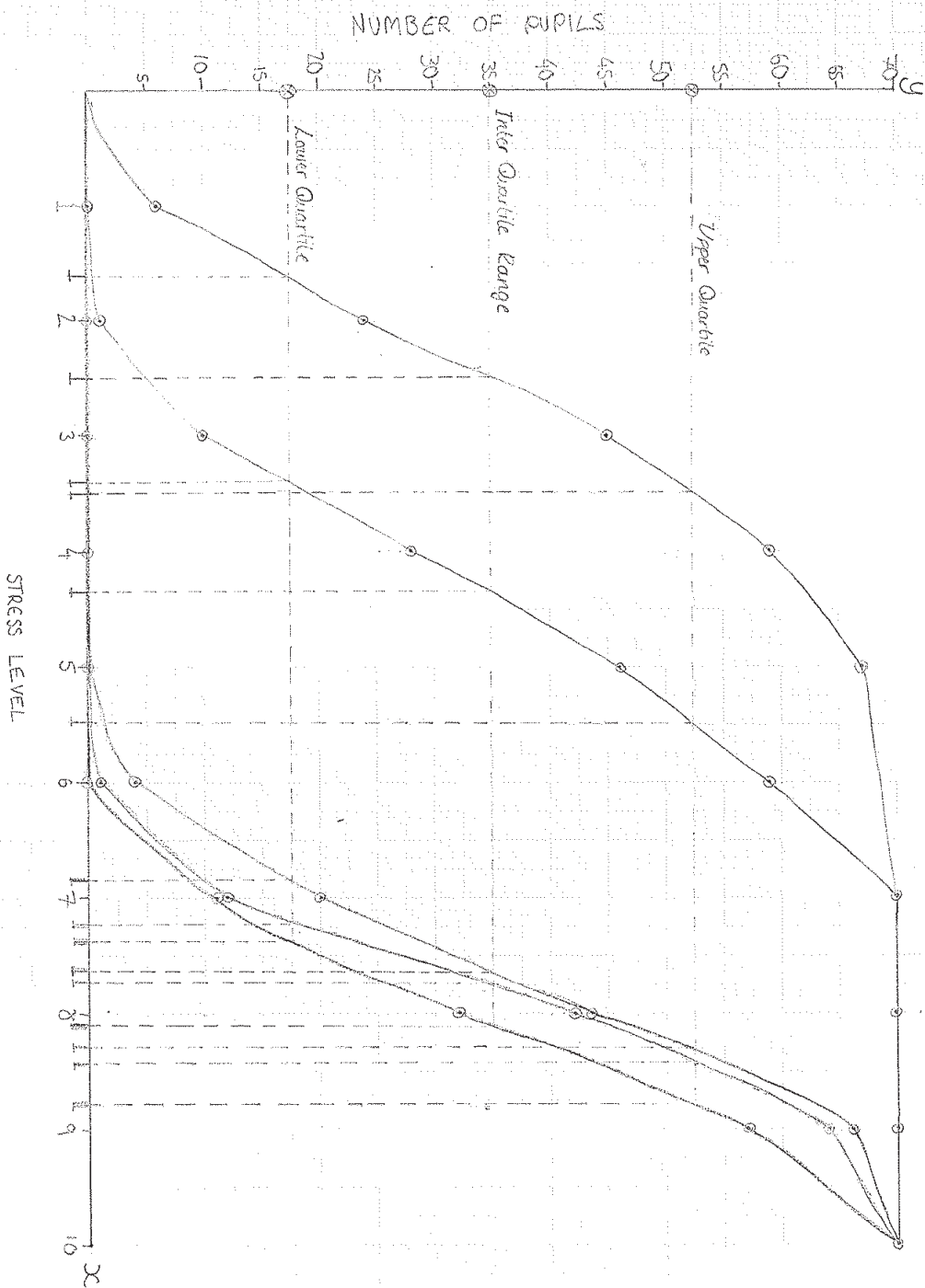
Looking at the ranges from each period it would seem my predictions have been correct. The mean (3.16) and the mode (3) for August Period all show very low stress reflecting the predicted nature of this period. Pre-London Week, End of Term 3 and Pre-Mock period all show very similar high results. My predictions are proven further by the mean and the mode in Pre-London Week being higher than both other periods. When looking into whether End of Term 3 or Pre-Mocks was more stressful it's observable that the

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Box Plots



A graph showing the cumulative frequency of pupils at varying stress levels.

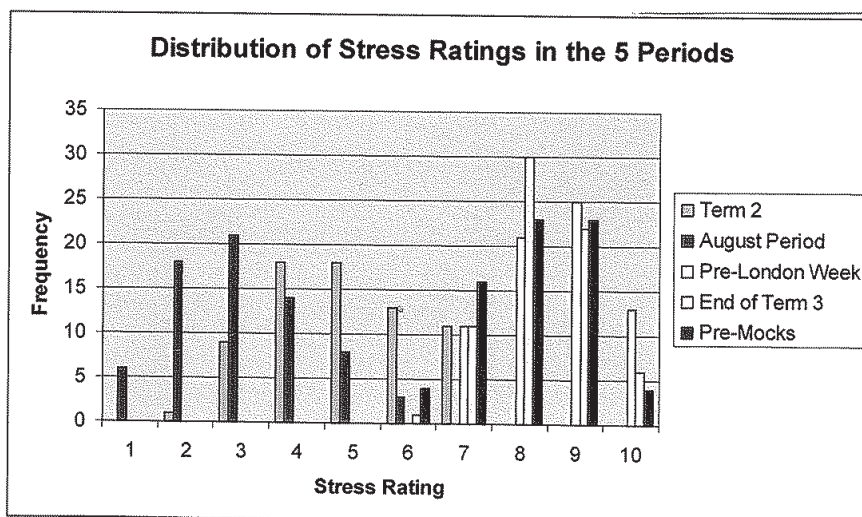


Key
 August period
 Term Two
 Pre-mocks
 End of term 3
 Pre-London Week

mean of End of Term 3 is higher but the mode is lower. This suggests that although the statistics for these two terms are not quite identical, they share a likeness in stress levels which differs slightly to Pre-London Week. The range for Term 2 (5) and August Period (5) show the biggest spread of data, this suggests that people were not feeling a particular consensus of stress levels at these times. The smallest range is shown in Pre-London Week (3), suggesting that at this time people were feeling similar levels of stress to one another. End of Term 3 (4) and Pre-Mocks (4) show identical ranges, this range is not significantly high or low but does show a slight trend toward stress levels between 6 and 10. The standard deviation reflects a similar image to the range in Term 2 and August Period, showing a fairly large spread. However, the fact that the lowest standard deviation is seen in the End of Term 3 suggests that although its range is not the smallest of the five, more of the recorded data was closer to the mean. This suggests a stronger tendency to rate stress at the same level in this period than in the others.

Bar Graph

I will now represent this data on a bar graph for each term to gain another visual representation of the general trends of stress in the five Periods of time.



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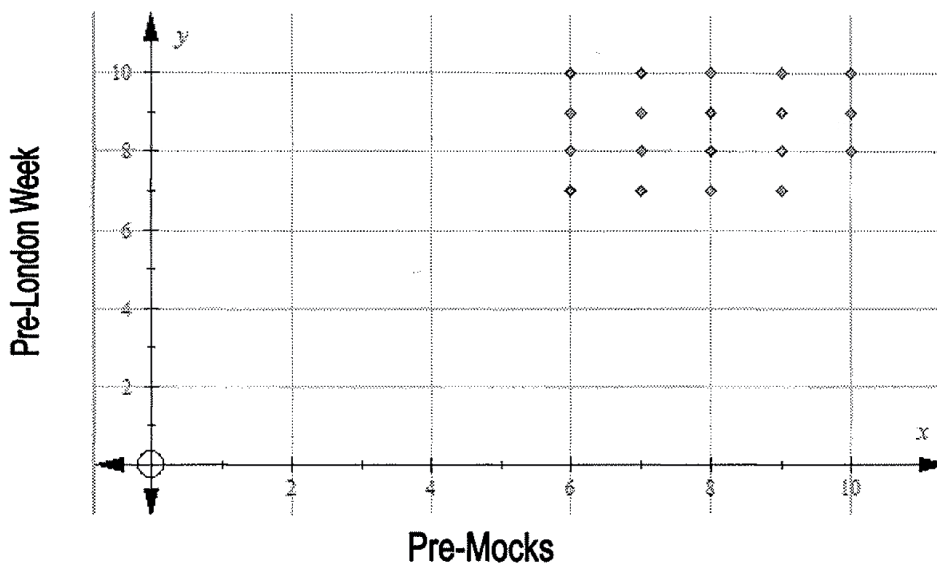
Observations:

One of the most obvious observations one can make from looking at this graph is that the different periods seem to be split at opposite ends of the graph. Term 2 and August Period is focused at the low end of the ratings suggesting, as predicted, these were times of low stress. My predictions stated that August Period should have been the time of lowest stress; this is proved by the fact that August Period was the only period to record the lowest rating of 1. Contrary to this, Pre-London Week, End of Term 3, Pre-Mocks is focused at high end of ratings suggesting, as predicted, that these were times of particularly high stress. The period to score the highest frequency for the highest scores of 9 and 10 is Pre-London Week, suggesting this was a particularly stressful time. The period in which most people felt the same way was in the End of Term 3 where 30 people recorded a score of 8. A dip in ratings at beginning, middle and end of data can also be observed. This suggests that due to the selection of periods showing high or low stress, the data gravitates to the center of the first and second half of the ratings. However Term 2 lessens the dip in the middle, suggesting an overlap in this divide. This backs up the prediction that this gives a good indication of how generally stressed the individual is.

Having established a good understanding of stress levels during the five time periods, I will now look in to how stress in one term may effect or determine stress in another.

Correlation

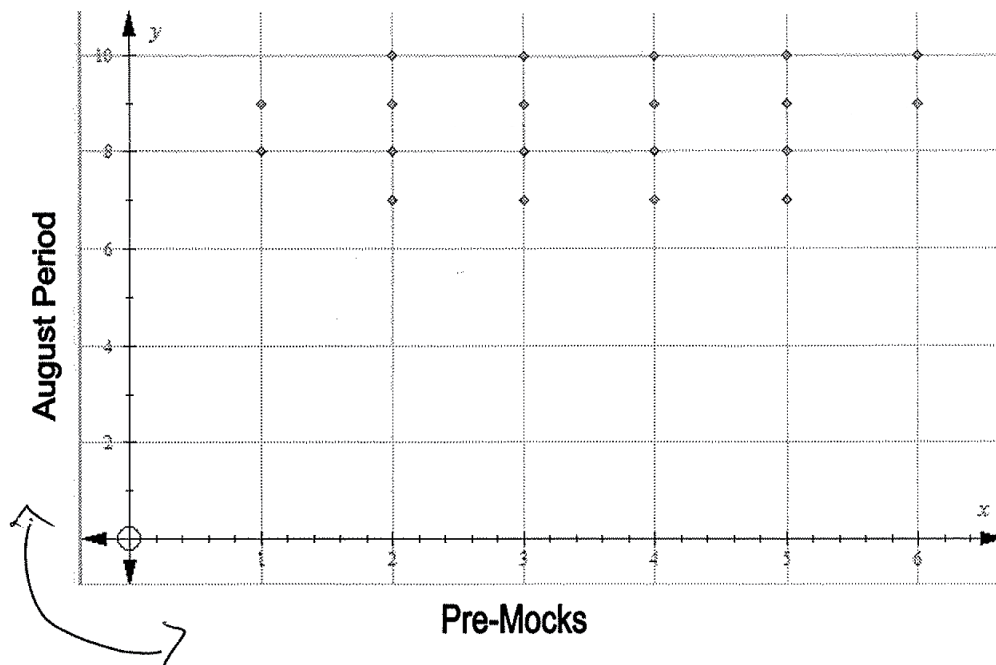
I will look at whether there is a correlation between stress levels in Pre-London Week and in Pre-Mocks, the two times of highest stress. This will tell me whether a female/male who was very stressed in one period is likely to be very stressed in another. In this case I will not distinguish between males and females, all data will be used.



Correlation Between Pre-Mocks and Pre-London Week	
Correlation Coefficient (r)	0.059108
r^2	0.0034938
Verdict	Almost no (very weak) correlation

Here, there is only a very weak correlation to suggest that the higher the stress in Pre-Mocks, the higher the stress in Pre-London Week.

Having found very weak correlation in this case, I will now see whether there is any correlation between stress levels in August Period to Stress levels in Pre-London Week. I would expect to see that the lower the stress in August Period, the lower the stress in Pre-London Week.



Correlation Between Pre-Mocks and August Period	
Correlation Coefficient (r)	0.14801
r^2	0.021908
Verdict	Almost no (very weak) correlation

Again, the correlation is very weak. However, if one was to give significance to the correlation that exists, it would prove the higher the stress in Pre-Mocks, the higher the stress in August Period. This suggests that even those slightly more stressed in a period of low stress will be more stressed during a period of high stress.

I will now split the data into two under the categories into two in order to start my comparison between males and females stress levels.

Males:

Term 2	August Period	Pre-London Week	End of Term 3	Pre-Mocks
4	2	8	8	7
5	4	9	8	8
5	2	9	9	7
3	6	10	10	9
6	5	8	8	7
4	3	9	8	8
7	4	10	10	9
5	3	7	6	7
5	2	8	8	9
7	3	9	7	8
6	4	8	9	9
4	5	9	8	9
6	4	7	7	8
7	3	10	8	7
3	1	9	8	9
5	3	8	8	6
4	3	10	9	8
3	2	7	8	6
5	3	7	9	7
7	2	8	8	8
2	3	10	8	7
3	4	7	8	7
4	5	8	7	8
5	2	8	9	9
7	1	8	8	8
6	3	9	9	6
5	4	10	10	7
7	5	7	9	8
7	2	7	8	9
4	4	8	10	10
5	1	9	9	8
6	3	9	9	9
6	3	10	8	10
3	4	9	8	7
4	4	8	8	8

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Females:

Term 2	August Period	Pre-London Week	End of Term 3	Pre- Mocks
6	4	10	9	9
4	2	9	9	8
6	4	8	9	9
5	3	8	9	8
6	2	8	7	8
3	3	9	7	8
3	2	9	9	9
4	3	9	8	9
4	2	10	9	8
3	3	9	8	9
5	2	9	8	7
6	4	7	8	9
6	3	8	8	8
4	2	9	8	7
5	3	8	9	7
7	5	9	8	8
5	2	9	9	9
4	3	9	7	8
7	1	8	7	7
4	3	7	7	8
5	4	8	8	9
4	1	9	7	9
7	5	10	7	9
6	2	9	9	9
5	6	9	10	10
7	5	9	7	7
5	4	8	8	8
4	2	7	9	9
4	2	8	9	10
3	1	8	8	8
4	3	7	9	9
5	6	9	9	7
4	5	10	10	6
5	4	10	8	8
6	3	10	8	9

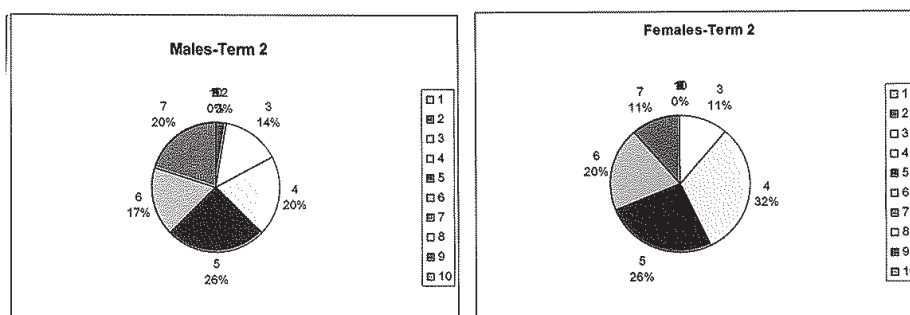
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As my intention is to compare stress in relation to gender, rather than the difference in time periods I will use only the control, the lowest stress period and the highest stress period in my comparison.

Pie Charts

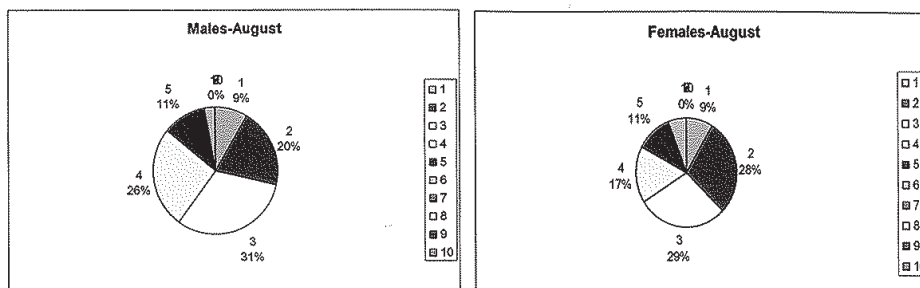
To gain an initial comparison between stress levels of sexes I will look at the data represented visually on Pie Charts.

Term 2



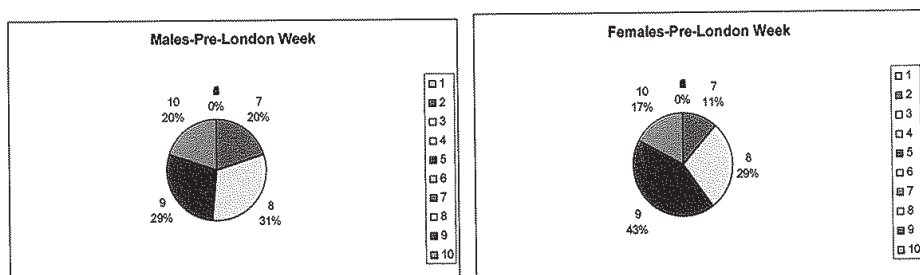
These charts show two main differences. Firstly, males show a 9% higher number of 7s than females, implying the males to be more stressed. Secondly, females show a 12% higher number of 4s, suggesting more females to record lower rating. This seems to back up the latter implication that *males are more stressed than females in this period*, suggesting males to be more generally stressed.

August Period



In August Period, the two Charts at first glance appear almost identical, suggesting very little difference in stress between males and females. However, looking closer, one can see that males show a 9% larger frequency of recorded 4s. Considering that 8 of the 9% difference is made up by an 8% larger frequency of females recording 2s, this suggests that more females were less stressed than males during this period.

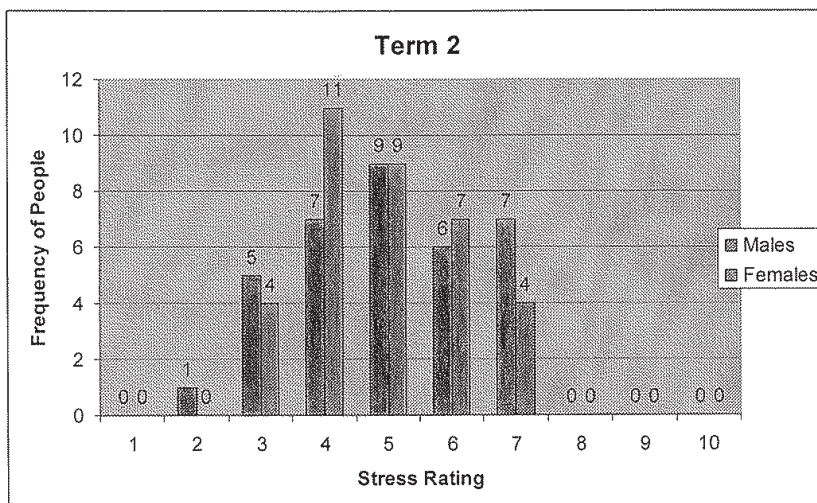
Pre-London Week



In Pre-London Week the most striking difference comes in the frequency of recorded 9s; females showing a 14% higher recorded frequency than males. This 14% in males is made up largely in a 9% higher recorded frequency of 7s, but also 3% is made up in a larger recorded frequency of 10s. Visually, and numerically, what this shows is that the males recorded frequencies are more equally spread over ratings 7-10, as we see the four segments seem to appear in much more of a quarterly shape than the females. Because males have a higher amount of tens yet females have a significantly larger amount of nines, it is difficult to conclude as to which sex was more stressed in this period.

Tables

I will now represent this data on a bar graph for each term to get a more detailed visual representation of how stress compares between males and females.



Term 2 has been used in this investigation to give an indication of general stress. Therefore this graph should show how *generally* stressed both sexes are.

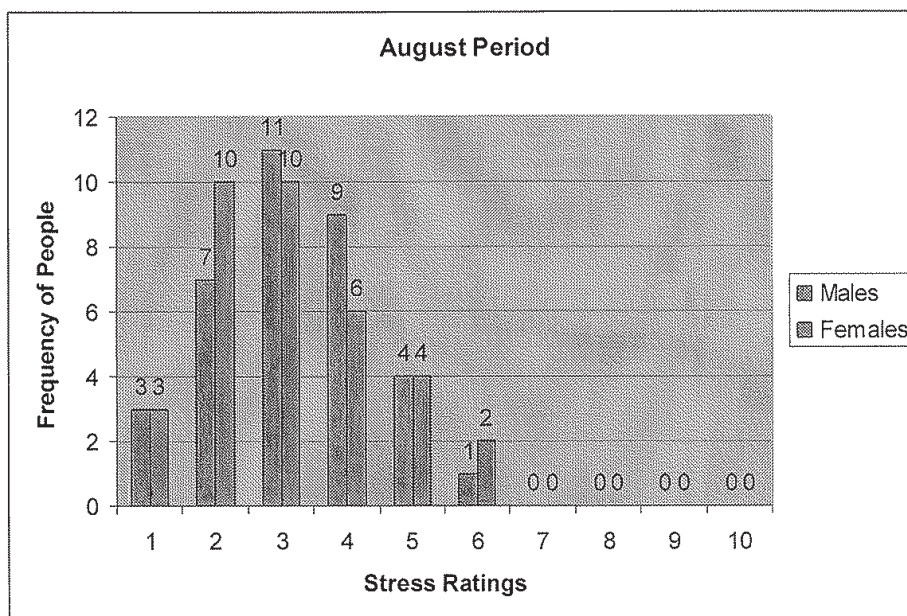
The lowest recorded stress of 2 came only from males. This suggests that males generally have ability to remain less stressed. All other ratings from 3 up to 7 were recorded at least 4 times by both sexes; the existence of the males recorded frequency of 2 therefore shows males data to be more spread.

The highest frequency of recordings of rating 7 came from males, suggesting a higher number of males were the highest level of stress than females.

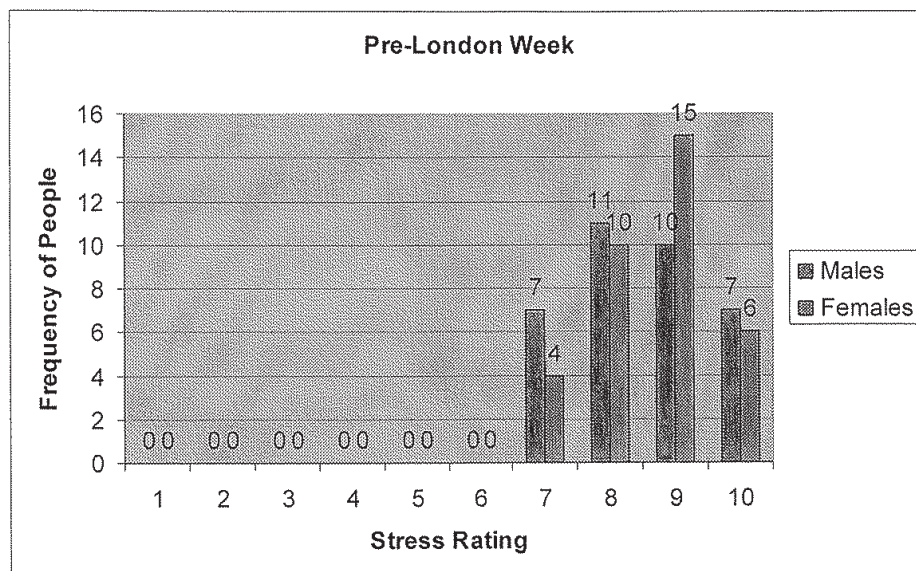
Females' data shows some symmetry with a peak in a neutral stress rating of 4, then showing less and less recorded ratings as one moves away from this point. This suggests the main body of recorded data is centered around a point of neutral stress.

Males' data again shows a general progression to a peak of very a neutral stress rating of 5, but upon descent then rises again at the maximum recorded stress rating of 7. This

could suggest that males are generally centered around a neutral point of stress but that also a significant number of males have a high general stress.




All data, males and females, is at low end of ratings; suggesting that overall, August Period was a time of low stress for both sexes. Both males and females data shows symmetry, peaking towards very beginning of scale. This suggests that the majority of the ratings were at a low point; as you move away from this point the likelihood of a recorded rating decreases, suggesting a normal trend in the data.




We see here that the recorded frequencies for Pre-London Week very concentrated to the high end of the rating scale; suggesting a period of high stress for both sexes. However, it is also noticeable that females' data peaks at 9, whereas males' data peaks at 8. This suggests that in the case of the majority, females were more stressed than males. Furthermore, the ascent and descent of the recorded frequencies is steeper in females; suggesting that females' data less spread. And because the females' data peak comes at a higher rating than males, one can make the observation that *more* females were *more* stressed than males during this period.

After looking in detail at the data visually on the pie charts and the bar graphs I will now look into calculated statistics to see if there are any significant comparisons to be made.

Calculated Statistics: Males

	Term 2	August Period	Pre-London Week
Number of Observations	35	35	35
Minimum score	2	1	7
Maximum score	7	6	10
Range	5	5	3
Mean	5	3.20	8.49
Median	5	3	8
Mode	5	3	8
Standard Deviation 	1.41	1.21	1.02

Calculated Statistics: Females

	Term 2	August Period	Pre-London Week
Number of Observations	35	35	35
Minimum score	3	1	7
Maximum score	7	6	10
Range	4	5	3
Mean	4.89	3.11	8.66
Median	5	3	9
Mode	4	2/3	9
Standard Deviation 	1.19	1.33	0.89

Comparisons:

Maximum/Minimum:

The maximum and minimum values are 11/12 times identical. This strongly suggests that the general level of stress in these times is not affected by gender. The 1/12 difference comes in Term 2 minimum where males show as 2 and females show as 3. This difference has a fairly low significance but nonetheless indicates that during Term 2, females had a slightly higher stress level boundary in '3 up to 7' compared to males '2 up to 7'.

Mean:

The mean values, again, do not differ in a big way. In Term 3, males were more stressed than females by a 0.11 difference; in August Period males were more stressed than females by a 0.09 difference however the Pre-London Week shows the biggest difference contrary to the others as females were more stressed than males by a 0.17 difference.

By looking at the mean, one could draw one of two conclusions.

Firstly, one could argue that males are generally more stressed than females by considering that two thirds of the results indicate this.

Conversely, one could also argue that because the largest difference shows females to be more stressed than male, this should be more relevantly considered.

Median:

The median shows no differences in Term 2 or August Period but, like the mean, shows a small difference in the Pre-London Week. This difference shows females stress level(9) to be higher than the males(8) by one. This could suggest that the second conclusion taken from the mean should be accepted, showing that Pre-London Week was a more stressful time for females than males.

Mode:

The mode for Pre-London Week supports that females were more stressed as it shows that females most frequently recorded the rating 9 compared to males who most frequently recorded level 8. However, the most frequently recorded rating from females both in August Period and Term 2 appears as one level below males, suggesting that more females were less stressed than males during these two periods.

Preliminary Conclusions:

From looking at the calculated statistics a few observations can be made. Firstly, observing Term 2 as a general level of stress, it's indicated that, ordinarily, females the less stressed gender. However, in the Pre-London Week period, females repeatedly

came out to be more stressed than males. This could suggest that though females are on the whole less stressed than males, that when put under pressure their stress levels rise more dramatically.

The measurement of the range of each gender's stress levels is another consideration to be made. This can be analyzed by observing the range and standard deviation.

Range:

August Period shows the same range of 5 for males and females, from 1 to 6, gravitating to the lower end of the scale. This range is fairly big, showing a range stretching somewhere within 50% of possible ratings, indicating a rather wide statistical variation for both males and females.

The Pre-London Week period again shows the same range of 3 for males and females, from 7 to 10, this time gravitating to the highest end of the scale. This range is small and shows more of a consensus of high stress ratings for males and females.

A difference can be seen in the range for Term 2; males show a range of 5 from 2 to 7, steadily gravitating from the bottom to the center of the scale; females show a smaller range of 4 from 3 to 7, gravitating to the middle of the scale. Observing that both maximums are the same, the value in looking at the range comes where we see that males' recordings descended further *down* the scale than females'. This seems to contradict the previous conclusion that females are generally less stressed than males as we see males reaching lower levels of stress than females during Term 2.

Standard deviation:

Looking at the standard deviation will give an indication of generally how far the data points fall from the mean.

Term 2 shows the largest difference between males and females; the standard deviation for the males' data spread surpasses the females by 0.22, suggesting their data to be more widely spread. In August Period the females' data spread surpasses the males' by 0.12 suggesting that in this period the males as a whole felt a more similar level of stress than

the females. Pre-London Week show's the contrary with males' data being more spread than females by 0.13.

What relevance does the general spread of data have to the comparison of stress between males and females? By assessing how closely the females or males rate their stress levels at times of predicted high and low stress, one can evaluate how much gender is affecting stress as a whole. A small range of data suggests that all females are giving similar results; therefore gender is playing a role. Conversely, a large range would suggest that gender is not a factor contributing to stress levels.

From my data I can observe, two thirds of the time, males' data is more widely spread than females. This implies that gender does not affect males as much in times of predicted high (Pre-London Week) and predicted general (Term 2) stress. The observation that the females' data is more spread than males' during August Period suggests that gender doesn't affect females' stress in times of predicted low stress. Overall this would suggest that females, as a group, are more affected by their gender than males in relation to stress.

Having looked at a range of statistical data, although I can draw some valuable conclusions, as we have seen, they do not always agree.

Therefore, I will now take a different approach with two Chi-Squared tests to see what conclusions they will draw with regard to gender and stress levels.

Chi-Squared Test of Independence 1

Taking in to account all time periods, are stress levels independent of *Gender*?

Factor 1: Gender, Male/Female

Factor 2: Stress Levels¹

H_0 : The two factors are independent of each other.

H_1 : The two factors are dependent on each other.

Observed Data

	Stress Very Low	Stress Low	Stress Average	Stress High	Stress Very High	Totals
Male	11	32	24	67	41	175
Female	13	31	23	56	52	175
Totals	24	63	47	123	93	350

Expected Data

	Stress Very Low	Stress Low	Stress Average	Stress High	Stress Very High	Totals
Male	12	31.5	23.5	61.5	46.5	175
Female	12	31.5	23.5	61.5	46.5	175
Totals	24	63	47	123	93	350

¹ Stress Very Low = Ratings 1 and 2

Stress Low = Ratings 3 and 4

Stress Neutral = Ratings 5 and 6

Stress High = Ratings 7 and 8

Stress Very High = Ratings 9 and 10

B3

C5

O	E	O-E	$\frac{(O-E)^2}{E}$
11	12	-1	0.083
32	31.5	0.5	0.008
24	23.5	0.5	0.012
67	61.5	5.5	0.492
41	46.5	-5.5	0.651
13	12	1	0.083
31	31.5	-0.5	0.008
23	23.5	-0.5	0.012
56	61.5	-5.5	0.492
52	46.5	5.5	0.651
TOTAL			2.492

$$X^2 \text{ calc} = \sum \frac{(O-E)^2}{E} = 2.49 \text{ (3SF)}$$

$$\begin{aligned} \text{Degrees of freedom (v)} &= (\text{rows}-1) \times (\text{columns}-1) \\ &= (2-1) \times (5-1) \\ &= 1 \times 4 \\ v &= 4 \end{aligned}$$

X^2 crit at 95% confidence level and 5% significance level = 9.488

$$2.492 < 9.488$$

Therefore, X^2 calc < X^2 crit so can accept H_0 at 5% significance level.

This means I can be 95% confident that gender is independent of stress level.

Having found a negative conclusion in Chi-Squared Test 1, I will now take in to account only the three periods of high stress to see if there is any influence of gender there.

C5

Chi-Squared Test of Independence 2

Taking in to account time periods of high stress, are stress levels independent of *Gender*?

Factor 1: Gender, Male/Female

Factor 2: Stress Levels²

H_0 : The two factors are independent of each other.

H_1 : The two factors are dependent on each other.

Observed Data

	Stress High	Stress Very High	Stress Highest	Totals
Male	24	40	41	105
Female	19	34	52	105
Totals	43	74	93	210

Expected Data

	Stress High	Stress Very High	Stress Highest	Totals
Male	21.5	37	46.5	105
Female	21.5	37	46.5	105
Totals	43	74	93	210

O	E	O-E	$\frac{(O-E)^2}{E}$
24	21.5	2.5	0.291
40	37	3	0.243
41	46.5	-5.5	0.651
19	21.5	-2.5	0.291
34	37	-3	0.243
52	46.5	5.5	0.651
TOTAL			2.37

² Stress High = Ratings 6 and 7
 Stress Very High = Rating 8
 Stress Highest = Ratings 9 and 10

$$X^2 \text{ calc} = \frac{\sum(O-E)^2}{E} = 2.37 \text{ (3SF)}$$

$$\begin{aligned} \text{Degrees of freedom (v)} &= (\text{rows}-1) \times (\text{columns}-1) \\ &= (2-1) \times (3-1) \\ &= 1 \times 2 \\ v &= 2 \end{aligned}$$

X^2 crit at 95% confidence level and 5% significance level = 5.991

$$2.37 < 5.991$$

Therefore, $X^2 \text{ calc} < X^2 \text{ crit}$ so can accept H_0 at 5% significance level.

This means I can be 95% confident that gender is independent of stress level.

In conclusion, both Chi-Squared tests have given me a negative response that, ignoring previous findings, would lead me to believe that gender is independent of stress.

Having drawn some interesting, though not always consistent conclusions when comparing males and females stress levels, I will now look into compare stress between genders from a different angle.

One of my previous suggestions was that, though females are on the whole less stressed than males, when put under pressure their stress levels rise more dramatically. This is interesting as it brings in the idea of the dynamics of stress, i.e. the rise and fall of stress between high periods of stress and low periods of stress. To look at this in more detail I will now calculate the difference between the recorded stress during Pre-London Week and August Period and use calculated statistics to analyze my findings.

Males

Pre-London Week (x)	August Period (y)	Difference (x-y)
8	2	6
9	4	5
9	2	7
10	6	4
8	5	3
9	3	6
10	4	6
7	3	4
8	2	6
9	3	6
8	4	4
9	5	4
7	4	3
10	3	7
9	1	8
8	3	5
10	3	7
7	2	5
7	3	4
8	2	6
10	3	7
7	4	3
8	5	3
8	2	6
8	1	7
9	3	6
10	4	6
7	5	2
7	2	5
8	4	4
9	1	8
9	3	6
10	3	7
9	4	5
8	4	4

Females

Pre-London Week (x)	August Period (y)	Difference (x-y)
10	4	6
9	2	7
8	4	4
8	3	3
8	2	6
9	3	6
9	2	7
9	3	6
10	2	8
9	3	6
9	2	7
7	4	3
8	3	5
9	2	7
8	3	5
9	5	4
9	2	7
9	3	6
8	1	7
7	3	4
8	4	4
9	1	8
10	5	5
9	2	7
9	6	3
9	5	4
8	4	4
7	2	5
8	2	6
8	1	7
7	3	4
9	6	3
10	5	5
10	4	6
10	3	7

Calculated Statistics:

	Males	Females
Number of Observations	35	35
Minimum score	2	3
Maximum score	8	8
Range	6	5
Mean	5.29	5.48
Median	6	6
Mode	6	7
Standard Deviation σ	1.52	1.48

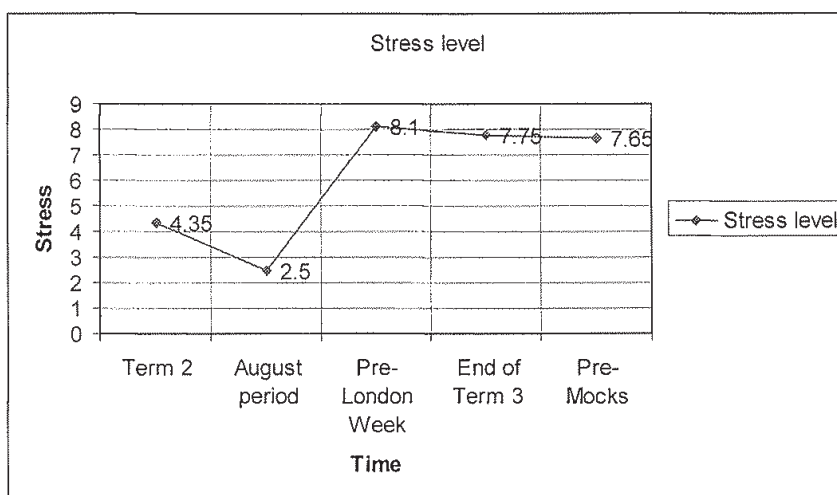
This data seems to allow me to assume that my suggestion was true. For females, the minimum score(3) is higher than males'(2), subsequently the range(5) for females is lower as both have a maximum of 8. This shows that, in the extreme case, the jump from low to high stress the females experience is larger than the males. Further proving this, both the mean and the mode are higher in females' differences than in males' differences. The standard deviation being 0.04 higher in males appears too small to be used to draw any valuable conclusion.

From this analysis, I can put forward the idea that females tend to experience stress at more extreme highs and lows than males.

Conclusion

From carrying out this investigation I can draw some interesting conclusions about stress levels during the second year.

Firstly, by looking at the box plots I formed from my cumulative frequency diagram I was able to establish a ranking of the five periods in relation to stress. This ranking starts with August Period; followed by Term 2; then Pre-Mocks; then End of Term 3 and finally Pre-London Week. Having obtained this data I can now sketch a graph showing chronologically where these periods come in relation to how stressful they are using the medians as an average of each period.



Looking at this graph it would seem that, once the high stress of Pre-London Week was over, the trend of stress would decrease meaning effectively that the worst was over. It is also interesting to note that the period of lowest stress comes directly before the period of highest stress. This could indicate that the work load faced in Pre-London Week comes as a huge shock to the system for students after a period of very low stress.

Secondly, in my graphs showing correlation of stress between terms showed almost no correlation on both counts. However, if you give significance to the little correlation that

exists, you find the suggestion that the higher the stress in one period, the higher the likelihood of high stress in another.

Thirdly, when comparing the male and the female data in Pie Charts, I found males to be more stressed in Term 2 and August Period, yet in Pre-London Week it remained ambiguous. The question of which sex was more stressed in Pre-London Week was given an answer when looking at the bar graphs which suggested *more* females were *more* stressed during that period. Consequently, I have obtained conclusions which are superficially inconsistent, as Term 2 and August Period suggest males to be more stressed yet in Pre-London Week females seem to be more stressed. However, when observing the nature of the periods when either sex was more stressed, as well as looking closely at calculated statistics, it is possible to make a compromise. This is namely that though females are two times out of three less stressed than males, when put under pressure of times of high stress their stress level rises more dramatically than males'.

The Chi-Squared testing was fairly invaluable as in both occasions it concluded that gender and stress are independent of each other. Although this had some value in showing that any influence gender has on stress levels is very small, it does not help to explain much more than a positive or negative answer.

Lastly, when observing the difference between the stress levels of males compared to females in periods of low and high stress I found that females tend to experience stress at more extreme highs and lows than males.

Evaluation

Overall I feel I have done a sufficiently comprehensive study into stress levels in the second year.

However, I do feel that, being given the chance, there are a few things I would do differently and a few things I could add to my project in order to improve it.

Firstly, I would obtain data from more students in order to perform a more reliable project. This proved difficult as it was very rare to encounter more than 4 or 5 second years at one place at one time and out of the 150 students in the second year, only a few had the time to participate. However, with more notice and a better strategy for dispersing the questionnaire more data could have been collected.

I would also like to have collected more information from the questionnaire to give the project a wider perspective. Firstly by adding more recorded stress levels for periods of low stress (perhaps the end of First Term or very beginning of Forth Term) I could get a better understanding of the lower end of the spectrum of stress. This would also have the added benefit of broadening the study to look into comparisons involving the first year.

Furthermore, I feel that to include the time period that would directly follow Pre-Mocks, namely Pre-IB exams would be an interesting period to add. Interesting because, as one can see from the graph of medians above, the stress was on a general decline as the students moved through forth term which would surely be disrupted by the coming of the IB exam period.

Lastly, I would take into account other factors contributing to stress. I found that my concentration of gender, to some extent, proved a weakness of the project in its ambiguity in the statistics and the disproof in the Chi-Squared testing. I could look into factors such as whether or not a student applied to the US (deadlines for US come in the period 'End of third Term'), the nationality of the student or the service they are in (for instance, ILBs (Inshore Lifeboat Service) have a lot of extra hours in August Period).

Although I feel my study to have drawn significant conclusions, with the above mentioned additions I feel it could have been improved.