Psychology, Units 3 and 4, requires a lot of prior knowledge and a lot of preparation if you wish to perform well. Many of you have completed Units 1 and 2, which is a good start and those of you who haven’t will need to complete some extra holiday homework to catch up.

Please see the list below of the things you MUST complete prior to returning in 2012:

1. Focus on Research - The stammering brain
2. Focus on Research - The brain at work
3. Research Methods Worksheets (those that weren’t complete during class time).
   - 3.1 Data Collection
   - 3.2 Types of Data
   - 3.3 Descriptive Statistics
   - 3.5 Frequency Distribution Curves
   - 3.6 Correlation
   - 4.1 Inferential Statistics
4. Complete “Brain Anatomy”

The following also needs to be completed by those students who didn’t do Units 1 and 2 Psychology:
1. Read the first section of your text books titled “For Students New to Psychology”.
2. Read Chapter 1 - Research Methods and complete Activity 1.1, 1.2, 1.5, 1.6, 1.8, 1.9, 1.11 and chapter review Multiple Choice questions and Short Answer Questions.

This is just the beginning so be prepared to work hard and efficiently when you return in 2012.

Have a great Christmas, a great break and return refreshed for you year to shine!

From your Psychology Teachers
Focus on Research

The stammering brain

For the first time, researchers have spotted differences in brain anatomy between stutterers and non-stutterers. The findings could help predict who is at risk for stuttering and perhaps lead to individually tailored treatments.

A research team, led by neurologist Anne Foundas at Tulane University Health Science Centre in New Orleans, Louisiana, used magnetic resonance imaging (MRI) to measure the volume of speech-related brain regions in 13 men and three women who had stuttered since childhood. They also measured a control group of 16, matched for sex (male stutterers outnumber females four to one) and handedness (stutterers are twice as likely to be lefties), as well as age and education. The researchers then compared two brain areas associated with speech and language – Broca’s area in the frontal lobe, and parts of Wernicke’s area in the temporal lobe.

The stutterers tended to have a much larger and more symmetric planum temporale, a region in Wernicke’s area associated with language and music processing. Ordinarily, this feature juts out more on the left side in right-handers. Stutterers also had more folds, or gyri, on the brain surface in Broca’s area, which Foundas suggests could disrupt connections between auditory and motor areas of the brain. ‘There was not one distinct feature across all stutterers,’ Foundas says. Rather, each had an average of four unusual features, while non-stutterers averaged only one. The study ‘very conclusively’ shows anatomic differences between stutterers and non-stutterers, says speech pathologist Roger Ingham of the University of California, Santa Barbara. He says it provides ‘an important link’ in a growing body of biological evidence on stuttering.

Source: Agrawal (2001).

Questions
1. What is the name of the type of research design employed by the researchers?
2. What differences were found in Broca’s area and Wernicke’s area between stutterers and non-stutterers?
3. How could a greater surface area on Broca’s area disrupt speech function?
4. What was the researchers’ conclusion?
5. What are the implications of this research for those who stutter?

Focus on Research

The brain at work

According to folklore, a person with a large head and a high forehead is likely to be intelligent. But brain efficiency has as much to do with intelligence as brain size does (Gazzaniga, 1995).

Psychologist Richard J. Haier and his colleagues found that the brains of people who perform well on mental tests consume less energy than those of poor performers (Haier et al., 1988). Haier measured brain activity with a PET scan. You will recall that a PET scan records the amount of glucose (sugar) used by brain cells. The harder neurons work, the more glucose they use. By using radioactively labelled glucose, it is possible to record an image of how hard the brain is working (see Figure 2.20 on the opposite page).

What did PET scans reveal when subjects took a difficult reasoning test? Surprisingly, the brains of those who scored lowest on the test used the most glucose. Although we might assume that smart brains are hardworking brains, the reverse appears to be true. High performing participants actually used less energy than poor performers did. Haier believes this shows that intelligence is related to brain efficiency: less efficient brains work harder and still accomplish less. We’ve all had days like that!

Questions
1. This research examined the relationship between two variables. What were the variables?
2. Why was a PET scan used?
3. Why was the finding so surprising?
4. What did the researcher conclude?
5. What further research would you be interested in conducting in this field? Why?

Figure 2.20 PET scans are used to map brain activity rather than brain structure. PET scans provide colour-coded maps that show areas of high activity in the brain over time. The red and green areas indicate high activity in brain areas when a participant worked on a verbal short-term memory task.
3 Collecting and presenting data

3.1 Data collection

In their search for accurate information, psychologists gather evidence in many ways. Sometimes they use experimental techniques, but sometimes they use other, non-experimental, techniques.

Case studies
A case study is an in-depth or detailed study on a single person or small group of people. It allows researchers to gain very specific information about a particular occurrence or phenomenon. However, case studies are not an ideal research technique, as they can be time-consuming to undertake and it is difficult to generalise findings from one person to the wider population.

Twins provide an excellent basis for case study research in psychology. When investigating the impact of nature versus nurture, identical twins provide fascinating insight into the debate. For example, case studies of twins who are reared apart, through circumstances such as adoption, allow insight into the impact of the environment on a child's development.

Case studies are often conducted by investigating a group of people over a period of time in what is known as a longitudinal study.

Observational studies
An observational study involves an individual observing another individual or a group of people in a natural environment, and recording observations about the behaviour they witness. The observer only records overt, observable behaviour. Observational studies are advantageous in that they eliminate the extraneous variable of artificiality; however, they rely upon an observer's interpretation of events. This means that the recordings are subject to observer bias, where the observer sees what they want or expect to see, and this may result in a biased representation of the behaviour. Observational studies are often cross-sectional studies, whereby a researcher seeks to investigate two or more samples of participants at the same point in time.

Self-reports
When individuals are asked to comment on their own thoughts, emotions and beliefs by answering a series of questions on a particular topic, this is known as a self-report. Self-reports allow researchers to collect subjective data that cannot be overtly seen or measured, and hence gain insight into the reasons behind behaviours. The use of self-reports can make it difficult to compare data between participants due to their subjective nature.

There are many different types of self-reports, including surveys and questionnaires, where participants respond to a series of verbal or written questions. These questions can be open-ended (where participants are free to comment without limitation) or close-ended (where participants may choose an answer from alternatives or are restricted in their choices). A rating scale involves individuals choosing the statement or the rating that best describes their opinion or attitude on a particular topic; this is a close-ended format. A common form of rating scale is the Likert scale, in which participants are asked to choose a response to a statement on a scale from 'strongly agree' to 'strongly disagree'.

Interviews are another way of collecting self-report data; these involve face-to-face or telephone contact in which questions are asked and answered. Interviews may be structured (asking a planned series of questions) or unstructured (conversation-like and open to change). Interviews are not very time-efficient because the execution of the interview and subsequent collation of data can take a long time. However, they are an excellent way to gain detailed responses that can be explored in greater depth.

Brain imaging and recording technologies
Brain imaging and recording technologies are scientific technologies that involve gaining structural or functional images of an active brain. Brain imaging devices include (for example) CT scans or MRIs, which take X-ray images of the brain on multiple axes to look at the structure of the brain; or fMRIs, which allow researchers to observe an active brain by measuring changes in blood-oxygen levels, to identify the areas that are most active when completing different tasks.

These technologies provide highly specific information about the brain and its functions; however, they are expensive to use and findings can be difficult to generalise to the wider population, as no two brains are exactly alike.
3.1 Check your understanding Data Collection

Explain which data-collection technique is being illustrated in each case, and provide one advantage and one disadvantage of each technique.

<table>
<thead>
<tr>
<th>Name:</th>
<th>Age:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Do you enjoy any of the following activities? (Circle all that apply.)
   - Cycling
   - Horse-riding
   - Aerobics
   - Dancing
   - Reading

a. What data-collection technique is identified?

b. Advantage of this form of data collection:

c. Disadvantage of this form of data collection:

2.

a. What data-collection technique is identified?

b. Advantage of this form of data collection:

c. Disadvantage of this form of data collection:

3.

a. What data-collection technique is identified?

b. Advantage of this form of data collection:

c. Disadvantage of this form of data collection:

4.

a. What data-collection technique is identified?

b. Advantage of this form of data collection:

c. Disadvantage of this form of data collection:
3.2 Types of data

Once the participants have been sampled and the experiment has been designed, the experimenter is ready to start the experimentation phase and gather data. Data are the information (observable facts) that psychologists systematically collect in experiments, studies and investigations. Another name for data is empirical evidence; that is, the information psychologists gain from direct observation and measurement. Examples of data range from people's attitudes about political issues to participants' results on an intelligence or personality test. Data are used by researchers as evidence to support their findings or to formulate predictions about future studies.

There are a number of different types of data.

Subjective vs objective data

Subjective data are data collected through observations of behaviour, or information based on participants' self-reports. Subjective data are often biased because they require personal information (such as attitudes or opinions) to be given and, because of this, subjective data can be difficult to statistically analyse. An example of subjective data would be data generated by someone observing the behaviour of children in a playground. If the observer sees a child throw a ball at another child, the observer might interpret this as aggressive. However, the child who threw the ball may have delayed motor abilities and may have hit the other child with the ball accidentally; so the action looked aggressive but it was in fact innocent. The data collected in such a situation is based solely on the observer's interpretation, and the facts of the situation are not known. The data is therefore subjective.

![Image of children playing]

**Figure 3.1** Data obtained by interpreting a child's behaviour in a playground is known as subjective data.

Objective data are data collected under controlled conditions and are easily measured and compared with other data. These types of data are often in numerical form and can be statistically analysed. An advantage of objective data is that it minimises many biases encountered in research. An example of a piece of objective data would be running speed, the height of a person or the number of siblings someone has.

Both of these data types have limitations. Subjective data can provide great insight into a person's opinions and beliefs, but researchers need to be aware that such data are difficult to compare with other data. If one person says on a depression scale that they are feeling '4 out of 10' and another person says they feel '6 out of 10', it cannot be assumed that the individual with the lower rating is the more depressed. Objective data, on the other hand, while very easy to compare, do not always provide reasoning behind the score because external factors are not taken into account. For example, in a 100-metre running race, Person A may record a faster time than Person B, and we would conclude from the objective data (time recorded) that Person A is faster. However, the objective data do not account for other factors that may have contributed to the result of the race, such as injury or exhaustion, or the type of footwear worn.

Qualitative vs quantitative data

Qualitative data are data that describe changes in the quality of behaviour, and are often expressed in words. Data such as this are difficult to categorise or statistically analyse because responses could take a wide variety of forms and are open to personal, observer or researcher biases. An example of qualitative data would be participants' descriptions of a film they had seen. Every participant would describe the film in a slightly different way, would have different ways of interpreting the plot, and would have their own unique feelings about and reactions to the film. Such information is difficult to quantify.

Quantitative data take a numerical or categorical form, and can be statistically analysed and readily measured and compared with other data. An example of quantitative data is the number of words recalled correctly from a list or a score on an intelligence test.

Qualitative data have many similarities to subjective data, as they are both opinion-based. Participants can be completely unrestricted in their responses and can provide great insight into why they feel a particular way. However, like subjective data, this is often difficult to summarise or compare with other data.

Quantitative data are similar to objective data in that researchers can easily draw conclusions from them and use them to make comparisons to other data. Quantitative data also share limitations with objective data, in that quantitative data restrict participants from providing explanations and leave little scope for participants to elaborate on their responses.
Check your understanding  Types of Data

1. State whether the types of data are objective or subjective and qualitative or quantitative.

<table>
<thead>
<tr>
<th>Types of data</th>
<th>Objective/Subjective</th>
<th>Qualitative/Quantitative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hair colour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of hours spent watching TV per day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What people see in an inkblot test</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Descriptions of why students like doing homework</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average height of students in a Year 10 class</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. You are interested in gathering the opinions of students at your school regarding compulsory wearing of uniforms. You don't want to restrict students' responses, so you decide to collect qualitative data.

   a. How could you collect this data to ensure that they are qualitative?

   b. What is one disadvantage of this type of data?

   c. The principal would like to be able to compare students' opinions easily, so she asks you to redo your study and collect quantitative data. How could you collect quantitative data on this topic?

   d. You present your quantitative results to the principal, who argues that although the data is quantitative, it is still subjective. How could that be?

   e. The principal decides to make school uniforms optional, but would still like to assess the students' preference for uniforms or casual dress. How could she gather objective data about this in the coming weeks?
3.3 Descriptive statistics

On their own, raw data are meaningless, because they have not been organised and hence are difficult to interpret. Raw data are organised using descriptive statistics. Descriptive statistics are used to summarise, organise and describe data obtained from research. This allows the data to be more easily interpreted.

Descriptive statistics include percentages, graphs and mathematical calculations such as measures of central tendency.

Percentages
A percentage illustrates the proportion of the sample that displays a particular behaviour; for example, 75 per cent of Year 12 students turn 18 in their final year of school, or 62 per cent of adolescents watch reality TV.

Using a percentage is a quick and effective way to compare the results of two different groups in a study. It is calculated by dividing the number of people that display a particular behaviour by the total number in the sample, and multiplying the result by 100.

Measures of central tendency
Measures of central tendency involve a calculation that shows how typical scores, or a majority of scores, fall in a data set. There are three measures of central tendency: mean, median and mode.

The mean is a commonly used measure whereby all of the scores in a data set are added together and then divided by the total number of pieces of data. The mean represents the average score in a data set. The mean score is an example of a sample statistic. Sample statistics are numbers that describe the behaviour or characteristics of a sample drawn from a larger population.

A limitation of using the mean is that it can be greatly influenced by a very large or very small score in the data set, known as an outlier. Outliers skew the representation of the data. For example, if you were considering the mean age of people in your Psychology class, the age of your teacher would be an outlier that could skew the results, as it would be higher than the average age of the students.

The median is the middle number in a data set. It is calculated by arranging all of the data from smallest to largest and then selecting the piece of data in the middle. The median is commonly used when reporting VCE results, as it is not affected by outliers in a data set. If there is an even number of pieces of data in a data set, the mean of the middle two numbers is the median.

The mode is the final measure of central tendency and reflects the most commonly occurring number within a data set. The mode can be useful in seeing which score occurs most often, but it can be an unreliable measure for small samples.

<table>
<thead>
<tr>
<th>Data set (scores on a test): 72, 73, 73, 78, 84, 85, 86, 90, 90, 90, 94, 96</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean = ( \frac{72+73+73+78+84+85+86+90+90+90+94+96}{12} )</td>
</tr>
<tr>
<td>= 84.25</td>
</tr>
<tr>
<td>Median = ( \frac{86+86}{2} )</td>
</tr>
<tr>
<td>= 85.5</td>
</tr>
<tr>
<td>Mode = 90</td>
</tr>
</tbody>
</table>

Figure 3.2 Calculating measures of central tendency

Spread of scores
Another way of describing data is by looking at how the data are spread. This is known as variability. One measure of a data set's variability is the range. The range of data can be calculated by subtracting the lowest score from the highest score.

Another measure of variability is standard deviation. Standard deviation explores variability of data by looking at how far each individual piece of data differs from the mean. A low standard deviation indicates that scores are clustered around the mean and hence there is low variability in that set of scores. A high standard deviation indicates that scores are spread out from the mean and hence there is high variability in that set of scores.

Using descriptive statistics
There are many other ways in which data can be described. The problem with descriptive statistics is that they only describe the data. For example, they can tell us which teaching method produced better scores on a test or whether chewing gum while studying produced higher scores on a memory task than not chewing gum, but they cannot tell us whether the difference between two scores is large enough to attribute to the independent variable or whether this difference occurred due to chance. In other words, descriptive statistics do not establish whether there is a cause-and-effect relationship between the variables.
3.3
Check your understanding Descriptive Statistics

1. Below is the number of points each of the 10 members of a basketball team scored in the final game of the season.

<table>
<thead>
<tr>
<th>Player no.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of points</td>
<td>21</td>
<td>14</td>
<td>7</td>
<td>7</td>
<td>6</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

a. What is the mean number of points scored by each player?

b. What is the median number of points scored by each player?

c. What is the mode for points scored by each player?

d. What do you believe is the best measure of central tendency to represent the point-scoring of this team? Why?

e. What percentage of the total goals did Player 1 score for her team (to the nearest whole number)?

f. Can we conclude that Player 1 is the team's best shooter? Explain your answer.

2. Sarah and Maeve are in two different Psychology classes at school, and they are discussing which class has done better on their recent assessment task. Both classes gained the same mean but achieved very different results. Their classmates' results are in the table below.

<table>
<thead>
<tr>
<th>Sarah's class</th>
<th>21</th>
<th>28</th>
<th>13</th>
<th>30</th>
<th>7</th>
<th>12</th>
<th>26</th>
<th>25</th>
<th>18</th>
<th>28</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maeve's class</td>
<td>26</td>
<td>23</td>
<td>24</td>
<td>26</td>
<td>22</td>
<td>20</td>
<td>24</td>
<td>19</td>
<td>21</td>
<td>22</td>
</tr>
</tbody>
</table>

a. Calculate the range of the scores in Sarah's class.

b. Calculate the range of the scores in Maeve's class.

c. How would you describe the variability of scores in both classes?

d. Can you conclude that one class has performed better than the other? Explain your answer.
3.5 Frequency distribution curves

A frequency distribution curve is a curve that shows the spread of a set of scores over equally-sized intervals.

A typical frequency distribution curve has a majority of scores placed around the mean, with tails at both ends representing a minority of very high or very low scores. Below is a typical bell-shaped curve that demonstrates the spread of scores for IQ. As you can see, a majority of the population has IQ scores between 90 and 110.

Bell-shaped curves can also be skewed. If there are more high scores than low scores in a data set, a frequency distribution curve will be negatively skewed. You may see a negatively skewed curve when plotting the results of giving Grade 6 students a Grade 4 maths test. If there are more low scores than high scores in a data set, a frequency distribution curve will be positively skewed. You may see a positively skewed curve when plotting the results of giving Year 11 Psychology students a university Psychology exam. It is the skew of the data in VCE subjects that helps administration to decide the scaling of each individual subject.
3.5 Frequency Distribution Curves

Check your understanding

1. Sketch each frequency distribution curve on the axes provided.
   a. A typical distribution curve with high variability
   b. A positively skewed curve

   c. A typical distribution curve
   d. A negatively skewed curve

   e. A bimodal distribution curve
   f. A typical distribution curve with low variability
3.6 Correlation

Some experiments ultimately seek to establish a cause-and-effect relationship between two variables; however, correlation studies simply seek to establish whether two variables are related at all. Note that correlation does not seek to imply causation.

Correlation is displayed visually, on a graph known as a scatterplot, and numerically, as a correlation co-efficient. A scatterplot is a graph that shows an individual dot for each piece of data. The correlation co-efficient is a number that describes the strength and direction of the correlation. One way to ascertain the correlation co-efficient is by analysing where all of the dots fall on a scatterplot.

Direction

A positive correlation occurs when both variables increase or decrease in relation to each other. This may be seen, for example, when investigating driver speed and number of car accidents if it is found that, as speed increases, so does the number of accidents. Positive correlation is expressed as a correlation co-efficient between 0 and 1.

A negative correlation occurs when, as one variable increases, the other one decreases, or, as one variable decreases, the other variable increases. This may be seen, for example, when investigating the relationship between exercise and weight, if it is found that weight decreases as exercise increases. Negative correlation is expressed as a correlation co-efficient between -1 and 0.

Strength

If the dots on a scatterplot can be joined to form a straight line, this is known as perfect correlation. This is as strong as a relationship between two variables can get. As such, if the line is in the positive direction, it is assigned the correlation co-efficient of 1; if the line is in the negative direction, it is assigned the correlation co-efficient of -1. A strong correlation may be seen if the dots are close to forming a line or are tightly bunched together around one line. Strong positive correlations may be expressed as 0.7 to 0.9, whereas strong negative correlations may be expressed as -0.7 to -0.9. As the relationship becomes weaker, the correlation co-efficient will approach zero, and the dots will get further apart. If there is no relationship between variables, this is known as zero correlation and is given the correlation co-efficient of 0; the dots in such a scatterplot would be randomly placed.
Check your understanding  

**Correlation**

1. The table shows a comparison between each AFL team's final position after round 16 in the 2010 season, and the average number of games played per player in each team throughout their football career, as at round 16 2010.

   a. Use these data to plot the correlation between the two variables.

<table>
<thead>
<tr>
<th>Club</th>
<th>Ladder position</th>
<th>Average number of games played per player (in career)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collingwood</td>
<td>1</td>
<td>96.6</td>
</tr>
<tr>
<td>Geelong</td>
<td>2</td>
<td>122.5</td>
</tr>
<tr>
<td>St Kilda</td>
<td>3</td>
<td>103.6</td>
</tr>
<tr>
<td>Fremantle</td>
<td>4</td>
<td>68.1</td>
</tr>
<tr>
<td>Western Bulldogs</td>
<td>5</td>
<td>107.8</td>
</tr>
<tr>
<td>Sydney</td>
<td>6</td>
<td>91.8</td>
</tr>
<tr>
<td>Hawthorn</td>
<td>7</td>
<td>84.7</td>
</tr>
<tr>
<td>Carlton</td>
<td>8</td>
<td>60.7</td>
</tr>
<tr>
<td>North Melbourne</td>
<td>9</td>
<td>57.7</td>
</tr>
<tr>
<td>Adelaide</td>
<td>10</td>
<td>87.5</td>
</tr>
<tr>
<td>Melbourne</td>
<td>11</td>
<td>63.8</td>
</tr>
<tr>
<td>Essendon</td>
<td>12</td>
<td>59.3</td>
</tr>
<tr>
<td>Brisbane</td>
<td>13</td>
<td>85.6</td>
</tr>
<tr>
<td>Port Adelaide</td>
<td>14</td>
<td>73.9</td>
</tr>
<tr>
<td>Richmond</td>
<td>15</td>
<td>54.3</td>
</tr>
<tr>
<td>West Coast</td>
<td>16</td>
<td>53.0</td>
</tr>
</tbody>
</table>


b. How would you describe the direction and strength of this correlation?

c. What is the problem with a situation such as a sporting ladder, where the most successful team has the lowest number (the top position) and the least successful team has the highest number (the bottom position)? Would the correlation look different if the most successful team 'scored' position 16 and the least successful team 'scored' position 1?
4.1 Inferential statistics

Typically, psychologists seek to discover general patterns of behaviour that apply widely to humans. For example, a researcher studying the effects of a new therapy on a small group of people suffering from depression would like to know if the therapy holds promise for all people with depression. Inferential statistics allow us to make inferences about the results of an experiment; to form conclusions and generalise findings; that is, to apply findings about the behaviour of small groups (samples) to the larger groups they represent (populations).

Experimenter use inferential statistics to determine whether or not the results of an experiment support the hypothesis. The researcher must also determine whether differences between results yielded by the experimental and control groups are due to manipulation of the IV, or to chance. For example, if students in Ms Perfect’s class outperformed students in Ms Lanati’s class, could we simply conclude that Ms Perfect is the better teacher? Inferential statistics allow us to determine whether other factors are involved.

Statistical significance refers to the significance of the difference between two scores; that is, whether we can attribute the results to the IV or to chance alone. Therefore, inferential statistics allow us to infer a cause-and-effect relationship between two variables; something that descriptive statistics do not allow.

### p-value

Before conducting an experiment, researchers set what is known as a p-value. A p-value is the level of probability that the results are due to chance alone, and determines statistical significance. In Psychology, it is typical to set a p-value at $p < 0.05$, which means that, for the results of a study to be statistically significant, the probability that the results are due to chance must be less than 5%.

![Diagram](Figure 4.1 Determining statistical significance)

When results are obtained, they must be tested for their statistical significance. Tests of significance include t-tests and chi-square tests. We will not investigate the tests here, but both allow researchers to determine the p-value for a particular set of results, and hence whether the results are statistically significant. If the p-value for the experiment is set at $p < 0.05$, the results of that experiment, when tested for significance, must be $p < 0.05$ in order for them to be deemed statistically significant.

If the results are found to be statistically significant, it is likely that the IV caused the change in the DV. This would support the experiment’s hypothesis, and conclusions and generalisations could be made from the study. If the p-value is greater than (>) 0.05, the results are not statistically significant, and the results are likely to be due to chance and not to the IV. Hence, the hypothesis is rejected and no conclusions can be drawn.

A p-value may be set lower (for example, at $p < 0.01$) for very important studies, such as when trialling medical drugs.
4.1 Check your understanding Inferential Statistics

For each experiment below, the p-value set at the beginning of the experiment was $p < 0.05$.

1. Experimenters conducted research investigating a link between frequency of meditation and length of sleep. A test of significance on the results was found to be $p < 0.05$.
   
   a. This means that the probability that the results occurred due to chance is:

   b. This means that (tick the appropriate endings to the sentence):

<table>
<thead>
<tr>
<th>the results are statistically significant</th>
<th>the results are not statistically significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>the independent variable has caused a change in the dependent variable</td>
<td>the independent variable has not caused a change in the dependent variable; chance factors have caused the change</td>
</tr>
<tr>
<td>a conclusion may be drawn</td>
<td>no conclusion can be drawn</td>
</tr>
</tbody>
</table>

2. Experimenters conducted research investigating a link between birth order and intelligence. A test of significance on the results revealed that $p > 0.05$.

   a. This means that the probability that the results occurred due to chance is:

   b. This means that (tick the appropriate endings to the sentence):

<table>
<thead>
<tr>
<th>the results are statistically significant</th>
<th>the results are not statistically significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>the independent variable has caused a change in the dependent variable</td>
<td>the independent variable has not caused a change in the dependent variable; chance factors have caused the change</td>
</tr>
<tr>
<td>a conclusion may be drawn</td>
<td>no conclusion can be drawn</td>
</tr>
</tbody>
</table>

3. Experimenters conducted research investigating the impact of driving lessons on driving test scores. A test of significance on the results showed that $p < 0.01$.

   a. This means that the probability that the results occurred due to chance is:

   b. This means that (tick the appropriate endings to the sentence):

<table>
<thead>
<tr>
<th>the results are statistically significant</th>
<th>the results are not statistically significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>the independent variable has caused a change in the dependent variable</td>
<td>the independent variable has not caused a change in the dependent variable; chance factors have caused the change</td>
</tr>
<tr>
<td>a conclusion may be drawn</td>
<td>no conclusion can be drawn</td>
</tr>
</tbody>
</table>
1. Shade and label all the “lobes” of the brain
2. Colour and label all the “cortices” of the brain
3. Identify Broca’s and Wernicke’s areas
4. On a separate piece of paper write the main functions of all the above areas (including the association areas of the lobes) and the Cerebral Cortex, Corpus Callosum and Cerebellum.