Internal assessment

Every IB Diploma Psychology student must submit one simple experimental study as part of the requirements for the course. This is marked by your teacher and moderated externally by an examiner. The mark for this piece of work makes up 20 per cent of your overall grade for your Diploma Psychology course. It is up to you to plan, carry out and then write up your experiment. The internal assessment (IA) is compulsory for both SL and HL students. The requirements for SL and HL students are the same.

The purpose of this section is to enable you to obtain the best marks possible.

The two most important things to remember are:

- your experiment needs to be ethical
- your experiment needs to be an actual experiment with only one **independent variable** (IV) that you have deliberately manipulated.

Making sure your study is ethical

For the experiment to be considered ethical, it must not cause any harm to anyone. This includes participants, researchers, bystanders, teachers/supervisors, moderators, and eventual readers. Harm can mean a number of different things such as: hurting, injuring, tormenting, teasing, torturing, traumatizing, impairing, wounding, mistreating, punishing, maltreating, misusing, abusing, molesting, damaging, or adversely affecting. It is important to understand that IB considers harm as psychological and emotional and not just in a physical sense. Your IA may well receive a mark of 0 if you do not take these ethical responsibilities seriously.

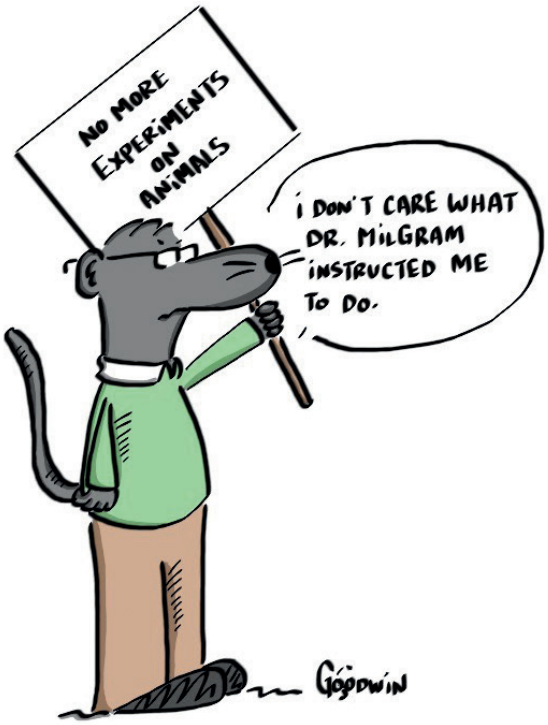
The following guidelines must be followed.

- Any experimental study that creates anxiety, stress, pain or discomfort for participants is not permitted.
- Experiments involving deception, conformity, obedience, or any other form of harm are not permitted.
- Any experiment that offends the sensitivities of the particular school, community, culture, or country is not permitted.
- Any experimental study that involves unjustified deception, involuntary participation or invasion of privacy, including the inappropriate use of information and communication technology (ICT), email and the internet, must be avoided. However, it should be noted:
    - there may be rare occasions when such infringements cannot be avoided, in which case the approval of other experienced psychologists should be sought before proceeding
    - **partial deception** may be allowed for some experiments where full knowledge of the experiment would fundamentally affect the outcome – such experiments are permissible provided they do no harm and participants

are fully debriefed at the end. Participants retain their right to withdraw their data at this point and this should be stated clearly in the design section.

- Any experiment involving conformity and obedience studies is not permitted under any circumstances.
- Consent must be explicitly gained from participants through the use of a consent form. **Implied consent** is not acceptable. This process should be clearly documented.
- All participants must be informed of the aims and objectives of the experiment – however, partial deception is allowed (see above).
- All participants must be informed before commencing the experimental study that they have the right to withdraw at any time. Pressure must not be placed on any individual participant to continue with the investigation.
- Young children (under 12 years) must not be used as participants as they cannot give **informed consent**.
- Experimental studies involving older children (from 12 years up to 16 years) need the written consent of parent(s) or guardian(s). Students must ensure that parents are fully informed about the implications for children who take part in such research. Where an experimental study is conducted with children in a school, the written consent of the teachers concerned must also be obtained. This process must be documented, although names should be removed from the documentation to guarantee **anonymity**.
- Participants must be debriefed and given the right to withdraw their own personal data and responses.
- Anonymity for each participant must be guaranteed even after the experiment has finished.
- Participants must be shown the results of the research and if reasonable deception was involved, the participants must have the deception explained and justified to them.
- You must not conduct research with any participant who is not in a fit state of mind and cannot respond freely and independently.
- If any participant shows stress or pain at any stage of an experimental study, the investigation must finish immediately, and the participant must be allowed to withdraw.
- Animals must not be used for the experimental study.
- All data collected must be kept in a confidential and responsible manner and not disclosed to any other person outside of the experimental work group.
- Data must not be used for purposes other than that agreed to by the participants.
- Teachers should be informed immediately if you suspect other groups or individual students are breaching guidelines. If you witness something that you consider to be a breach of ethical guidelines then it is your duty to report it.

- Experimental studies that are conducted online are subject to the same guidelines. Any data collected online must be deleted once the research is complete. Such data must not be used for any purpose other than the conduct of the experimental study.



Making sure your study is an experiment

You should decide on your choice of topic. The following points will serve as a guide.

- The topic can be from any area of psychology.
- The theory or model on which your investigation is based is known as the **base-study**. It must be psychological in nature and must have appeared in a **peer-reviewed** publication.
- The link between the study or model used and your aims and objectives for your experiment must be made clear.
- The relevance of the experiment, that is, the reason for carrying out the experiment, must be made clear.

You are only allowed to use the experimental method in your IA. The experimental method looks for a relationship between two variables to support a **hypothesis** of **cause-and-effect**.

The two variables are:

- the independent variable (IV): the variable manipulated by the experimenters
- the **dependent variable** (DV): the variable that is measured

All other factors that could affect the DV should be controlled as far as possible. The study you are using as a base for your IA may guide you towards appropriate controls, but it may be adapted to suit the context in which you and your group are working.

Approaches to the independent variable

It is important that there is only one IV in the experiment. You should use your base-study to help guide how you manipulate the IV. You may wish to conduct a simple experiment, in which case the IV should only have two conditions. However, you should remember that your base-study may have several conditions for the IV. You may choose to replicate all the conditions or choose to simplify the experiment and select two conditions for your own experiment. Furthermore, details of how the IV is **operationalized** may also differ from the base-study.

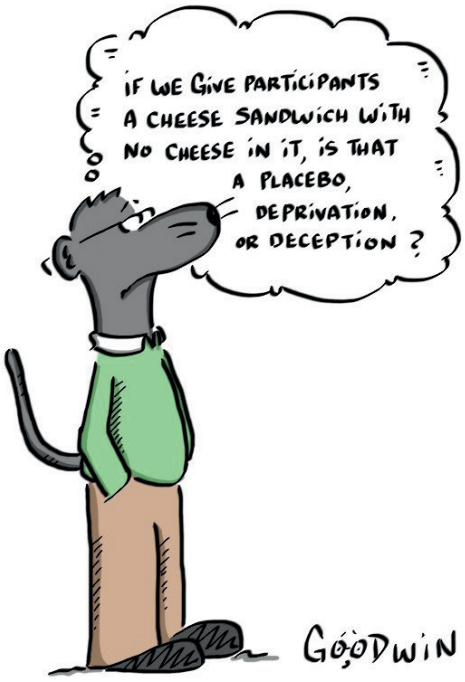
For example, you may choose different words for a word list, or a different type of music for the study to suit your own circumstances, provided the link between the study and your own experiment remains clear.

Variables that are based on pre-existing characteristics of the participants are not suitable for the IA. These include, but are not limited to:

- **gender** (e.g. comparing the results of female and male participants)
- age (e.g. comparing the performance of 10-year-old participants and 18-year-old participants)
- native language (e.g. comparing native French speakers and native Mandarin speakers)
- **culture** (e.g. comparing the results of Afro-Caribbean participants and Swedish participants)
- education level (e.g. comparing the performance of students in grade 5 and grade 11)
- **socioeconomic** status (e.g. poor participants and rich participants)
- handedness (e.g. left-handed and right-handed participants).

If you use any of these as an IV, your experiment will not meet IB requirements and will not earn marks.

In addition, experiments involving the following elements are not acceptable and will not earn marks: **placebos**, ingestion or inhalation (e.g. food, drink, smoking, drugs), or deprivation (e.g. sleep, food).



Approaches to the dependent variable

The DV is the variable being measured. There are a number of approaches you can take.

You can replicate the operationalization of the DV used in the study on which you base your experiment.

You can adapt the operationalization of the DV to suit your own circumstances or resources. For example, you could alter the number of measurements taken, the type of measurements taken or use a different DV altogether. However, you must make the link between your base-study and your own experiment clear and be able to justify your alterations.

In addition, you may choose to alter the method of the base-study in a variety of different ways to better suit the context in which you are working.

For example, you may alter:

- the type of participants (as the most feasible participants for a school experiment would be other students)
- the number of participants involved (the base-study may have had access to participant numbers that are impossible to replicate in a school)
- the design (the base-study may have used a **matched pairs** design that cannot be replicated in school as there are too few participants to choose from, making matching problematic).

The marking criteria are designed to allow for a degree of flexibility and full marks can be achieved if the variations outlined above are applied.

Group work

You are required to work as part of a group to plan and conduct the investigation. You cannot work alone. Your research method, subjects and materials, as well as the operationalization of the IVs and DVs, will be the result of the group working together. Once the data has been generated, the collaboration is complete and your group should disperse. Each member of the group must write up the report independently of other group members. The data should be analysed and conclusions drawn independently.

You should not discuss the results with other members of the group. Likewise, your evaluation should be carried out independently. While there will be some similarities (as you will be drawing on the same data as other members of the group), it is important that you remember the expectations for **academic honesty** and the consequences of academic malpractice.

Your group must consist of a minimum of two students and a maximum of four students. SL and HL students may work together. You may also choose to collaborate virtually with another student or students in other IB World Schools. Alternatively, you may work with another student studying a psychology course from another curriculum provider (such as A-levels or AP), or a student studying a related course such as an experimental science or social science course.

Assessing group work

Collaboration represents an authentic way of working in the field of research, but as it is difficult to assess a team member's contribution completely objectively, the reporting of the method is awarded fewer marks than the other sections. However, your evaluation of the method (including protocols, participants and materials) is where a clear understanding of the exploration will be rewarded, as this is carried out independently of the group. It is expected that you will point out the strengths as well as the limitations of the method as part of your evaluation – a good design will generate as much opportunity for comment as a less effective design, but it is anticipated that you will only gain the higher marks for the evaluation if you are fully engaged in the thinking behind the design of the investigation.

Make sure you fully understand the difference between collaboration and collusion before you begin.

Organization and presentation

The following details should be stated on the front page of the IA:

- title of the investigation
- IB candidate code (alphanumeric, e.g. XYZ123)
- IB candidate code for all the other group members
- date, month and year of submission
- number of words.

Your final report should be between 1800 and 2200 words in length and consist of the following components. You should use these as subheadings to subdivide your work:

- Introduction
- Exploration
- Analysis
- Evaluation
- References

The references are not assessed but must be included to meet the requirements of honest academic practice. Not attributing the ideas of others included in your work amounts to academic misconduct. If academic misconduct is discovered in any work you submit for IB assessment, you will not be awarded a grade for the subject.

It should be noted:

- you are not expected to define existing ideas or create new knowledge
- you are expected to research and represent existing definitions and the work of published academics.

Your reference section should reflect this.

The appendices do not count towards the word count but should be kept to a minimum. Appendices should include:

- raw data tables
- print-outs of calculations and/or results from statistics software or calculations made for analytical purposes
- consent form pro forma (unfilled)
- copy of standardized instructions and debriefing notes
- supplementary materials.

How to write an internal assessment

The following section is divided into the subheadings you should you use for your IA.

Introduction

In this section you have to:

- clearly state the aim of your investigation
- explain the relevance of the aim – why it is important
- explain the theory or model on which your investigation is based

- describe the link between the base-study or model and your investigation and explain why it is important
- clearly state the IVs and DVs
- clearly operationalize the **null** or **research hypotheses**.

Suggested word count: 600 words

The introduction should contain the academic background to the study. It should clearly show how your investigation is linked to the original base-study/theory. You must explain the base-study in depth. Explain the aim, method, results, and conclusion. The aim can be defined as the overall research goal (usually the research question). It does not need to be copied from the original study, you can use your own words. The method can be defined as what happened in the study. The results can be defined as exactly what was found in terms of their data. The conclusions can be defined as the broader meaning that comes from the results.

Example paragraph showing how to explain a base-study:

Loftus and Palmer (1974) aimed to show that eyewitnesses do not accurately 'replay' what they saw. Instead they reconstruct events based on their schemas or simplified mental representations. Loftus and Palmer aimed to show that participants' perceptions of a car's speed could be manipulated by leading questions. An independent measures laboratory experiment was conducted, with 45 undergraduate students being presented with seven film clips of traffic accidents. The experiment's IV was a key verb that took five conditions in the question: 'About how fast were the cars going when they smashed into each other?' 'Smashed' was substituted with 'collided', 'bumped', 'contacted' and 'hit'. The mean speed associated with 'smashed' was 40.8 mph while the mean for 'hit' was 31.8 mph. Loftus and Palmer (1974) concluded that eyewitness testimony can be manipulated by using different words in a leading question.

The aim of the study is clearly stated.

The aims are statements of what the research tries to show. Do not use the word 'investigate' when stating the aim because the IA is an investigation. You should state the aim precisely, so use words such as measure, discover, explain and evaluate. You can also use the aim of the IA in the title. The aim should include the target population.

Example of an aim being clearly stated:

Aim: To measure the effect of leading verbs (IV) on speed perceptions (DV) on international high school students.

The experimental and null hypotheses must be appropriately stated and fully operationalized. The prediction made in the experimental hypothesis is justified by your explanation of the original base-study/theory.

The hypothesis is a statement that predicts the experiment's outcome. An operationalized hypothesis clearly contains the IV and shows the effect on the DV. There should be an experimental hypothesis (H1) and a null hypothesis (H0). The null hypothesis predicts that the IV will have no effect on the DV. The experimental hypothesis predicts that there will be an effect. You should clearly state what this effect

will be, and indicate how it will be observed. Based on the results of the experiment, one hypothesis will be rejected. The hypothesis should follow logically from previous research.

Examples of experimental and null hypotheses:

H1: Participants exposed to the leading verb 'smash' when asked to estimate the speed of a car crash will have significantly higher speed estimations than participants who are exposed to the verb 'hit' when asked to estimate the speed of a car crash.

H0: Participants exposed to the leading verb 'smash' when asked to estimate the speed of a car crash will have no significant difference in their speed estimation than participants who are exposed to the verb 'hit' when asked to estimate the speed of a car crash.

H1: Participants exposed to a more emotionally intense verb (smash) will have significantly higher speed perceptions (measured in mph) than participants who were exposed to a less emotionally intense verb (hit) when asked to estimate the speed of a car on a video.

H0: Participants exposed to a more emotionally intense verb (smash) will not have significantly higher speed perceptions (measured in mph) than participants who were exposed to a less emotionally intense verb (hit) when asked to estimate the speed of a car on a video.

Exploration

In this section you have to:

- state and explain the research design
- state and explain the **sampling technique**
- describe the sample and explain why they were chosen
- state the variables that you controlled (the **controlled** variables) and explain why they were controlled
- state and explain why you chose the materials you did.

State and explain the research design

Experimental designs are usually either:

- **repeated measures** (the same participants experience the IV's conditions); or
- **independent measures** (different participants experience the IV's conditions).

'Explain' means to give reasons for using a particular design and how it was used in your investigation.

For example:

Repeated measures are used because they require fewer participants, and variables such as participants' intelligence can be controlled in each condition.

Independent measures avoid **demand characteristics**, such as participants guessing what the experiment is trying to find out and then not responding naturally.

Example paragraph:

> *Independent measures were used to control demand characteristics. Participants would probably guess the nature of the study if they were exposed to both verbs and so their responses would be unnatural. We gathered the participants in a room and asked them to draw pieces of paper from a hat labelled with letters A or B.*

State and explain the sampling technique

Sampling means choosing participants from the wider population and this section requires you to describe how and why you chose the participants.

There are three main types of sampling.

Purposive sampling: targets a particular group of people who would make good study participants because of their characteristics. 'Appropriate' characteristics would depend on the aim of the study.

Example:

> *We chose purposive sampling because the experiment required a good command of English. We deliberately approached good English speakers who we knew because having some participants with native English skills and others who have English as a second or third language would make the results less reliable.*

Opportunity sampling: where members of a target population are asked to take part just because they are available. In this situation, you ask possible participants that you see in the corridor or in lessons. This is sometimes called convenience sampling.

Example:

> *We chose an opportunity sampling method because it is quick and convenient and because we needed the full agreement of a teacher in advance to use their classes for our experiment. We approached a supportive teacher and agreed in advance to use their lesson time for our experiment. We used 22 participants because this was the class size.*

Random sampling: each member of a target population has the same chance of being sampled. In this situation, you write each name on a separate piece of paper and put the names into a container and then pull out the required number of participants. Do not use the phrase 'random selection' as it is not a suitable way to describe this process.

Example:

> *We chose a random sampling method to achieve an unbiased sample. We placed every name from our grade level onto a piece of paper and then put them in a hat and pulled out 20 names.*

Describe the sample and explain why they were chosen

The sample refers to the participants who will take part in the experiment. You need to describe the group in terms of:

- age range
- gender ratio
- nationality
- language proficiency
- whether they are psychology students or not.

These characteristics can be collected when giving out the consent forms. The potential participants could be asked to answer questions relating to their personal characteristics.

State how you allocated your participants to the groups

Example:

> *We put the participants' names in a hat and then pulled them out. In this way we randomly allocated them to each condition before the experiment began.*

State the relevant characteristics of the sample and explain why they are important

Example:

> *Fifteen out of our 20 participants were fluent in English or considered it their first language. However, five stated English was their second language. This is relevant because the investigation was conducted in English.*

State the controlled variables and explain why they were controlled

The controlled variables are not the variables you are interested in. However, they have to be held constant so the experimenter can focus on the IV and DV. You can list the controlled variables and, next to each, explain why you considered it a variable you needed to control and then state how you controlled it.

For example:

> *Pre-existing knowledge of IB DP Psychology: this is a variable that needs to be controlled because knowing the outcome or the background to the investigation may impact how a participant behaves and responds. We controlled for this variable by screening potential participants and asking them on the consent form if they had studied IB DP Psychology or had a sibling who had done so. Any potential participant who answered in the affirmative was not asked to participate.*

Age: this is a variable that needs to be controlled because the task in the investigation is cognitive in nature and cognitive development is linked to age. We controlled for this variable by only choosing students in Grades 11 and 12. We also asked for their age on the consent form and excluded anyone who was below the age of 16.

State and explain why you chose the materials you did

Materials refers to any object or apparatus you used to conduct your investigation. You can list them and provide an explanation next to each.

Example:

Clock: we used a clock to make sure the responses were timed and kept consistent between the two groups.

Pens: we provided pens to make sure they were kept constant between each group because the colour and type of pen may influence the participants' perception of the task they were asked to do.

Quiet room: we found a quiet room in the school because we needed to isolate the participants from intruding noise as this would distract them from the task they were asked to do.

Analysis

In this section you have to:

- state and explain the use of **descriptive** and **inferential statistics**
- present a clear and accurate graph that addresses the hypothesis
- interpret the statistical findings in a way that links them to the hypothesis.

Your analysis section should not include any raw data of any kind. Usually if you can see any individual participant scores then this can be considered raw data. All raw data should be available in an appendix. You can make reference to it in the Analysis section by labelling the place where you have put it (e.g. Appendices I) with Roman numerals.

The data collected should be appropriately displayed.

This means you use appropriate headings for each section of your results.

You need one graph with an appropriate title and one descriptive results table with an appropriate title.

Your analysis section should be further subdivided with the following titles: 'Descriptive statistics' and 'Inferential statistics'. Descriptive statistics describe a data set without drawing any inferences or conclusions about what is being described. Inferential statistics draw conclusions or inferences regarding to what extent the independent variable caused a change in the dependent variable.

The graph of results must be accurate, clear and directly relevant to the hypotheses of the study. Make sure that the graph has a title, a legend (a key), and a clear label for each axis. They should be simple representations of the results (descriptive), not the raw data.

The graph should show whether the experiment's DV is affected by the change in the IV. This could be as simple as showing a bar chart representing the mean of IV1 and the mean of IV2. It is often better to draw the graph by hand (with a pencil and ruler), scan it and paste it into the report because computer-generated graphs sometimes show too much or inappropriate information. Good graphs are clear and simple.

In order to make sure that the graph is clear you should:

- make it large
- give it a title, and include (N = ...) after the title to show the number of participants
- give it a border
- label the axes (include units)
- label the data either on the graph or with a key (legend)
- show the measure of central tendency and the measure of dispersion, if possible.

The data should be analysed in terms of descriptive statistics to highlight the **variability** and spread of the data.

Your results section must show whether the IV caused a change in the DV.

Your descriptive results should usually involve one measure of **central tendency** and one measure of **dispersion**. These should be applied to the data and their use explained. A common mistake is to calculate more than one measure of central tendency (mean, median, mode) and more than one measure of dispersion averages (range, standard deviation, variance, interquartile range). Use one of each.

A measure of central tendency shows the most likely, the most probable, the typical piece, or the average piece of data. Choose from the mean, median, or mode.

Use the mean to describe the typical, most likely, piece of data. If there are extreme outliers, (unusually high or low pieces of data) the mean will be distorted. As a result, it does not describe the typical data. If there are outliers, use the median.

If the data is not **continuous**, use the mode. If a group includes five girls and 15 boys, the most likely gender is male. It would not make sense to say that the typical gender is 0.75 male.

A measure of dispersion shows how varied the group of data is or how dispersed the data is from the normal or central data. The actual measure used depends on the data set you have collected.

Use the standard deviation if the data is continuous and the data set is **normally distributed** and use the interquartile range if the data is skewed.

Make sure that you include information on what the statistics are describing. For example, the mean speed is not 35.5, it is 35.5 miles per hour.

Examples:

> *The low value indicates that the data tends to be very close to the mean, suggesting there is a great deal of similarity in the data set.*
>
> *The high standard deviation indicates the data is spread out over a large range of values, suggesting there is less similarity in the data set.*

The median and interquartile range go together because they both ignore outliers. Mean and standard deviation go together because standard deviation measures the spread from the mean.

Results

You should put the results in a table showing the values. You should explain what you see in the table. For example:

> *The median estimate of speed for the question using 'smashed' was XX mph, while the median estimate of speed for the question using 'hit' was XX mph. The standard deviation of the data set associated with 'smashed' was XX mph. The standard deviation of the data set associated with 'hit' was XX mph.*

Inferential statistics are used to draw conclusions about the significance of the data generated in terms of supporting a hypothesis. Cause and effect should be treated with caution and conclusions should be tentative.

Social scientists need to know if the difference seen in the DV data sets is large enough to be the result of them manipulating the IV. If it is, they can be confident the manipulation of the IV caused the effect on the DV and their hypothesis has been supported. In statistical terms, they need to know whether the difference between the two conditions is significant enough. Therefore a statistical test needs to be applied to the data.

In summary, inferential statistics help answer the question: To what extent are we confident that the IV caused the DV to change, and that the DV did not change by chance?

You need to choose an appropriate inferential statistical test and explicitly justify why you have chosen it. There are two questions that need to be asked before a statistical test can be chosen:

Which design was used (repeated measures or independent measures)?

Is the data nominal, ordinal, or interval/ratio?

Nominal data

Nominal data is where the values/observations can be given a number. The numbers are simply labels. For example, in a data set, males could be coded as 0 and females as 1. The marital status of an individual could be coded as Y if married and N if single. Where people are required to estimate speed of cars they could be asked: 'Are they going fast or slow?'. Participants' responses could be coded 'f' for fast or 's' for slow.

Ordinal data

Ordinal data is where the values or observations can be put in order. For example, asking people to estimate the speed of cars on a scale of one to ten (ten being the fastest). In this way, the data can be ranked (placed in order). In ordinal data, the order is important (e.g. large to small; slow to fast) but the difference between the values is not because there is no standardized way of measuring the difference.

Interval data

Interval data is where the values/observations can be put in order and the difference (or interval) between the values is standardized and is the same. Miles per hour (mph) and temperature (Celsius) are examples of interval data. They are standardized measuring scales that are recognised throughout the world.

Choosing the correct inferential statistical test

	Choosing a statistical test	
	Independent measures design	**Repeated measures or matched pairs design**
Nominal data	Chi squared test	Sign test
Ordinal data	Mann–Whitney U Test	Wilcoxon signed-rank test
Interval or ratio data	Unrelated t-test	Related t-test

You then need to make sure the results of the inferential statistical test are accurately stated. Each statistical test produces different values. It is important that you include all of the values. For example, Wilcoxon signed-rank tests produce an N value, a critical value and an observed value.

An example showing how to justify and explain the use of an inferential statistical test:

I used a repeated measures design and my data was at least ordinal status. Therefore, the appropriate statistical test to use was the Wilcoxon signed-rank test. All calculations can be found in Appendix III.

The observed value (T) was calculated to be 0 because none of the paired scores had a negative value when the differences were subtracted.

The critical value was calculated to be 3 for a one tailed hypothesis at the 0.005 level of significance when N= 10 (Wilcoxon and Wilcox, 1964). N is the number of paired scores used.

T must be equal or less than the critical value for the results to be considered significant. Therefore, my results can be considered to be highly significant.

You then need to state whether the null hypothesis has been accepted or rejected appropriately according to the results of the statistical test and make your statement of statistical significance appropriate and clear. You must include a sentence where you accept or reject the null hypothesis based on the results of the test.

An example showing how to interpret the statistical findings in a way that links them to the hypothesis:

Statement of significance: The difference between condition A and condition B is significant at the 0.05 level of significance when N=10. I can reject my null hypothesis and accept my experimental hypothesis.

You should never use the words 'proof' as your conclusions are only tentative. Your results will either help support the hypothesis or not.

Evaluation

In this section you have to:

- discuss your findings with reference to the background theory or model
- discuss strengths and limitations of the design, sample, and procedure, explain them and make them relevant to the investigation
- explain and justify modifications that are explicitly linked to the limitations of your investigation.

Your evaluation of the experiment should focus on:

- the limitations of the method – those factors that are likely to have had an influence on the outcome of the experiment but could not have been avoided (human error or accidents and omissions that could easily have been avoided with a little foresight and planning are not acceptable as limitations)
- suggestions for improving the method to generate more data or more effective data in order to arrive at a firmer conclusion. These may be based on the limitations identified or proposed on the basis of a fresh consideration of the experimental design.

You can divide your evaluation section into four subsections. You can use these subheadings:

- Discussion with reference to the background theory
- Strengths
- Limitations
- Suggested modifications

Discussion with reference to the background theory

You need to discuss your findings in the context of the base-study. You should include a statement about whether the results from your experiment support or refute the study. Repeat the descriptive results. Write the same sentence that you used below the graph. State how the results support or refute the experimental hypothesis. Repeat your statement of significance.

Strengths

Strengths of the design need to be clearly stated and explained. Even if your results are non-significant, it is likely that your descriptive results were generally as expected. You could divide your strengths into design, sample, and procedure, and say one strength for each.

Limitations

Limitations of the design need to be clearly stated and explained. You must give at least three problems with the design and procedure and say why they occurred and why you consider them to be limitations. You could divide your weaknesses into design, sample, and procedure, and state one weakness for each. Only include factors that are likely to have had an influence on the outcome of the experiment but could not have been avoided. For example, do not claim the small sample size affected your results unless you make it clear the sample size could not have been avoided and you are absolutely certain, and can support it with evidence, that a larger group would have changed the result. Furthermore, do not claim any limitation that could easily have been remedied with better planning on your part. You may wish to discuss variables that may have affected the result, but the nature of the experimental method made it difficult to include.

Suggested modifications

For each limitation, explicitly state how you would modify the study in the future to eliminate those weaknesses. Assume you have slightly more resources at your disposal. You may wish to focus on the design element and include more variables to improve **ecological validity**. You may wish to introduce qualitative data techniques to reduce the limiting effects of using an experiment to investigate complex human behaviour. You need to explain why this modification is useful or essential for future study. Therefore, after each modification you can state: 'This modification is essential because…'