Empirical Research Activity (ERA)

Psychology is a science that uses the scientific method to observe, describe, predict and explain behaviour. As psychology students you too will rely on the scientific method to conduct experimental (empirical) research to examine questions of interest. After the research has been conducted, it is written up as an empirical research activity (ERA) following specific formatting guidelines. An ERA is structured as follows:

TITLE*
ABSTRACT
INTRODUCTION*
METHOD
• Participants
• Materials/Apparatus
• Procedure
RESULTS
DISCUSSION
REFERENCE LIST*
APPENDICES*

Those sections marked with * always start the top of a new page. The other sections begin with a heading below the previous section. The abstract and introduction DO NOT require headings. The abstract simply begins underneath the title and the introduction starts at the very top of the next page. The appendices and a design subsection of the Method section are the only non-compulsory parts of an ERA report.

THIRD PERSON
ERA’s must be written in the 3rd person. This means no personal pronouns such as “I” or “we”. For example, instead of “We found that...” you should write, “It was found that...”.

PAST TENSE
ERA’s refer to the experiment in the past tense. This means you describe what DID happen, not what will happen in the experiment. For example, instead of “The aim of this experiment is to...” you should write, “The aim of this experiment was to...”.

CORRECT IN-TEXT CITATION
Whenever you make reference to another author, theorist or piece of research you must acknowledge where the information came from following APA guidelines. For example, students with low attendance experience difficulty when completing SACs (Thompson, 2007). Clarke and Donohoe (2008) investigated the performance of Year 12 students by measuring the number of...

PLAIN AND SIMPLE LANGUAGE
ERA’s are scientific reports so no emotive or journalistic language should be used. Be objective! For example, “The results were terrific” vs “The results were striking”.

NO DEFINITIVE CONCLUSIONS
In science, nothing is proven. The hypothesis is either supported or rejected based on the results.
TITLE

The title should concisely summarise the main idea of the study in no more than 10-12 words. Do not use abbreviations in the title, and do not waste words by including redundant statements like “A study of...” or “An experimental investigation of...”. Titles often take the form “the effect of x (independent dependent variable) on y (dependent variable)”.

<table>
<thead>
<tr>
<th>GOOD EXAMPLES</th>
<th>BAD EXAMPLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The relationship between self-esteem and academic performance in primary school children</td>
<td></td>
</tr>
<tr>
<td>• The effect of self-esteem manipulation on school children’s academic performance</td>
<td></td>
</tr>
<tr>
<td>• A replication of the Prisoner’s Dilemma game—cooperation and competition</td>
<td></td>
</tr>
<tr>
<td>• Left brain functioning versus right brain functioning</td>
<td></td>
</tr>
<tr>
<td>• Recognition of emotions from facial expressions</td>
<td></td>
</tr>
<tr>
<td>• A study of issues relating to self-esteem at school</td>
<td></td>
</tr>
<tr>
<td>o not very informative</td>
<td></td>
</tr>
<tr>
<td>• School children’s performance on academic tests and how this is affected by self-esteem</td>
<td></td>
</tr>
<tr>
<td>o too long through wasting words – should be more concise</td>
<td></td>
</tr>
</tbody>
</table>

ABSTRACT

An abstract is a SINGLE PARAGRAPH (100-150 words) SUMMARISING the whole of the study. It is an overview of the study that enables the reader to understand the question being addressed, and what the conclusions were. Although the abstract appears at the beginning of the ERA, it should be written last. An abstract is NOT an introduction to the paper. Your aim is not to entice the reader to continue reading, but to simply inform them about what to expect.

• The abstract should provide a concise summary of every section of the ERA:
  1. A summary of the introduction including the aim and hypothesis.
  2. Characteristics of the participants.
  3. The experimental method including procedure (and names of tests used if applicable).
  4. The results (including statistical significance levels).
  5. A summary of the discussion (e.g., conclusions and implications).

<table>
<thead>
<tr>
<th>GOOD EXAMPLE</th>
<th>BAD EXAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current literature supports a correlation between self-esteem and academic performance, but has failed to clarify the causal direction of this relationship. In the present study, 82 children (40 male and 42 female) aged between 8 and 10 were randomly assigned to receive either a high or low self-esteem manipulation, using Berry’s (1994) “False-feedback” task. Subjects who received the high self-esteem manipulation were found to score significantly higher (p=0.02) on a subsequent academic assessment task than those in the low self-esteem group, suggesting a causal effect of self-esteem upon academic performance. The study however does not rule out the possibility of a bi-directional relationship, which should be investigated in future research.</td>
<td></td>
</tr>
<tr>
<td>We performed an experiment upon school children to see if their scores on an academic achievement test would be different depending on if they had just received an experimental manipulation designed to lower their self-esteem or to raise their self-esteem. We used a task devised by Berry to manipulate self-esteem, by giving half the children very poor feedback of their performance on a task and the other half very good feedback. The children then did an academic achievement test of short answer and multiple-choice questions for an hour. When we analysed the results, we then found that the group who had received the positive feedback performed better on the academic achievement test than the group that had received the negative feedback. This proves that you level of self-esteem causes your intelligence.</td>
<td></td>
</tr>
</tbody>
</table>
• The abstract provides a complete summary of the most important aspects of the paper, from the purpose of the study, to subjects and methods, results, conclusion and directions for future work.
• The abstract is a good length (110 words) and words are not wasted.
• Sentences are written concisely, and each sentence contains valuable information.
• It is written in the 3rd person (no personal pronouns such as "I" or "we") and refers to the experiment in the past tense (what DID happen, not what will happen, in the experiment).
• There is not mention of the problem under investigation.
• Not enough information about the subjects – at the very least you must report the number of subjects and who they were (adults, college students, primary school children, etc).
• A bit too much information on the method – don’t need quite that much detail.
• The conclusion is entirely unjustifiable.
• The abstract is longer than the previous one but contains much less information. It is not written concisely and words are wasted and statements are repeated unnecessarily.
• The abstract includes personal pronouns ("we").
• You must use a proper in-text citation, eg. “Berry (1994)”, if you cite other work in the abstract.

INTRODUCTION

“Introduction” is a bad term for this section, as it is much more than an ‘introduction’ as you would find in an essay. However, the introduction is written in prose and should flow in the way an essay does, that is, using sentences and paragraphs instead of “dot points”. You generally start the introduction quite broadly, and then narrow down until you reach your specific hypothesis.

Introduce the broad area of research
1. Describe the broad area of research (context) of your study and why it is important.

Establish the specific topic
2. Describe the specific topic your study will explore and why you have chosen it.

Discuss previous research of direct relevance
3. Describe previous research that has been done about the specific topic that has direct relevance to your study. Be sure to describe what the previous researchers DID (eg, brief summary of their procedure), what they FOUND (eg, brief summary of their descriptive statistics), and what they CONCLUDED (eg, brief summary of their findings).

Identify the aim
4. Specify the question that your study is trying to answer. Your study should be trying to achieve something new, to answer a question that is yet to be answered. This is where you identify how your research differs from the previous research. Be careful however that you do NOT repeat information here that will be in your ‘Method’ section.
   a. You may begin with “The aim of this research was to...”
State the hypothesis

5. In the final sentence or two you will clearly state what you expect to find in your study and WHY you expect it. That is, you MUST provide a clear justification for your hypothesis. This is usually based upon the previous research discussed earlier. You should state your hypothesis formally and clearly.
   a. You may begin with “It was hypothesis that…”

Example 1: Based upon the literature reviewed, it was hypothesised that participants exposed to a high self-esteem manipulation would perform better on an academic assessment task than those given a low self-esteem manipulation.

Example 2: The literature reviewed above suggests that participants who undergo a high self-esteem manipulation would perform better than those receiving a low self-esteem manipulation, on a subsequent academic assessment task.

METHOD

The method section describes in detail how your study was conducted, enabling the reader to assess the quality of the design and materials used. It must contain the full details of the study, so that the reader could replicate it. The method section is the only part of a report that contains specific subheadings you are expected to use. They are presented in the following order:

Participants

• Begin the method section with a description of the participants that took part in your study.
• Include information on major demographic characteristics such as gender, age, education level, etc.
• Ensure your sample is representative of the research population as outlined in the operationalised hypotheses. The validity of your study may be compromised if your sample is not representative, or the process by which participants were selected creates bias.
• Include information on how the participants were selected (e.g., random, stratified or opportunity sampling).

<table>
<thead>
<tr>
<th>GOOD EXAMPLE</th>
<th>BAD EXAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>80 undergraduate psychology students (30 male and 50 female) with an average age of 21 (age range of 19-52) participated for course credit were randomly selected. For 80% of participants, English was their first language, with the remaining participants having an equivalent level of English language proficiency. Two participants were unable to complete all tasks and their data was discarded.</td>
<td>The participants in the study were undergraduate psychology students. There were 80 of them and they ranged in age from 19 to 52, with the average age being 21 years old. 30 of the subjects were male, and 50 were female. They all participated as part of the assessment for their course. For 80% of participants...</td>
</tr>
<tr>
<td>• Contains participant information important for the study. E.g., a breakdown of language ability if your study investigates language.</td>
<td>• Wastes a lot of words but contains the same information as the good example (52 words, as apposed to only 23 words)</td>
</tr>
<tr>
<td>• Written extremely concisely, while still maintaining a flow between sentences.</td>
<td></td>
</tr>
</tbody>
</table>
Materials (or Apparatus)
- The next subheading in the method section describes the specific materials that were used in the study. This includes a description of any psychological tests or questionnaires used (often with a brief evaluation of the quality of the test/questionnaire), any computer programs and hardware used, etc. Note that you do not explain how your subjects used the materials, but simply list what materials were used in the study.
- For example, the materials section for the study ‘What effect does television violence have on children’s aggression?’ may be: *The stimuli consisted of 9 weapon pictures (3 guns, 3 clubs and 3 swords), 9 plant pictures (3 fruits, 3 trees and 3 flowers), 18 aggressive words and 36 non-aggressive words. These were presented as picture-word pairs (that is, prime-target pairs) on an Apple Macintosh computer.*

Procedure
- The procedure summarises each of the steps involved in running a participant through the experiment. The procedure is usually a little longer than the other sections. Remember that enough information must be given so the reader can replicate your study. This includes:
  a. The experimental design by which participants were allocated to the control group or experimental group (e.g., independent-groups design, matched-participants design, repeated measures design).
  b. The actual procedure the participants work through in the experiment. For example, summarising the instructions given to participants. You can be brief if the procedure is fairly simply (e.g., “All participants were given 20 minutes to complete the questionnaire individually in a quiet room”). However, it is recommended that instructions are written verbatim.
  c. Details of the way the participants were debriefed at the end of the experiment.
- Although the following information may not appear in the completed ERA, it must be considered when planning and conducting the experiment:
  a. The research method (e.g., experiment; case study; observation; survey; correlational study) and type of data (e.g., qualitative, quantitative, longitudinal, snap-shot).
  b. How to avoid effects from extraneous and confounding variables (e.g., placebo effects, single-blind procedure, experimenter effects, double-blind procedure).
  c. How to observe ethical principles (e.g., informed consent procedures, confidentiality, voluntary participation, withdrawal rights, deception, debrief).

RESULTS

You only report and describe results in the results section – you do NOT interpret the results here (leave that for the discussion section). Write very concisely in this section. Your sentences still need to be in prose rather than in point form, but all you are doing is directly reporting the relationship between the different parts of your idea. No raw data is included in the results section as it should be included in the appendix.

Introduce the data
1. Summarise the data collected (e.g., which descriptive statistics such as the measures of central tendency including mean, mode, median were used).
Present the data
2. Present the summarised data as a table or figure.
   a. Never show exactly the same data in both a table and figure. Most importantly, never include data in a table or figure without directly referring to it in the text of the results section.
   b. All graphs must have the axes clearly labelled (usually the independent variable along the horizontal x-axis and dependent variable along the vertical y-axis). The title for a table appears above, and the title for a figure (e.g., graph) appears below.

Discuss the data
3. Use descriptive statistics to summarise what the table or figure shows.

Investigate the data
4. State how inferential statistics were used in the statistical analysis.
   a. Remember that we cannot tell anything relevant about the difference between two numbers in a psychological experiment without comparing them statistically, so you must ALWAYS include your statistical evidence when presenting the results. For inferential statistics (t tests), include the direction (eg, higher/lower) of the effect in the text if appropriate (eg, group A higher than group B), and the likelihood probability (the ‘p-value’, eg p=0.64).

Results
The mean percentage of correctly recalled words was calculated and presented in Figure 1 below.

Figure 1: Percentage of correctly recalled words
As shown in Figure 1 above, the highest percentage of correctly recalled words were from the end of the list (words 11 – 15) with the mean number of words correctly recalled 80%, then the beginning of the list (words 1 – 5) at 45%, and the smallest percentage of words were correctly recalled from the middle of the list (words 6 – 10) at 25%.

The words were then divided into two groups, Group A (words 1 – 5 demonstrating primacy effect, and words 11 – 15 demonstrating recency effect) and Group B (words 6 – 10). The mean percentage of words correctly recalled in each group was calculated and it was determined that Group A had a significantly higher percentage of correctly recalled words than Group B. A test of significance was conducted to determine whether this difference occurred by chance or because of the independent variable. A t-test showed that the difference was statistically significant (p≤0.05).
DISCUSSION

The discussion is where you interpret your results and their implications for the previous research you reviewed in the introduction.

Was the hypothesis supported or rejected?

1. Write a statement (conclusion) indicating whether the results support or reject your hypothesis. This must be in the first sentence, and should state quite formally whether the main hypotheses presented at the end of the introduction are supported or rejected by the results. Note that findings of an experiment cannot prove the hypothesis—they merely support or do not support it.

How did the results support or reject the hypothesis?

2. Very briefly identify how the descriptive and inferential statistics supported or rejected the hypothesis.
   a. A statistically significant result is a result for which the probability that change to the DV happened by chance (extraneous variables and not the IV) is less than 5% (p<0.05). Sometimes it is possible to say that the probability is even lower than this. However, this does not mean that the hypothesis was proven. It is only possible to conclude that the hypothesis was (or was not) supported, albeit strongly.

How did your method and results differ from previous research?

3. Relate your findings back to the previous research from in the introduction, showing what your study has added to the broader body of knowledge. Compare methods and results.

Were there any limitations to your study (extraneous or confounding variables)?

4. Identify limitations/problems with the study, and suggest directions for future research. Could the study be improved in any way? Did anything go wrong or was something overlooked? Have the results brought up new questions that future research could investigate? You need to IDENTIFY the limitation, its possible IMPACT on your study, and how it could be AVOIDED in the future.

Can your results be generalised?

5. Conclude whether the results from the sample can be generalised to the research population.
   a. Consider the test of significance, the sample size, how representative the sample was of the research population, whether the extraneous variables were confounding variables, and the actual topic studied (physiological or psychological).
How does biology relate to psychology?
Coon (2006) claims, “all of your thoughts, feelings, and actions can be traced back to electrical impulses flashing through the spidery branches of nerve cells within the brain” (p.54). Nerve cells, also called neurons, carry information from the environment to the nervous system, and from the nervous system to muscles and organs (Westen et al, 2006). “The human nervous system has three main functions – to receive information, to process information and to coordinate a response to information” (Grivas & Carter, 2005, p. 237). Sub-divisions of the nervous system include the central nervous system – consisting of the brain and spinal cord – and the peripheral nervous system. Rawlings et al (1999) highlight the importance of the central nervous system describing it as “the command centre for all the complex commands, decisions and evaluations that determine behaviour” (p. 184). The peripheral nervous system is likewise essential to the functioning of the nervous system, as explained by Marieb (1998):

- The peripheral nervous system, composed primarily of nerves, is an essential part of any functional nervous system. Without it, the central nervous system would lack its rich bank of information about events of the external and internal environments (p. 490).

By understanding the biological basis of psychology we can investigate “how and to what extent can the environment modify the predetermined capacities of an organism” (Gazzaniga, 1973, p. 4). Weiten (1992) also considers the impact of heredity on behaviour to be an important consideration.

Example of a reference list for the references used above

Reference List


If you have additional information relevant to the study but too detailed or otherwise inappropriate to include in the body of the paper, you may include this in an appendix, starting the top of a new page after your reference list.

- For example, if you developed a new questionnaire for the experiment, you would mention that you did so in the method section and then might include the full questionnaire in an appendix at the end. As with tables and figures, you NEVER include material in an appendix without referring to it somewhere in the text of the paper.
  - For example, in the method section you might describe the questionnaire you’ve developed, then say (See Appendix A for the full questionnaire).

**IMPORTANT**: Note that it is HIGHLY UNLIKELY you would never ever need to include an appendix in a VCE ERA. Adding one to include additional graphs or materials loosely related to the study is inappropriate and will be more likely to lose you marks than give you any more.