Psychology 2019 v1.3

IA2 mid-level annotated sample response

August 2018

Student experiment (20%)

This sample has been compiled by the QCAA to assist and support teachers to match evidence in student responses to the characteristics described in the instrument-specific marking guide (ISMG).

Assessment objectives

This assessment instrument is used to determine student achievement in the following objectives:

2. apply understanding of localisation of function in the brain, visual perception, memory or learning to modify experimental methodologies and process primary data
3. analyse experimental evidence about localisation of function in the brain, visual perception, memory or learning
4. interpret experimental evidence about localisation of function in the brain, visual perception, memory or learning
5. investigate phenomena associated with localisation of function in the brain, visual perception, memory or learning through an experiment
6. evaluate experimental processes and conclusions about localisation of function in the brain, visual perception, memory or learning
7. communicate understandings and experimental findings, arguments and conclusions about localisation of function in the brain, visual perception, memory or learning.

Note: Objective 1 is not assessed in this instrument.

Instrument-specific marking guide (ISMG)

Criterion: Research and planning

Assessment objectives

2. apply understanding of localisation of function in the brain, visual perception, memory or learning to modify experimental methodologies and process primary data
5. investigate phenomena associated with localisation of function in the brain, visual perception, memory or learning through an experiment

The student work has the following characteristics:	Marks
• informed application of understanding of localisation of function in the brain, visual perception, memory or learning to modify experimental methodologies demonstrated by - a considered rationale for the experiment - justified modifications to the methodology • effective and efficient investigation of phenomena associated with localisation of function in the brain, visual perception, memory or learning demonstrated by - a specific and relevant research question - a methodology that enables the collection of sufficient, relevant data - considered management of risks and ethical or environmental issues.	5–6
• adequate application of understanding of localisation of function in the brain, visual perception, memory or learning to modify experimental methodologies demonstrated by - a reasonable rationale for the experiment - feasible modifications to the methodology • effective investigation of phenomena associated with localisation of function in the brain, visual perception, memory or learning demonstrated by - a relevant research question - a methodology that enables the collection of relevant data - management of risks and ethical or environmental issues.	3–4
• rudimentary application of understanding of localisation of function in the brain, visual perception, memory or learning to modify experimental methodologies demonstrated by - a vague or irrelevant rationale for the experiment - inappropriate modifications to the methodology • ineffective investigation of phenomena associated with localisation of function in the brain, visual perception, memory or learning demonstrated by - an inappropriate research question - a methodology that causes the collection of insufficient and irrelevant data - inadequate management of risks and ethical or environmental issues.	1–2
• does not satisfy any of the descriptors above.	0

Criterion: Analysis of evidence

Assessment objectives

2. apply understanding of localisation of function in the brain, visual perception, memory or learning to modify experimental methodologies and process primary data
3. analyse experimental evidence about localisation of function in the brain, visual perception, memory or learning
5. investigate phenomena associated with localisation of function in the brain, visual perception, memory or learning through an experiment

The student work has the following characteristics:	Marks
• appropriate application of algorithms, visual and graphical representations of data about localisation of function in the brain, visual perception, memory or learning demonstrated by correct and relevant processing of data • systematic and effective analysis of experimental evidence about localisation of function in the brain, visual perception, memory or learning demonstrated by - thorough identification of relevant trends, patterns or relationships - thorough and appropriate identification of the uncertainty and limitations of evidence • effective and efficient investigation of phenomena associated with localisation of function in the brain, visual perception, memory or learning demonstrated by the collection of sufficient and relevant raw data.	5–6
• adequate application of algorithms, visual and graphical representations of data about localisation of function in the brain, visual perception, memory or learning demonstrated by basic processing of data • effective analysis of experimental evidence about localisation of function in the brain, visual perception, memory or learning demonstrated by - identification of obvious trends, patterns or relationships - basic identification of uncertainty and limitations of evidence • effective investigation of phenomena associated with localisation of function in the brain, visual perception, memory or learning demonstrated by the collection of relevant raw data.	3–4
• rudimentary application of algorithms, visual and graphical representations of data about localisation of function in the brain, visual perception, memory or learning demonstrated by incorrect or irrelevant processing of data • ineffective analysis of experimental evidence about localisation of function in the brain, visual perception, memory or learning demonstrated by - identification of incorrect or irrelevant trends, patterns or relationships - incorrect or insufficient identification of uncertainty and limitations of evidence • ineffective investigation of phenomena associated with localisation of function in the brain, visual perception, memory or learning demonstrated by the collection of insufficient and irrelevant raw data.	1–2
• does not satisfy any of the descriptors above.	0

Criterion: Interpretation and evaluation

Assessment objectives

4. interpret experimental evidence about localisation of function in the brain, visual perception, memory or learning

6. evaluate experimental processes and conclusions about localisation of function in the brain, visual perception, memory or learning

The student work has the following characteristics:	Marks
• insightful interpretation of experimental evidence about localisation of function in the brain, visual perception, memory or learning demonstrated by justified conclusion/s linked to the research question • critical evaluation of experimental processes about localisation of function in the brain, visual perception, memory or learning demonstrated by - justified discussion of the reliability and validity of the experimental process - suggested improvements and extensions to the experiment that are logically derived from the analysis of evidence.	5–6
• adequate interpretation of experimental evidence about localisation of function in the brain, visual perception, memory or learning demonstrated by reasonable conclusion/s relevant to the research question • basic evaluation of experimental processes about localisation of function in the brain, visual perception, memory or learning demonstrated by - reasonable description of the reliability and validity of the experimental process - suggested improvements and extensions to the experiment that are related to the analysis of evidence.	3–4
• invalid interpretation of experimental evidence about localisation of function in the brain, visual perception, memory or learning demonstrated by identifying inappropriate or irrelevant conclusion/s • superficial evaluation of experimental processes about localisation of function in the brain, visual perception, memory or learning demonstrated by - cursory or simplistic statements about the reliability and validity of the experimental process - ineffective or irrelevant suggestions.	1–2
• does not satisfy any of the descriptors above.	0

Criterion: Communication

Assessment objective

7. communicate understandings and experimental findings, arguments and conclusions about localisation of function in the brain, visual perception, memory or learning

The student work has the following characteristics:	Marks
• effective communication of understandings and experimental findings, arguments and conclusions about localisation of function in the brain, visual perception, memory or learning demonstrated by - fluent and concise use of scientific language and representations - appropriate use of genre conventions - acknowledgment of sources of information through appropriate use of referencing conventions.	2
• adequate communication of understandings and experimental findings, arguments and conclusions about localisation of function in the brain, visual perception, memory or learning demonstrated by - competent use of scientific language and representations - use of basic genre conventions - use of basic referencing conventions.	1
• does not satisfy any of the descriptors above.	0

Task

Context
You have completed the following practicals in class: • Use an experimental research design to investigate the effect of learning environment on memory, replicating aspects of the 1998 investigation by Harry Grant et al. (mandatory practical). • Modify an experiment investigating memory, such as context-dependent cues on memory (Tulving & Pearlstone 1966) (suggested practical). • Modify an experiment investigating memory, such as levels of processing theory — deep processing (semantic) (Elias & Perfetti 1973) (suggested practical).
Task
Modify (i.e. refine, extend or redirect) an experiment in order to address your own related hypothesis or question. You may use a practical performed in class, a related simulation or another practical related to Unit 3 (as negotiated with your teacher) as the basis for your methodology and research question.

Sample response

Criterion	Marks allocated	Result
Research and planning Assessment objectives 2, 5	6	4
Analysis of evidence Assessment objectives 2, 3, 5	6	4
Interpretation and evaluation Assessment objectives 4, 6	6	3
Communication Assessment objective 7	2	2
Total	**20**	**13**

The annotations show the match to the instrument-specific marking guide (ISMG) performance-level descriptors.

Key: Research and planning | Analysis of evidence | Interpretation and evaluation | Communication

Note: Colour shadings show the characteristics evident in the response for each criterion.

Communication [2]

acknowledgment of sources of information through appropriate use of referencing conventions

The use of in-text referencing fits the purpose of a scientific report.

Research and planning [3–4]

a reasonable rationale for the experiment

The rationale shows adequate application of scientific concepts appropriate to the research question. However, the rationale contains some irrelevant background information not related to the research question, and does not give reasons for modifying the methodology.

Title: Increasing the accessibility of information in memory.

Rationale:

Forgetting is the apparent loss or modification of information from an individual's memory. Trace Decay Theory and Displacement Theory propose how information is lost from short-term memory. Trace Decay Theory assumes that memories leave a trace in the brain and that forgetting occurs as a result of the automatic decay or fading of the memory trace (Brown, 1958). On the other hand, displacement theory suggests that forgetting occurs due to the limited capacity (Miller, 1956) of short-term memory (Atkinson & Shiffrin, 1968).

Raajimakers and Shiffrin (1980) proposed the Search of Associative Memory (SAM) model which suggests that the retrieval stage of memory processing is cue dependent. That is, during retrieval, cues for unknown items are assembled from short-term memory, defined as 'memory processes associated with preservation of recent experiences' (Gerrig & Zimbardo, 2002). Building upon this model, Rundus' (1973) model of recall explains that humans attempt to organise items being learned semantically (Rundus, 1973).

To investigate semantic organisation of information, Bousfield (1953) investigated the effect of categorical clustering of words on recall. Researchers grouped words according to their division (e.g. 'dog' is in 'Animal' division), and asked participants to freely recall as many words as possible (Manning & Kahana, 2012). The majority of participants recalled words belonging to the same division in clusters (e.g. once 'dog' was recalled, another animal followed). It was concluded that information is

Research and planning [3–4] **a relevant research question** The research question is connected to the rationale and allows the effective investigation of accessibility of information in short-term memory. However, the response does not specifically identify the independent variable or the dependent variable. **feasible modifications to the methodology** The modifications can be achieved. However, the response does not justify how the modifications will refine, extend or redirect the original experiment.	organised in categories and once cues are identified items under them follow, supporting the SAM model. However, according to the information processing model of memory, and described by Feigenbaum (1961), forgetting occurs not because information has decayed or displaced, but because the information becomes 'inaccessible in a large and growing association network'. Thus there appears to be a distinction between availability and accessibility of information. Prior to the experiment conducted by Tulving and Pearlstone (1966), there were no attempts by researchers to distinguish between availability and accessibility in terms of information recall from memory. To test this phenomenon, they used categorised word lists and recall words in the presence or absence of category names as retrieval cues. They hypothesised that a proportion of words not accessible for recall under the unaided conditions would become accessible as a consequence of experimental presentation of such retrieval cues, thus indicating that sufficient information was available, but was not accessible (Tulving & Pearlstone 1966). They found that sufficiently intact memory traces of many words not recalled under the non-cued recall conditions were available in the memory store, but not accessible for retrieval. The original experimental methodology devised by Tulving and Pearlstone (1966) was modified to refine the methodology. **Research question:** Do cues increase the accessibility of information within short term memory? The null hypothesis states that there will be no difference in accessibility of information between conditions. The alternative hypothesis states that there will be a difference in accessibility of information between the conditions. **Methodology:** **Variables** The experimental methodology was refined to test only one independent variable. In this case, the two levels of the independent variable were the condition of recall (cued [CR] as the experimental condition or non-cued [NCR] as the control condition). Recall was operationalised by the presence or absence of retrieval cues in the form of category headings on participant response sheets. The dependent variable was the number of words correctly recalled out of 24. The number of words per category was refined to 2. In order to minimise extraneous variables, the use of standardised word lists, and time limits on viewing and recall were controlled. **Participants** The participants were extended to include a sample selected from 450 students, aged 14-17, attending a high-school in Queensland, Australia. In order to recruit participants, a convenience sampling method was used. The sample consisted of grade 10 students, aged 14-16 years, and

participants were randomly assigned to one of two conditions (i.e. independent groups design) by drawing numbers marked 1 or 2 out of a hat.

Materials

- PowerPoint containing stimuli
- Categorised lists
- Hat containing paper slips each displaying a number from 1-22
- Non-cued recall response sheets
- Cued recall response sheets

Research and planning [3–4]

a methodology that enables the collection of relevant data

The methodology allows data to be collected so an informed conclusion can be drawn. However, the data is not sufficient to answer the research question.

Procedure

- NCR participants were given a response sheet, with no cues, facing down on the table and a pen.
- Participants were briefed on the experiment and verbally given standardised instructions.
- Participants were shown six lists, each containing four words, on a PowerPoint. 10 seconds was provided to learn each list.
- When the word “NOW” appeared on the PowerPoint, participants were asked to turn over their response sheets and record as many words as they remembered for 2 minutes. After 2 minutes, they were told to stop writing.
- Participants were debriefed using a standardised script.
- Response sheets were collected. Raw data was placed into tables.
- The NCR group was dismissed and the CR group entered the classroom. Steps 5-10 were repeated for them except with response sheets containing category headings as cues. Raw data for CR was placed into *Table 1*.

Research and planning [5–6]

considered management of risks and ethical or environmental issues

The response shows careful and deliberate identification and planning to handle risks and ethical or environmental issues in the experiment.

Safety and ethical considerations

To ensure the effective management of ethical issues:

- informed parental consent forms (as participants were under the age of consent, 18 years), were provided to, and returned by, all participants before commencing the experiment
- participants were briefed and debriefed, and reminded that they had the right to withdraw from the experiment at any time
- anonymity and confidentiality was maintained by the use of participant codes
- due to the nature of the experiment, participants were not subjected to physical or psychological harm, however, if they wished to speak with someone after the experiment, they were referred to the classroom teacher or the school counsellor.

Analysis of evidence [3–4]

collection of relevant raw data

The raw data has direct bearing upon the research question. However, the raw data that has been collected is not sufficient to answer the research question.

basic processing of data

The mean and standard deviation have been calculated, which demonstrates fundamental data processing. However, the lack of inferential statistical analysis will limit how applicable the data is to the research question.

Communication [2]

appropriate use of genre conventions

The response follows scientific conventions of the construction of tables.

fluent and concise use of scientific language and representations

The response represents data clearly so that the trends, patterns and relationships can be easily identified.

Raw data:

Table 1. Sample of raw data table for the cued recall (CR) and non-cued recall (NCR) conditions.

NCR	CR
9	12
11	18
14	19
16	20
…..	….

Descriptive statistics

The most appropriate measure of central tendency chosen was the mean, and the standard deviation as the measure of dispersion, as the data was in intervals and there were no obvious outliers identified from the raw data. Descriptive statistics are displayed in *Table 2* and *Figure 1*.

Table 2. Mean and standard deviation scores for number of words correctly recalled in non-cued recall (NCR) and cued recall (CR) conditions.

Condition	Mean number of words correctly recalled ($\bar{x}$)	Standard Deviation of words correctly recalled (s)
Non cued recall (NCR)	17	4
Cued recall (CR)	20	3

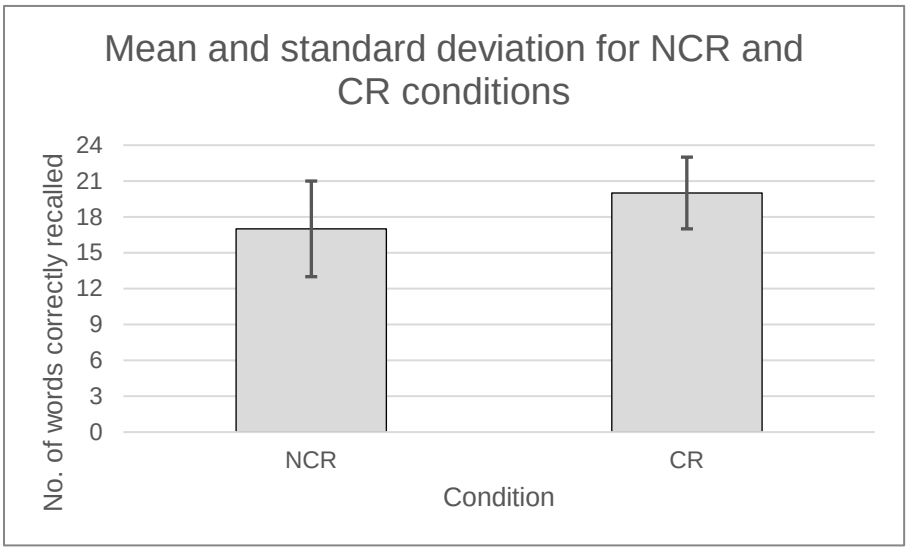

Figure 1: Mean and standard deviation scores for number of words correctly recalled in non-cued recall (NCR) and cued recall (CR) conditions.

Analysis of evidence [3–4] **identification of obvious trends, patterns or relationships** The response recognises a clearly evident pattern. However, this analysis is not thorough, as some relationships that are applicable to the research question (e.g. overlapping error bars) have not been recognised. **basic identification of uncertainty and limitations of evidence** The response shows fundamental consideration of the impact of measurement uncertainty. However, measurement uncertainty has not been appropriately quantified. **Interpretation and evaluation [3–4]** **reasonable description of the reliability and validity of the experimental process** Evaluation of the experimental process suggests that the process lacks reliability and validity. However, the response does not use evidence to justify these statements. **Interpretation and evaluation [1–2]** **inappropriate or irrelevant conclusion/s** The conclusion to the research question is inappropriate as the error bars suggest that the difference is not significant.	The results show that the mean score for the NCR group (17) was lower than the mean score for the CR group (20). The standard deviation in the NCR group (4) has a greater dispersion of scores than the CR group (3), indicating greater variability between participants in this condition. **Limitations of the evidence and reliability and validity of the experimental process:** The large standard deviations observed in the data can be explained by a lack of reliability and validity in the experimental process. A large standard deviation was observed for the NCR condition. Large standard deviations indicate that data points are widely dispersed around the mean which suggests that extraneous variables are not fully controlled, therefore making the data less reliable. Data that is widely dispersed can indicate an unreliable experimental methodology. Although experimenters sought to control extraneous variables, it is likely that the uncertainty observed in the data was due to natural participant variability. To attempt to control for this, experimenters used random allocation of participants to conditions. A further consideration should be the effect of the refinements made to the original experiment's methodology. The original lists used were not accessible to the experimenters. Thus, the creation of new lists may have affected the reliability of the experimental methodology. Finally, in terms of validity, the population validity would also be deemed to be low due to the use of a small, and unrepresentative sample. Furthermore, the ecological validity would also be considered low as the experiment was conducted in a laboratory. **Conclusion:** In answer to the research question, 'Do cues increase the accessibility of information within short term memory?' the null hypothesis was rejected as the results indicated that there was a difference in accessibility of information between the two conditions.

Interpretation and evaluation [3–4]

suggested improvements and extensions to the experiment that are related to the analysis of evidence

The suggested modifications address the limitations of the experiment. However, the response does not use evidence to show that these modifications would improve the reliability and validity of this experiment.

Communication [2]

fluent and concise use of scientific language and representations

The response is easily understood, avoids unnecessary repetition and meets the required length.

acknowledgment of sources of information through appropriate use of referencing conventions

The use of a referencing system fits the purpose of a scientific report.

Suggested improvements and extensions:

By analysing the evidence obtained in the experiment, it was clear that the experimental processes lacked reliability (sample and test), population validity and ecological validity.

To improve the reliability of the sample, a refinement might be to increase the sample size (> 100). To improve the reliability of the test, a refinement could be to use a known test.

An extension to the experiment that would increase validity would be to test the phenomenon on a more diverse population group or do a less controlled experiment.

Word count: 1515

References

Brown, J. (1958). Some tests of the decay theory of immediate memory, Quarterly Journal of Experimental Psychology, 10, 12-21.

Bousfield (1953) (as cited in Manning, J. R., & Kahana, M. J., 2012). Interpreting semantic clustering effects in free recall. Memory, 511-517.

Feigenbaum, E. A. (1961). The simulation of verbal learning behaviour, Proceedings of the Joint Computer Conference, 19, 121 – 132.

Gerrig, R. J., & Zimbardo, P. G. (2002). Glossary of Pyshcological Terms. Retrieved December 30, 2013, from American Psychological Association: http://www.apa.org/research/action/glossary.aspx

Manning, J. R., & Kahana, M. J. (2012). Interpreting semantic clustering effects in free recall. Memory, 511-517

Miller, G. (1956). The magical number seven, plus or minus: Some limits on our capacity for processing information, The psychological review, 63, 81-97.

Raajimakers, J. G., & Shiffrin, R. M. (1981). Search of associative memory. Psychological Review, 93-134

Rundus, D. (1973). Negative Effects of Using List Items as Recall Cues. Journal of Verbal Learning and Verbal Behaviour, 43-50

Tulving, E., & Pearlstone, Z. (1966). Availability Versus Accessibility of Information in Memory of Words. Journal of Verbal Learning and Verbal Behvaiour 5, 381-391.

Social Science Statistics. (2017). Mann-Whitney U Test Calculator. Retrieved from http://www.socscistatistics.com/tests/mannwhitney/default2.aspx