



UNIT 3 PSYCHOLOGY

**SUM
MER**

SCHOOL

VCE SUMMER SCHOOL

Unit 3 Psychology

Area of Study 1

How Does the Nervous System Enable Psychological Functioning?

Area of Study 2

How do People Learn and Remember?

VCE Accreditation Period

2023 – 2027



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VCE SUMMER SCHOOL HEAD START LECTURES

STUDY DESIGN (2023 – 2027) – EDITION 1

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ABOUT THE COVER IMAGE

THE POWER OF ART

Engaging with art is essential to the human experience. Almost as soon as motor skills are developed, children communicate through artistic expression. Throughout each stage of our lives, art plays different and important roles. The arts have the power to bring joy, stir up emotions and influence our behaviour. Art crosses all divides. It breaks down cultural, social and economic barriers and plays a big role in how humans see and interact with others, and the world in general.

Art decreases stress levels and improves mental health and well-being, particularly in patients suffering chronic or terminal illness. It has the power to educate people and convey meaning in a way that can be appreciated by every person. Furthermore, it gives us the opportunity to travel through time and learn from the beliefs, dreams, habits, thoughts, culture and lives of people in different places and times.

The arts also challenge us with different points of view, encourages communication, promotes stronger critical thinking and problem-solving skills and unlocks the potential of the human mind. It is also closely linked to academic achievement, civic engagement and social and emotional development.

The benefits of art are significant and undeniable. Use it to benefit both your mental and physical health as you journey through your VCE.



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SECTION 1: UNIT 3 PSYCHOLOGY

**AREAS OF STUDY
OUTCOMES
KEY KNOWLEDGE & SKILLS
ASSESSMENT**

UNIT 3: HOW DOES EXPERIENCE AFFECT BEHAVIOUR AND MENTAL PROCESSES?

On completion of this unit, students should be able to examine the functioning of the nervous system to examine the contribution that classical and contemporary research has made to the understanding of the structure and function of the nervous system, and to the understanding of biological, psychological and social factors that influence learning and memory.

Use these tables as checklists when revising. Tick off each dot point when you are satisfied that you have thoroughly covered all of the information associated with that topic.



AREA OF STUDY 1 – HOW DOES THE NERVOUS SYSTEM ENABLE PSYCHOLOGICAL FUNCTIONING?

In this area of study, the student should be able to explain how the structure and function of the human nervous system enables a person to interact with the external world and analyse the different ways in which stress can affect nervous system functioning.

Key Knowledge Includes:

Nervous System Functioning	✓
The roles of different divisions of the nervous system in responding to, and processing and coordinating with, sensory stimuli received by the body to enable conscious and unconscious responses, including spinal reflexes.	
The role of neurotransmitters in the transmission of neural information across a neural synapse to produce excitatory effects (as with glutamate) or inhibitory effects (as with gamma amino butyric acid [GABA]) as compared to neuromodulators (such as dopamine and serotonin) that have a range of effects on brain activity.	
Synaptic plasticity – resulting from long-term potentiation and long-term depression, which together act to modify connections between neurons (sprouting, rerouting and pruning) – as the fundamental mechanism of memory formation that leads to learning.	
Stress as an Example of a Psychobiological Process	✓
Internal and external stressors causing psychological and physiological stress responses, including the fight-flight-freeze response in acute stress and the role of cortisol in chronic stress.	
The gut-brain axis (GBA) as an area of emerging research, with reference to the interaction of gut microbiota with stress and the nervous system in the control of psychological processes and behaviour.	
The explanatory power of Hans Selye's General Adaptation Syndrome as a biological model of stress, including alarm reaction (shock/counter shock), resistance and exhaustion.	
the explanatory power of Richard Lazarus and Susan Folkman's Transactional Model of Stress and Coping to explain stress as a psychological process (stages of primary and secondary appraisal).	
Use of strategies (approach and avoidance) for coping with stress and improving mental wellbeing, including context-specific effectiveness and coping flexibility.	

AREA OF STUDY 2 – HOW DO PEOPLE LEARN AND REMEMBER?

In this area of study, students study the neural basis of memory and learning and examine factors that influence the learning of new behaviours and the storage and retention of information in memory. They consider the influence of biological, psychological and social factors on the fallibility of memory.

Key Knowledge Includes:

Approaches to Understand Learning	✓
Behaviourist approaches to learning as illustrated by classical conditioning as a three-phase process (before conditioning, during conditioning and after conditioning) that results in the involuntary association between a neutral stimulus and unconditioned stimulus to produce a conditioned response, and operant conditioning as a three-phase model (antecedent, behaviour, consequence) involving reinforcement (positive and negative) and punishment (including positive and negative).	
Socio-cognitive approaches to learning, as illustrated by observational learning as a process involving attention, retention, reproduction, motivation and reinforcement.	
Approaches to learning that situate the learner within a system, as illustrated by Aboriginal and Torres Strait Islander ways of knowing where learning is viewed as being embedded in relationships where the learner is part of a multimodal system of knowledge patterned on Country.	
The Psychological Process of Memory	✓
The explanatory power of the Atkinson-Shiffrin multi-store model of memory in the encoding, storage and retrieval of stored information in sensory short-term and long-term memory	
the roles of the hippocampus, amygdala, neocortex, basal ganglia and cerebellum in long-term implicit and explicit memories.	
The role of episodic and semantic memory in retrieving autobiographical events and in constructing imagined futures, including evidence of brain imaging and post-mortem studies of brain lesions with people with Alzheimer's disease and aphantasia as an example of individual differences in the experience of mental imagery.	
The use of mnemonics (acronyms, acrostics and the method of loci) by written cultures to increase the encoding, storage and retrieval of information as compared with the use of mnemonics such as sung narrative used by oral cultures, including Aboriginal people's use of songlines.	

EXTRA NOTES ON THE AREAS OF STUDY FOR UNIT 3

Area of Study 1: How does the nervous system enable psychological functioning?

Area of Study 2: How do people learn and remember?



KEY SCIENCE SKILLS

A set of key skills considered essential to Psychology applies across Units 1 to 4. A number of these key skills are linked to the research methodologies listed for each unit.

Key Skills Include:	✓
<p>Develop aims and questions, formulate hypotheses and make predictions:</p> <ul style="list-style-type: none"> • Identify, research and construct aims and questions for investigation. • Identify independent, dependent and controlled variables in controlled experiments. • Formulate hypotheses to focus investigations. • Predict future outcomes of investigations. 	
<p>Plan and undertake investigations:</p> <ul style="list-style-type: none"> • Determine appropriate investigation methodology: case studies; classification and identification; controlled experiment (within subjects, between subjects, mixed design); correlational study; fieldwork; literature review; modelling, product, process or system development; simulation. • Design and conduct investigations; select and use methods appropriate to the investigation; including consideration of sampling technique (random and stratified) and size to achieve representativeness, and consideration of equipment and procedures, taking into account potential sources of error and uncertainty; determine the type and amount of qualitative and/or quantitative data to be generated or collated. • Work independently and collaboratively as appropriate and within identified research constraints, adapting or extending processes as required and recording such modifications. 	
<p>Comply with safety and ethical guidelines:</p> <ul style="list-style-type: none"> • Demonstrate ethical conduct and apply ethical guidelines when undertaking reporting investigations. • Demonstrate safe laboratory practices when planning and conducting investigations by using risk assessments that are informed by safety data sheets (SDS), an accounting for risks. • Apply relevant occupational health and safety guidelines while undertaking practical investigations. 	

Key Skills Include:	✓
<p>Conduct investigations to collect and record data:</p> <ul style="list-style-type: none"> • Systematically generate and record primary data, and collate secondary data, appropriate for the investigation. • Record and summarise both qualitative and quantitative data, including use of a logbook as an authentication of generated or collated data. • Organise and present data in useful and meaningful ways, including tables, bar charts and line graphs. 	
<p>Analyse and evaluate data, methods and scientific models:</p> <ul style="list-style-type: none"> • Process quantitative data using appropriate mathematical relationships and units, including calculations of percentages, percentage change and measures of central tendencies (mean, median, mode), and demonstrate an understanding of standard deviation as a measure of variability. • Identify and analyse experimental data qualitatively, applying where appropriate concepts of; accuracy, precision, repeatability, reproducibility and validity; errors; and certainty in data, including effects of sample size on the quality of data obtained. • Identify outliers and contradictory or incomplete data. • Repeat experiments to ensure findings are robust. • Evaluate investigation methods and possible sources of error or uncertainty, and suggest improvements to increase validity and reduce uncertainty. 	
<p>Construct evidence-based arguments and draw conclusions</p> <ul style="list-style-type: none"> • Distinguish between opinion, anecdote and evidence, and scientific and non-scientific ideas. • Evaluate data to determine the degree to which supports the aim of the and make recommendations, as appropriate, for modifying or extending the investigation. • Evaluate data to determine the degree to which the evidence supports or refutes the initial prediction or hypothesis. • Use reasoning to construct scientific arguments, and to draw and justify conclusions consistent with evidence base and relevant to the question under investigation. • Identify, describe and explain the limitations of conclusions, including identification of further evidence required. • Discuss the implications of research findings and proposals, including appropriateness and application of data to different cultural groups and cultural biases in data and conclusions. 	

Key Skills Include:	✓
<p>Analyse, evaluate and communicate and explain scientific ideas</p> <ul style="list-style-type: none"> • Use appropriate psychological terminology, representations and conventions including standard abbreviations, graphing conventions and units of measurements Discuss relevant psychological information, ideas, concepts, theories and models and the connections between them. • Analyse and explain how models and theories are used to organise and understand observed phenomena and concepts related to psychology, identifying limitations of selected models/theories. • critically evaluate and interpret a range of scientific and media texts (including journal articles, mass media communications, opinions, policy documents and reports in the public domain), process, claims and conclusions related to psychology by considering the quality of available evidence. • Analyse and evaluate psychological issues using relevant ethical concepts and guidelines, including the influence of social, economic, legal and political factors relevant to the selected issue. • Use clear, coherent and concise expression to communicate to specific audiences and for specific purposes in appropriate scientific genres, including scientific reports and posters. • Acknowledge sources of information and use standard scientific referencing conventions. 	

UNIT 3 PSYCHOLOGY SCHOOL ASSESSMENT

School-assessed Coursework for Unit 3 will contribute 20 per cent to the study score

Outcomes	Marks allocated	Assessment tasks
<p>Outcome 1</p> <p>Analyse how the functioning of the human nervous system enables a person to interact with the external world, and evaluate the different ways in which stress can affect psychobiological functioning.</p>	40	<p><i>For Outcomes 1 and 2</i></p> <p>For each outcome, one task selected from:</p> <ul style="list-style-type: none"> • analysis and evaluation of at least one psychological case study, experiment, model or simulation • analysis and evaluation of generated primary and/or collated secondary data • comparison and evaluation of psychological concepts, methodologies and methods, and findings from three student practical activities • analysis and comparison of two or more contemporary media texts. <p>Each task type can be selected only once across Units 3 and 4.</p> <p>For each task the time allocated should be approximately 50–70 minutes for a written response and 10 minutes for a multimodal or oral presentation.</p>
<p>Outcome 2</p> <p>Apply different approaches to explain learning to familiar and novel contexts and discuss memory as a psychobiological process.</p>	40	
Total marks	80	

HOW TO OPTIMISE YOUR PERFORMANCE IN VCE PSYCHOLOGY

Many high achieving students develop the following habits. In the long term, their use not only maximises academic performance, but helps to make study a less stressful and far more enjoyable experience.

Be organised.

This means keeping notes in a clear order so you can follow them when you are revising. It's hard to tell what's what with dozens of loose handouts spilling out of a folder.

Don't fall behind.

Begin working immediately once your teacher sets a task. Not only will you avoid considerable stress, but if you happen to catch a cold or experience a personal problem, it won't spell disaster. You'll be able to handle whatever happens because you are one step ahead, and not falling more and more behind each passing day. Being up-to-date with your work acts as a form of insurance.

Seek help for problems.

Tell someone who cares about you and get some help – sooner rather than later. Speak to your parents, teachers, welfare staff at your school, or other people who can help you.

Be enthusiastic.

Have you ever noticed how difficult it is to learn something when you aren't interested in it, while you can be a storehouse for all kinds of complex information and otherwise on topics which do interest you? **Make yourself interested** in the topics you study.

Be challenged by study and not overwhelmed and stressed by it.

Your attitude to study and the way you think about it can either energise and empower you, or immobilise you, drain you of energy and erode your confidence.

Pace yourself.

This means being committed for the **entire** school year. Many students lose motivation and make less effort sometime early in second semester. Predictably, most of them regret it later when they get their final results.

Revise regularly, and revise material as soon as you can after learning it for the first time.

Make a habit of revising and reviewing the main ideas from each class for homework each night. Your learning will be more organised and thorough. You won't need to cram before examinations. If you aren't stressed, you'll perform much better because stress acts like a barrier blocking access to memory. **It is also very important to revise newly learnt material as soon as you can after learning it.** You want to consolidate (strengthen) your memory of the information you have just learned.

Use spaced practice.

This means learning **reasonable** amounts of material for **reasonable** periods of time. It is the opposite of cramming.

Continuous revising.

Don't quit revising material once you know it. If you continue to practice it (very briefly) you'll find the material you want will be more easily retrieved from memory in pressure situations such as exams and class tests.

Organisation and elaboration.

Elaboration means expanding on what you are learning and relating it to other material you know and have already stored in your memory. By elaborating on material, you not only make it meaningful and hence more memorable, but you place it into a memory 'file' where you are more likely to locate it when needed.

Organise your learning as you would should your wardrobe. It's easier to find your clothes if you know where they hang, which shelf or drawer they are on or in. Do what you can to organise material so you can locate it in memory. You might use concept maps, headings, card systems, diagrams, memory techniques like acronyms and acrostics, or use of visual imagery to commit material to memory.

Other Suggestions Include:

- **Experimenting** to see how you learn best - enjoy learning about your own learning. We usually have preferred ways of learning. Simply reading and rereading notes is a most ineffective way to learn.
- **Carrying** a glossary with you, and studying it on the train on the way home etc.
- **Using** highlighter pens and colours etc. to emphasise key points, definitions and terms.
- **Completing** past examination papers which are available on the internet. Make sure you mark each exam carefully and pay close attention to the solutions provided. Be sure to do any follow-up work first, before tackling another one.
- **Organising** a study group with like-minded friends.
- **Telling** (or teaching) someone what you know about a particular topic you are studying. Verbalising your learning will strengthen it and give you practice retrieving the information from your memory. You might like to see what sort of reception you get when you describe the main function of the lobes of the cerebral cortex for the family over the evening meal!

**SECTION 2: SCIENTIFIC
RESEARCH METHODS**

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AN INTRODUCTION TO PSYCHOLOGY

It will be helpful for you to reflect on the nature of psychology regardless of whether you studied Units 1 and 2 of the subject last year, or are a new student of VCE Psychology.

The current definition used in VCE Psychology is:

'Psychology is the systematic study of the nature and development of the mind and behaviour of people and animals, including the biological structures and processes underpinning and sustaining them'.

Psychology is scientific. This means it uses carefully organised and structured methods to systematically collect, measure, analyse and interpret data (information). To ensure the methods used to gather information are scientific, as with other sciences like chemistry and physics, the goals of psychology are **description, prediction, control** and **explanation**.

As many of the different, personal mental processes studied in psychology can't be directly seen or observed because they are internal, psychology is often **inferential**. It infers (or works things out) in order to make logical assumptions, judgements and conclusions based on what can be seen and other available evidence. For example, you know people **can** learn information, even though you **can't** visibly witness learning taking place in yourself or others. However, you **can** observe what yourself and others **can do** as a result of learning. It is **whether or not you see a difference in the behaviour of yourself or others** after learning that allows you to infer whether learning has occurred. Doesn't a high mark earned on a difficult examination provide evidence suggesting that some underlying process of mind is responsible for your pleasing performance on it? What you show you know during the exam (that you didn't know earlier before learning) allows you and your teacher to infer whether learning has occurred.

The term 'mind' refers to our mental experiences. However, psychologists generally use the umbrella term **cognitive or cognitive processes** to refer to mental experiences. As psychology investigates a whole host of personal, internal cognitive processes or experiences like thinking, motivation, consciousness, memory, learning and problem-solving, which cannot be directly observed, these processes are sometimes also referred to as **hypothetical constructs**. A hypothetical construct is a concept or idea used to describe something we believe exists although it can't be directly observed or measured. Its existence is inferred from indicative behaviour which can be measured.

If you are confused remember this:

- mind means mental processes and experiences;
- cognitive also means mental processes and experiences;
- and mental processes and experiences are hypothetical constructs because we can't directly observe their existence, only infer them from other behaviours which can be seen.

The term behaviour usually refers to all observable actions from walking or talking to scratching or blinking. It is observable behaviours which allow us to make inferences. That is, we can infer (work out) whether a woman is problem-solving by observing what she **does** to solve it and her solution; whether rewards will motivate a girl to work harder at school by observing what she **does** after a reward is offered for each good grade; and whether a man is thinking by observing what he **does** to solve a riddle or complex math problem etc.

As a scientific study, psychology relies on gaining **empirical evidence** (gained from direct observation and measurement) rather than hearsay, hunches, intuition or unconfirmed guesses. In order for the information to be reliable, credible and therefore useful to human kind in the long run, psychology must also be selective in terms of the way information is gathered on a particular topic.

Scientific investigation methodologies is the term used to collectively refer to a whole range of techniques **used to generate empirical evidence** at the researcher's disposal. Some research methods include use of **case study and controlled experiments**. Each method has a particular purpose, some advantages and limitations. You will not study all of them this year.

Throughout Units 3 and 4 you will examine **the case study** briefly; **the controlled experiment** in detail; and the **ethical considerations** researchers must take into account to ensure that participants are not harmed either physically or psychologically as a result of their involvement in psychological research.

The **method** that is used to conduct research in psychology is known as the **scientific method**. This forms the basis of all research in psychology as it does in many other areas of research.

The **scientific method** is very systematic in that it follows very specific steps to study particular topics. By rigorously following these steps, psychologists are able to be confident that their research findings are accurate and reliable, and provided the result is statistically significant they can also reach a conclusion on their results. **Theories** that are formed without the use of the scientific method do not have the same credibility as those that are formed through less rigorous methods.

The steps in the scientific method are as follows:

- (a) Identify the research problem
- (b) Formulate a hypothesis
- (c) Design the method
- (d) Collect the data
- (e) Analyse the data
- (f) Interpret the data
- (g) Report on the research findings

When gathering information on subject matter of interest, psychology uses two main types of information or data:

QUALITATIVE AND QUANTITATIVE DATA.

Quantitative data (or information) can be converted, presented or expressed in the form of numbers, while qualitative data involves the expression of information through words to describe characteristics or qualities of subject matter which can't be reduced to numbers effectively. For example, think about **love** as an experience. It isn't really useful to assign numerical values to experiences like **love**. Rating the experience of **love** on a score of 1 – 10 is relatively meaningless in terms of the information it conveys. It isn't especially helpful or informative. However, interviews with a variety of people describing their personal experiences of **love** could yield detailed and potentially useful information about differences

they notice in their behaviour. This might include changes in their physiological responses (like having sweaty palms, a dry mouth or a racing heart); their mood; their ability to concentrate; or changes in their sleep patterns or appetite. However, it is important to realise that it is rare for qualitative and quantitative data to be used completely separately in psychological research. Often, we collect both in an effort for one to verify the other, enhancing the validity of the results.

EXERCISE 1: TEST YOUR UNDERSTANDING

- (a) Essentially, psychology is a systematic study that is also inferential. What is meant by these terms?

- (b) Identify four different areas which are often the subject matter of psychological research.

- (c) In your own words explain what is meant by the term hypothetical construct.

- (d) What is meant by the term cognitive, or cognitive processes?

- (e) Identify four different cognitive processes. Are these cognitive processes also examples of hypothetical constructs? (Answer yes or no to the second part of this question.)

(f) Surveys, experiments, interviews and case studies are all examples of _____ psychologists use to gather information.

(g) What is meant by the term **empirical evidence**?

(h) A variety of different _____ are used to gather empirical evidence on areas of human behaviour studied in psychology.

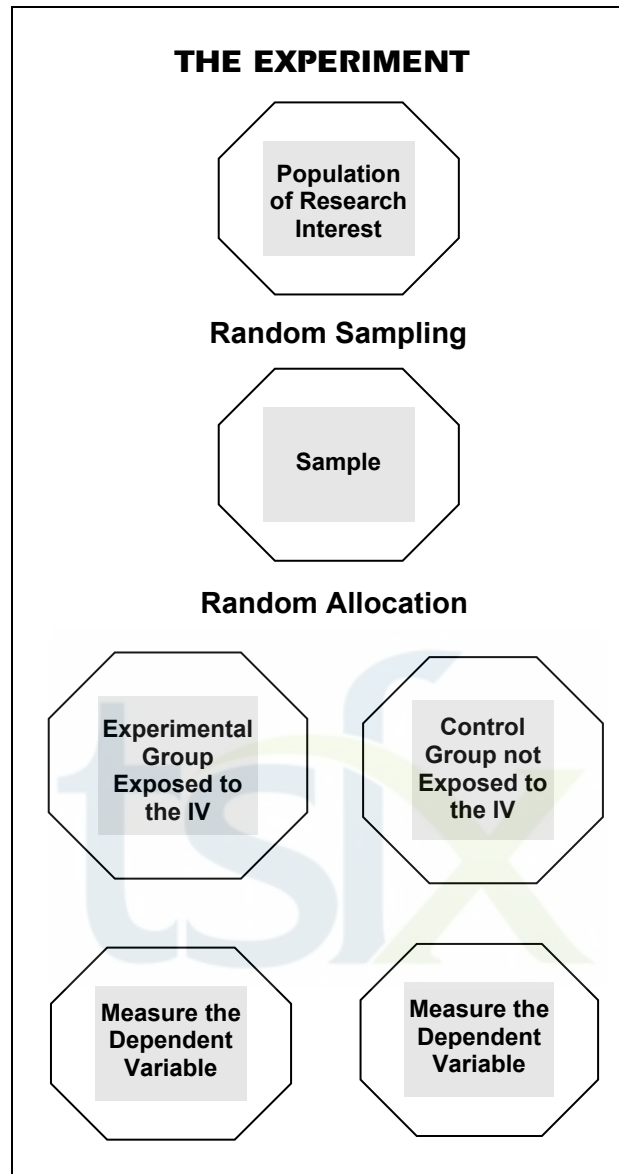
(h) In order to have credibility, psychological research must be conducted in a scientific manner. What is meant by the term *scientific* in this context?

(i) How are unobservable mental processes like memory and learning **actually** studied by research psychologists? What do they need to do?

(k) Case studies (only on the brain this year) and the experiment are two different _____ you will study over the course of this year in VCE Psychology.

(l) The term *data* simply means _____. Two different types of data are _____ and _____ data.

THE SIMPLE EXPERIMENT & THE INDEPENDENT & DEPENDENT VARIABLES



An **experiment** is used to test a suspected **cause** and **effect** relationship between variables, and seeks to determine whether the independent variable causes a change in the dependent variable (the IV is the **suspected cause** and the DV shows the **effect** of the IV).

THE INDEPENDENT VARIABLE:

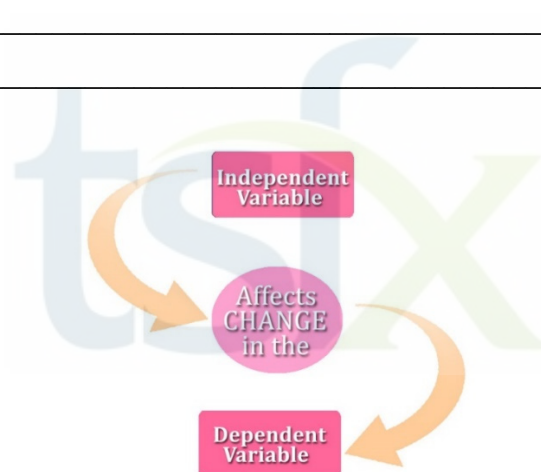
The **independent variable (IV)** is the variable which is systematically manipulated, changed or varied in some way by the experimenter in order to determine its effect on the participant's response (dependent variable).

Examples include:

THE DEPENDENT VARIABLE:

The **dependent variable (DV)** shows any effects of the independent variable, and is the variable **expected** to change as a result of manipulation of the independent variable.

Examples include:



QUESTION 1

Identify the dependent and independent variables in the following study.

A study conducted by Redbooth (a project management software company) suggests that alertness depends on the time of the day and apparently, the productivity of office workers worldwide is at its peak at 11 am, then gradually declines, and ultimately plummets after 4 pm.

Independent Variable: _____

Dependent Variable: _____

QUESTION 2

A researcher investigated the relationship between test length and grades in an Introductory Psychology course. She conducted an experiment and found that students taking long exams received better grades than students who took short exams. The independent variable was

- A short exams
- B test grades
- C class size
- D length of test.

THE HYPOTHESIS

A **hypothesis** is a testable prediction about the relationships between two variables.

The following table describes how a hypothesis can be constructed from a research question using an **'If-then-when'** construction process:

Step 1: Ask a research question of interest: <i>Does food sweetness depend on temperature?</i>					
Step 2: Identify the independent variable (IV): <i>Temperature</i>					
Step 3: Identify the dependent variable (DV): <i>Perceived sweetness of food</i>					
Step 4: Construct a hypothesis (a – f below):					
a	b	c	d	e	f
If... (the DV)...	Relationship phrase (to the IV) ...depends on... ...results from... ...is affected by... ...is directly related to...	...then...	Trend indicator (effect on the DV) ...shows an increase/decreasebe greater than/less than... ...be larger/smaller...	...when...	Trend indicator (action by the IV). ...increased/decreased... ...greater/less... ...large/small...
Hypothesis: If the perceived sweetness of food is directly related to temperature, then ice-cream at a temperature of 15°C will be perceived by an individual as relatively sweeter than ice-cream at 4°C.					
Notes: <ul style="list-style-type: none"> • Different writing styles for hypotheses can be equally valid. • Some hypotheses may include reference to the specific population involved in the experiment, for example, 'If the perceived sweetness of food is directly related to temperature, then ice-cream given to Year 12 students at Galbrick College at a temperature of 15 °C will be perceived by individual students as being sweeter than ice-cream at 4°C'. More generally, however, the population is described in the introduction of an experimental report. 					

QUESTION 3

Identify the IV and DV in the following hypotheses.

- (a) It is hypothesised that students who get eight hours sleep the night before the final maths exam will score higher than those who receive less than eight hours sleep.

IV:

DV:

- (b) It is hypothesised that people who own a pet will perform better on a wellbeing self-rating scale than those who don't own a pet.

IV:

DV:

QUESTION 4

A researcher investigated different temperatures to examine how heat affects performance. The researcher compared three temperature conditions (20°, 30° and 40°). A separate group of participants was tested in each of the 3 different conditions, and for each participant, the researcher recorded the number of errors made on a problem-solving task.

For the above research scenario:

- (a) State a suitable research hypothesis:

- (b) Identify the independent variable:

- (c) Identify the dependent variable:

EXTRANEOUS VARIABLES

An **extraneous variable** is any variable other than the independent variable that can cause a change in the dependent variable and therefore affects the results of the experiment in an unwanted way.

Extraneous variables are 'unwanted' because they can make it difficult for the researcher to conclude that any change in the DV was caused solely by the presence of the IV and not some other variable.

IV	DV	Extraneous Variable
Consumption of 1200 grams of chocolate for each day over a period of 5 weeks compared to no consumption of chocolate on any day for a period of 5 weeks.	Amount of weight gained in total over the 5 weeks.	Individual differences such as: The metabolism of participants. An extremely thin or obese participant.

Further examples include:

Extraneous variables can be eliminated, or their potential effects minimised by making particular choices/changes in the research design.

When the potential effects of an extraneous variable have been removed from an experiment the variable is said to be a **controlled variable**.

QUESTION 5

Read the following extract and identify as many extraneous variables as you can.

A psychologist wanted to investigate whether giving students an incentive to improve academic performance increases the number of high grades achieved. He asked two colleges to take part. One school offered students a payment of \$50 for every A grade they achieved. The second school did not offer any rewards.

CONFOUNDING VARIABLES

“A confounding variable is a variable other than the IV that has had an unwanted effect on the DV, making it impossible to determine which of the variables (the IV or the Confounding) produced the change in the DV”.

A confounding variable was originally an extraneous variable that has then HAD an unwanted effect on the DV. This unwanted effect must be proven to have occurred.

Example:

IV	DV	Extraneous Variable
Consumption of 1200 grams of chocolate for each day over a period of 5 weeks compared to no consumption of chocolate on any day for a period of 5 weeks.	Amount of weight gained in total over the 5 weeks.	Individual differences such as: The metabolism of participants. An extremely thin or obese participant.
Confounding Variable		
The results of the experiment were an average weight gain of 0.05 kilos. HOWEVER: The chocolate was off and every participant who consumed the chocolate developed severe diarrhoea.		

ALTHOUGH WE CAN PREVENT EXTRANEIOUS VARIABLES FROM HAVING ANY EFFECT, WE CAN'T REVERSE THE EFFECTS OF A CONFOUNDING VARIABLE!

QUESTION 6

A researcher studying a new teaching technique uses a control and experimental group in a study to determine if it will improve levels of academic achievement of psychology students at a Victorian university. Those in the control group have normal psychology lectures, while those in the experimental group have the same lecturer using the new teaching technique. Then, on the last day of term, both groups are tested on their understanding of coursework: The control group in the morning, and the experimental group in the afternoon.

What could be the confounding variable in this experiment?

CONTROLLING EXTRANEOUS VARIABLES

So, what are some common **extraneous variables** that have the potential to **BECOME** confounding variables if they are **NOT CONTROLLED**?

Name of the Extraneous Variable	Description	Examples
Individual Participant Differences	These are the variables that make one individual different from another. These are expected by the researcher.	Age, gender, intelligence, personality, memory, educational background, economic background, religion, motivation, self-esteem, social skills, physical health, emotional state, mood, co-ordination, past experience etc.
Ways to Minimise this Extraneous Variable		
Careful choice of technique used to select and allocate participants so that the groups of participants in the experiment are as similar as possible.		
The Placebo Effect	<p>The improvement in an individual's health or well-being due to an individual's belief that the treatment given to them will be effective.</p> <p>In a psych experiment: it is seen when there is a change in the responses of participants due to their belief that they are receiving some kind of experimental treatment and they respond in accordance with that belief.</p>	A patient recovers from an illness or pain when they have been given a substance or treatment that has no actual medicinal or therapeutic value at all!
Ways to Minimise this Extraneous Variable		
Perform a single-blind procedure where the participants don't know if they are in the experimental or control group of an experiment. The single-blind procedure acts as a control for the placebo effect.		

Name of the Extraneous Variable	Description	Examples
Experimenter Effects	Occurs when there is a change in a participant's response due to the researcher's (experimenter's) expectations, biases or actions, rather than the effect of the IV.	<p>An experimenter testing feelings of happiness after eating ice-cream smiles and makes jokes to participants as he hands out surveys.</p> <p>OR</p> <p>Same experiment but the experimenter now yells at them to "hurry up" and tells them "you're fat".</p>
Ways to Minimise this Extraneous Variable		
Perform a double-blind procedure. In a double-blind procedure both the participants and the experimenter don't know which group the participants have been allocated to in an experiment, the experimental or control group. The double-blind procedure controls for the placebo effect and the experimenter effect.		
Experimenter Bias	Part of the experimenter effect – but involved in the collection of treatment and data.	You are the experimenter and want to find out whether the colour red makes people happy. Unfortunately 56% of participants wrote that red usually makes them feel mad. You "forget" to enter in this data.
Order Effects	When performance as measured by the DV is influenced by the specific order in which the conditions, treatments or tasks are presented.	<p>Determining the effect of drinking alcohol on driving.</p> <p>When you are first tested on the driving simulator – you are sober.</p> <p>But when you are next tested on the driving simulator you are intoxicated.</p>
Ways to Minimise this Extraneous Variable		
<p>Use counterbalancing.</p> <p>Counterbalancing involves systematically changing the order of treatments or tasks for participants in a 'balanced' way to 'counter' the biasing influence or unwanted effects on performance of any one order.</p>		

Name of the Extraneous Variable	Description	Examples
Use of non-standardised instructions and procedures	Each participant does not experience exactly the same procedure. All in the control group are exposed to IV still-but in general all participants experience something slightly different due to different instructions or procedures provided by researcher.	When each researcher tests a participant in their own home – the experience would be different for all participants.
Ways to Minimise this Extraneous Variable		
<p>Use standardised instructions and procedures.</p> <p>This means that the instructions given to all participants for each condition need to be predetermined and identical. The techniques used for making observations and measuring responses should also be identical and all participants should be treated in the same way.</p>		

QUESTION 7 (VCAA SAMPLE EXAM 2017)

In an experiment, it is essential to control for extraneous variables so that:

- A There is a probability that the results will be obtained by chance.
- B A valid conclusion can be drawn about the effect of the independent variable on the dependent variable.
- C A valid conclusion can be drawn about the effect of the dependent variable on the independent variable.
- D The hypothesis is supported and the results of the experiment can be generalised to the broader population.

HOW PARTICIPANTS ARE SELECTED FOR A STUDY (SAMPLING)

The **participants** are the people selected for use in a psychological study. The **sample** refers to a **smaller representative subset of participants** drawn from the larger population of research interest. (To be representative of the larger population the sample must have one or more characteristics in common with the people represented.)

The **population** refers to the larger group of research interest from which the sample is drawn. (A population refers to a particular group who have one or more characteristics in common – all VCE students; only female VCE students; and may be large or small.)

RANDOM SAMPLING

Random Sampling occurs when every member of the population of research interest has an equal chance of being selected as a participant in the study, and the selection of one participant doesn't affect the selection of others. (A table of random numbers or a lottery process can be used. Remember, if a sample isn't random it is a **biased sample** – and therefore invalid.)

STRATIFIED SAMPLING

Stratified Sampling occurs when a population of research interest is divided into distinct groups or 'strata', and then samples are drawn from each stratum in the same proportions as they occur in the target population. For example, a stratified sample might consist of 100 people who earn below \$40,000 dollars per year; \$55,000 dollars per year; \$70,000 per year; and those who earn above \$100,000 per year.

The **advantage of stratified sampling** is that participants in the study are equally represented in the same proportion as they occur in the larger population of research interest. Income, age, gender, religion, ethnic background, IQ score, educational level and residential area are often used to divide a population into separate strata.

RANDOM-STRATIFIED SAMPLING

Random-stratified sampling occurs when a population of research interest is divided into distinct groups or 'strata', and then random samples are drawn from each stratum in the same proportions as they occur in the target population. For example, a stratified sample might consist of 100 people who earn below \$40,000 dollars per year **randomly chosen**; \$55,000 dollars per year **randomly chosen**; \$70,000 per year **randomly chosen**; and those who earn above \$100,000 per year **randomly chosen**.

HOW PARTICIPANTS ARE DISTRIBUTED TO THE GROUPS IN A STUDY (ALLOCATION)

Participant allocation simply involves distributing the participants of the sample into the different groups involved in the study or experiment.

Random allocation (or assignment) means that every participant in the experiment has an equal chance of being in any of the groups used in a study. It is an important means of experimental control. Note the difference between random selection (which moves from population of research interest to sample) and random allocation (which moves from sample to experimental/control groups).

Experiments have two different groups:

- The experimental group
- The control group

The **experimental group** is exposed to the **independent variable** (and experimental conditions) in an experiment. The purpose of the experimental group is to determine the effect that the IV has on the value of the DV.

The **control group** is not exposed to the **independent variable** (control condition), but **treated exactly the same** as the experimental group in **all** other respects. It provides a baseline for comparison with the results of the experimental group.

IMPORTANT TERMS TO BE AWARE OF

- A **placebo** is an inactive or fake substance or treatment.
- The **placebo effect** occurs if a participant's response (or behaviour) is affected by the expectation that a particular 'treatment' will produce a particular effect or change in behaviour. (It is sometimes seen in medical settings when people are given fake medications and their condition improves.)
- In a **single-blind** procedure participants don't know if they are in the experimental or control group in an experiment. The single-blind procedure acts as a control for the placebo effect.
- The **experimenter effect** occurs unintentionally when the experimenter's personal characteristics, actions or treatment of the participants or data collection/ interpretation affects the dependent variable, and therefore the results of an experiment (sometimes called experimenter bias).
- In a **double-blind procedure** both the participants and the experimenter don't know which group the participants have been allocated to in an experiment, the experimental or control group. The double-blind procedure controls for the placebo effect **and** the experimenter effect.

EXPERIMENTAL DESIGNS

There are three different experimental designs that you must be familiar with:

1. Having two or more entirely separate groups in an experiment (**the between subjects design**).
2. Matching participants in pairs, and then randomly allocating each one of the pair to the separate groups in the experiment (**the matched participants design**).
3. **Testing the same participants in all conditions tested in an experiment, usually a control and experimental group** (the repeated measures design).

Experimental Design	Advantages of Design	Limitations of Design
<p>Within subjects Design</p> <p>A within subjects design is where each participant is involved in both the experimental and control conditions in the experiment.</p> <p>i.e. Each participant is tested twice</p>	<p>Controls participant-related extraneous variables because the same participants are used in the control and experimental condition, so the effects of individual differences are balanced out and identical in both groups.</p> <p>Fewer participants are required than in some other investigations designs such as the between subjects groups, thus making is cost effective.</p>	<p>The order effect refers to the improvement or decline in the participants' performance on a task due to the practice and experience gained in the first task or condition in an experiment or boredom.</p> <p>The order effect can be controlled by counterbalancing which reverses the order of the experiment conditions.</p>
<p>Between Subjects Design</p> <p>An independent groups design is where each participant is randomly allocated to one of two or more entirely separate groups, usually an experimental and control group.</p>	<p>As entirely separate groups of participants are used, there is little possibility that the order effect will affect the participants' responses as it can in the within subjects design.</p>	<p>Although random allocation is used, there is less control over participant-related extraneous variables (like IQ and motivation) which may not be evenly distributed between the groups – especially if the sample of participants is relatively small.</p>

Experimental Design	Advantages of Design	Limitations of Design
<p>Mixed Design</p> <p>A mixed design uses a combination of both a between subjects design (by allocating participants to separate groups) and a within subjects design (by testing participants both before and after they have been exposed to an IV)</p>	<p>Eliminates participant- related extraneous variables and also generates more precise and detailed results as the effects of an order effect can be compared between separate groups</p>	<p>There may be other variables that affect the IV such as a placebo effect or an experimenter affect which impact the behaviour/ performance of the participants across the different phases of the experiment</p>

Note that particular designs are better at eliminating extraneous variables than others.

- **A between subjects and a mixed design are effective at eliminating extraneous variables.**

A disadvantage of these designs is that an order effect occurs, which can be controlled by counterbalancing. As you can imagine, this is not suitable for studying all phenomena.

- **Between subjects design** results in large numbers of extraneous variables and large sample sizes **MUST BE USED**.

Use the following information to answer Question 8 & 9:

Dr Chan investigated the effects of caffeine on an individual's response to a physical stressor. She designed and administered an experiment involving 20 individuals (10 male and 10 female), aged between 20 and 40 years old, with no existing medical conditions. In Condition 1 of the experiment, participants were required to drink a 100 mL cola drink that contained no caffeine. In Condition 2 of the experiment, the same participants were then required to drink a 100 mL cola drink that contained 20 mg of caffeine.

QUESTION 8 (ADAPTED FROM THE VCAA 2017 EXAM)

What type of research design has Dr Chan used in her experiment?

- A between subjects
 - B within subjects
 - C mixed design
 - D fieldwork
-
-

QUESTION 9 (VCAA 2017)

Which one of the following research methodologies/techniques was used by Dr Chan to minimise potential confounding and extraneous variables in the experiment?

- A Use of a placebo
 - B Counterbalancing
 - C Stratified sampling
 - D A double-blind procedure
-
-

QUESTION 10 (EXTRACT FROM VCAA 2017)

New study finds caffeine prevents stress

by Samantha Delagonda

Chronic stress has a number of negative effects, including lowered mood and impairments of memory.

In new research conducted with mice, Dr Rodrigo Cunha and his colleagues claim to have provided the first evidence of a causal link between caffeine consumption and the prevention of stress, including the effects of caffeine on mood and memory.

Cunha and his colleagues first allocated the mice into two matched groups. One group was given caffeine in its drinking water for a period of three weeks and the other group was given a placebo substance in its water for a period of three weeks. During this time, half of the mice in the caffeine group and half of the mice in the placebo group were exposed to chronic stress. The other half of the mice in each group were not exposed to chronic stress.

Therefore, there were four groups of mice: placebo plus stress (P+S), placebo without stress (P-S), caffeine plus stress (C+S) and caffeine without stress (C-S).

After the three-week period, the mice from all four groups were tested on measures of mood and memory performance. The amount of sweetened water consumed was used to measure mood in the mice, with a lower consumption of sweetened water indicating lower mood. The number of trials taken to learn a maze was used to measure memory performance, with fewer trials in the maze being associated with better memory performance.

The results showed that the mice in the P+S group drank less of the sweetened water and took more trials to learn the maze than the mice in the P-S group. In contrast, the mice in the C+S and C-S groups performed similarly to each other, and did not differ from the mice in the P-S group on either measure.

Dr Cunha explained the results by saying that caffeine consumption appeared to prevent the effect of stress on mood and memory by acting as an antagonist for a substance called adenosine in the brain. Adenosine normally lowers mood and alertness, which can impair memory function.

In terms of the scientific research methodologies and techniques outlined in the article name the type of experimental research design used and identify one advantage of using this type of design. (2 marks)

TYPES OF DATA

There are various types of data:

- **Qualitative Data:**
Refers to descriptions of the characteristics of what is being studied.
- **Quantitative Data:**
Refers to measurements, numerical information about the variables being studied.
- **Primary Data:**
Refers to original data that has been gathered, measured, organised by a researcher.
- **Secondary Data:**
Refers to data that has been sourced from a third party in the form of data generated from past research.

Collection of data is completed through controlled experiments, case studies, fieldwork and correlational studies.

The quality of data collection and its validity is essential to the success of the research.

The following table summarises the types of variables that apply to VCE Psychology.

Type of Variable	Definitions
Independent	An independent variable is the variable for which quantities are manipulated (selected or changed) by the experimenter, and assumed to have a direct effect on the dependent variable. Independent variables are plotted on the horizontal axis of graphs.
Dependent	A dependent variable is the variable the experimenter measures, after selecting the independent variable that is assumed to affect the dependent variable. Dependent variables are plotted on the vertical axis of graphs.
Controlled	Controlled variables are variables that have the potential to affect the dependent variable, thus are controlled in order to eliminate their potential to act as extraneous or confounding variables.
Extraneous	Any variable that is not intentionally studied in an experiment is an extraneous variable and must be controlled (kept constant), or at least monitored, in order that it does not threaten the internal validity of experimental results by becoming a confounding variable.
Confounding	Confounding variables are types of extraneous variables that correlate either directly or inversely with both the independent and dependent variables and can interfere with the validity of the experiment by providing alternative explanations for experimental results.

QUESTION 11

Which is an example of qualitative data?

- A 10 answers to the question: How old were you when you first remember doing something naughty?
 - B An answer to the question: How fast were the cars going when it hit the bus?
 - C An answer to the question: Why do you believe that you could resist eating that chocolate?
 - D Five diary entries that tick off a list of things that did or did not happen that day.
-
-

QUESTION 12

Gender and state are examples of which type of data?

- A Discrete data
 - B Continuous data
 - C Categorical data
 - D Ordinal data
-
-

QUESTION 13

Data that arises from counts is called

- A Continuous data
 - B Nominal data
 - C Discrete data
 - D Continuous data
-
-

MEASURES OF CENTRAL TENDENCY

Measures of central tendency tell us how the data are clustered near the central point of the dataset. Using the descriptive statistics, we can quickly calculate these three measures.

Consider the following data set:

88, 111, 111, 102, 111, 94, 130, 125, 99, 105, 125, 119

Rearranging this data set in increasing order gives:

88, 94, 99, 102, 105, 111, 111, 111, 119, 125, 125, 130

MEAN:

The average of all the scores, calculated by adding up all the scores and dividing that total by the number of scores.

e.g. $88 + 94 + 99 + 102 + 105 + 111 + 111 + 111 + 119 + 125 + 125 + 130 = 1320$

The mean score for this group of data is 110 ($1320 \div 12 = 110$)

MEDIAN:

The score that occurs exactly halfway between the lowest and the highest score when arranged in order.

There are 12 values which means that the median will occur half-way between the sixth and seventh value.

$$\text{Median} = \frac{111+111}{2} = 111$$

The median score for this group of data is 111.

MODE:

The most commonly occurring score in the dataset. For this dataset, the mode is 111.

MEASURES OF VARIABILITY

Measures of variability tell us about how scores are spread out. When used along with measures of central tendency, they tell us a great deal about the features of the dataset.

Consider the following data set:

88, 111, 111, 102, 111, 94, 130, 125, 99, 105, 125, 119

Rearranging this data set in increasing order gives:

88, 94, 99, 102, 105, 111, 111, 111, 119, 125, 125, 130

RANGE:

The most basic of these measures, range is simply the difference between the highest score and the lowest score in the dataset.

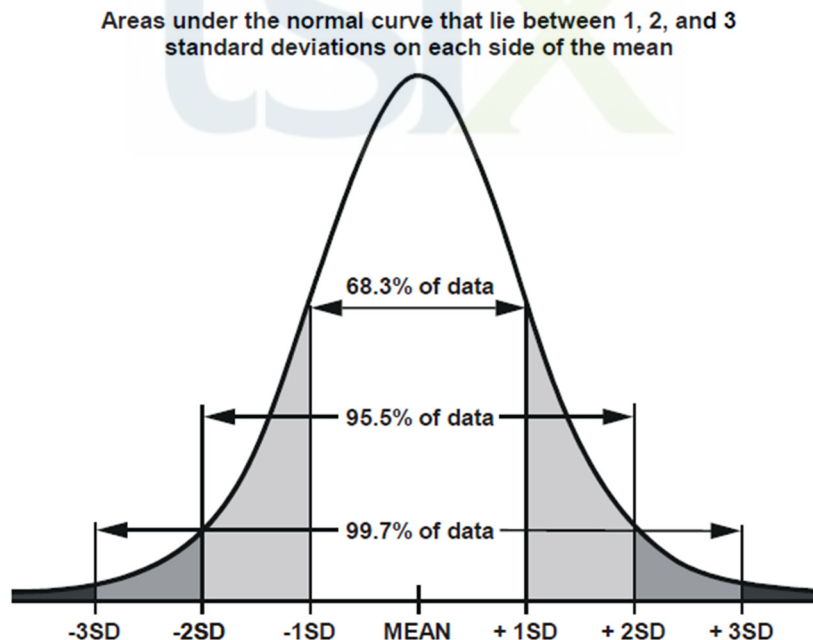
In the dataset above, the range is $130 - 88 = 42$.

The larger the range the more variance of scores across the sample, the smaller the range indicates less variance across the sample.

STANDARD DEVIATION:

The standard deviation is a very useful measure that tells us how far, on average, scores are different from the mean. This is done by taking the square root of the mean variance.

Consider the following normal distribution curve:



In a normal curve, a certain set percentage of scores will fall within one, two, three or four standard deviations of the mean. A low standard deviation is indicative of a small amount of variation in the scores, that is most scores are clustered around the mean, whereas a high standard deviation indicates much more variability across the scores.

Note: Although data sets may have the same mean they may not have the same degree of variation, or spread, in the data.

Use the following information to answer Questions 14 and 15.

As part of an experiment, a psychologist records the number of correct responses on a memory test. He records the following scores:

11, 15, 17, 24, 19, 28, 27, 28, 15, 15, 15, 19, 16

QUESTION 14

The mode for this set of data is:

- A 15
 - B 17
 - C 19
 - D 27
-
-

QUESTION 15

The median for this set of data is:

- A 15
 - B 16
 - C 17
 - D 18
-
-

DRAWING CONCLUSIONS FROM RESEARCH STATISTICS

Obviously, this is what research originally sets out to do – to draw conclusions and find out something useful about the population of interest.

Generalisation of results occurs after the research is complete. For this to be possible, the following criteria must be met:

- The results show statistical significance
- The sample was large and representative of the population
- All sampling procedures were appropriate (eg. Stratified random sampling)
- All experimental procedures were appropriate (eg. Standardised instructions, use of a placebo, etc)
- All measures were valid (eg. The test measured what it was supposed to be measuring)
- All possible confounding variables were controlled.(eg. Temperature was kept constant in a study on aggression, using repeated measures research design if appropriate).

The good news is that in psychology, although we use statistics, we never have to calculate more than the very simplest of them. Computer programs and calculators do it all for us! It is very useful, however, to know how these statistics work and what they mean.

THE QUALITY OF RESEARCH

VALIDITY

Validity refers to the extent to which an instrument measures what it is *supposed* to measure. Basically, the research design and the specific procedures used should match the requirements of the investigation to produce results that are relevant to the aims of the research.

- **Internal Validity:**

This examines whether the results gained from a measure are truly due to the variable that it is thought to be measuring. Two forms of internal validity are:

- **External Validity:**

This is a criterion-related validity that refers to the extent to which results from this measure are comparable with other, established measures of the variable.

Experimental data is said to be valid if the measurements that have been made are affected by a single IV only. They are not valid if the investigation is flawed and extraneous variables have not been controlled.

If a research study has a high level of validity, this means that the investigation has produced results that accurately measure the behaviour or mental process that was claimed to have been measured.

Validity also relates to the conclusions (including any generalisation) the researcher makes about a study. In this case, the results are considered valid if the conclusion(s) drawn by the researcher is (are) correct. This means that the conclusion is specifically based on those variables that the study was investigating, and the data obtained from the study.

QUESTION 16

Internal validity relates to

- A How much we can generalise the result to other situations.
 - B How much we can generalise the result to other samples from the same population.
 - C How well the data agree with the experimental hypothesis.
 - D How well the features of the experimental design allow us to relate the data to the experimental question.
-
-