GCSE to A-level progression: Scientific skills student booklet

Introduction

Aims of this transition guide

- To provide an introduction to psychology as a science.
- To support your transition from GCSE to A-level Psychology by outlining and explaining the role played by science and research skills in the study of Psychology.
- To help you practise applying your research methods knowledge and skills to a psychological context.
- To help build your confidence and readiness to study A-Level Psychology.

Psychology is a science

The British Psychological Society (BPS) defines Psychology as 'the science of mind and behaviour.' As a science, Psychology requires research to test hypotheses, so that researchers come to conclusions which are based on evidence. This is the why research methods play such an important role in your studies of A-level Psychology.

You will also see the importance of science when you consider the aims of the A-level Psychology specification:

- to develop and demonstrate a deep appreciation of the skills, knowledge and understanding of scientific methods
- to develop competence and confidence in a variety of practical, mathematical and problem-solving skills.
- to understand how society makes decisions about scientific issues and how the sciences contribute to the success of the economy and society.

In addition, the Assessment Objectives for A-level Psychology reflect how important science is when studying Psychology.

Assessment Objectives (AOs) are set by Ofqual and are the same across all AS and A-level Psychology specifications and all exam boards.

A01	A02	A03
AO1: Demonstrate knowledge and understanding of scientific ideas, processes, techniques and procedures	**AO2**: Apply knowledge and understanding of scientific ideas, processes, techniques and procedures: • in a theoretical context • in a practical context • when handling qualitative data • when handling quantitative data.	**AO3**: Analyse, interpret and evaluate scientific information, ideas and evidence, including in relation to issues, to: • make judgements and reach conclusions • develop and refine practical design and procedures

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Making the links – connecting GCSE study to A-level

We learn best when we make links between new learning and what we already know and understand. By building on this, we make better use of our learning time and avoid unnecessary duplication. We can do this by recognising that some of the concepts and skills previously learned in science can be applied to Psychology too; the difference is that we are now applying the skills to a psychological context.

When studying science at school (eg GCSE Combined Science/Biology/Chemistry/Physics), you will have learned about Working Scientifically. By studying this, you will have developed your scientific thinking and a range of research skills including experimental skills, such as hypotheses, identifying variables, planning and carrying out investigations, drawing conclusions, analysing data and evaluating methods and findings.

Working Scientifically is closely aligned to the 'Research methods' topic on the A-level Psychology specification, where you will find that you're already familiar with the following:

- designing research
- conducting research
- analysing and interpreting data.

Take some time to remind yourself of some of the material that you have already studied in Working Scientifically.

Working Scientifically – GCSE science

1. Development of scientific thinking

- Understand how scientific methods and theories develop over time.
- Use a variety of models such as representational, spatial, descriptive, computational and mathematical to solve problems, make predictions and to develop scientific explanations and understanding of familiar and unfamiliar facts.
- Appreciate the power and limitations of science and consider any ethical issues which may arise.
- Explain everyday and technological applications of science; evaluate associated personal, social, economic and environmental implications; and make decisions based on the evaluation of evidence and arguments.
- Evaluate risks both in practical science and the wider societal context, including perception of risk in relation to data and consequences.
- Recognise the importance of peer review of results and of communicating results to a range of audiences.

2. Experimental skills and strategies

- Use scientific theories and explanations to develop hypotheses.
- Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena.
- Apply a knowledge of a range of techniques, instruments, apparatus, and materials to select those appropriate to the experiment.
- Carry out experiments appropriately having due regard to the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations.
- Recognise when to apply a knowledge of sampling techniques to ensure any samples collected are representative.
- Make and record observations and measurements using a range of apparatus and methods.
- Evaluate methods and suggest possible improvements and further investigations.

3. Analysis and evaluation

Apply the cycle of collecting, presenting and analysing data, including:

- presenting observations and other data using appropriate methods
- translating data from one form to another
- carrying out and represent mathematical and statistical analysis
- representing distributions of results and make estimations of uncertainty
- interpreting observations and other data (presented in verbal, diagrammatic, graphical, symbolic or numerical form), including identifying patterns and trends, making inferences and drawing conclusions
- presenting reasoned explanations including relating data to hypotheses
- being objective, evaluating data in terms of accuracy, precision, repeatability and reproducibility and identifying potential sources of random and systematic error
- communicating the scientific rationale for investigations, methods used, findings and reasoned conclusions through paper-based and electronic reports and presentations using verbal, diagrammatic, graphical, numerical and symbolic forms.

Activity 1: Working Scientifically

- You will encounter much of what you have already studied in Working Scientifically when you study the 'Research methods' topic in AQA A-level Psychology.
- The table below is an extract from the 'Research methods' specification content that you will cover in AQA A-level Psychology. (You will find full details of the topic on page 20–21 of the specification under 'Research methods').
- Put a tick beside the material that you have already covered during your studies of 'Working Scientifically' at GCSE.

Research methods	Tick if covered
Experimental method: types of experiment, laboratory and field experiments; natural and quasi-experiments.	
Observational techniques. Types of observation: naturalistic and controlled observation; covert and overt observation; participant and non-participant observation.	
Self-report techniques. Questionnaires; interviews, structured and unstructured.	
Correlations. Analysis of the relationship between co-variables. The difference between correlations and experiments.	
Content analysis	
Case studies	
Aims: stating aims, the difference between aims and hypotheses	
Scientific processes	**Tick if covered**
Hypothesis: directional and non-directional.	
Sampling: the difference between population and sample; sampling techniques including: random, systematic, stratified, opportunity and volunteer; implications of sampling techniques, including bias and generalisation.	
Pilot studies and the aims of piloting. Experimental designs: repeated measures, independent groups, matched pairs.	
Observational design: behavioural categories; event sampling; time sampling.	
Questionnaire construction, including use of open and closed questions; design of interviews.	
Variables: manipulation and control of variables, including independent, dependent, extraneous, confounding; operationalisation of variables.	
Control: random allocation and counterbalancing, randomisation and standardisation.	
Demand characteristics and investigator effects.	
Ethics, including the role of the British Psychological Society's code of ethics; ethical issues in the design and conduct of psychological studies; dealing with ethical issues in research.	
The role of peer review in the scientific process.	
The implications of psychological research for the economy.	
Reliability across all methods of investigation. Ways of assessing reliability: test-retest and inter-observer; improving reliability.	
Types of validity across all methods of investigation: face validity, concurrent validity, ecological validity and temporal validity. Assessment of validity. Improving validity	
Features of science: objectivity and the empirical method; replicability and falsifiability; theory construction and hypothesis testing; paradigms and paradigm shifts.	
Reporting psychological investigations. Sections of a scientific report: abstract, introduction, method, results, discussion and referencing.	

Activity 2: Research methods

We will now focus on the following aspects of Working Scientifically/Research methods:

- hypothesis
- independent and dependent variables
- correlational research
- undertaking a practical investigation.

Research methods 1: Hypothesis, independent and dependent variables

What do you need to know?

A-level Psychology specification

- Hypotheses: directional and non-directional
- Variables: manipulation and control of variables, including independent, dependent.

Add a clear definition to each of the terms in the table below. These links may help:

Independent and Dependent Variables | tutor2u
What is a Hypothesis? | Simply Psychology

Term	Definition
Hypothesis	
Independent variable	
Dependent variable	

Activity 3: Past paper questions (science/investigative skills)

Before applying your Working Scientifically knowledge and skills to psychological contexts, firstly complete some past paper questions from science. This will serve as a reminder of your knowledge of hypothesis, independent and dependent variables.

Need a reminder? Our glossary of GCSE Science terms may help.

Question 1

Almost 200 years ago, an important investigation into plant growth was carried out.

George Sinclair, the Duke of Bedford's head gardener, planted seeds in 242 plots of land, each four feet square.

Charles Darwin concluded from this investigation:

If a plot of ground is sown with one species of grass and a similar plot is sown with several different species of grass, the second plot will produce a greater number of plants and a greater mass of plant material.

(i) What **two** factors are named in Darwin's conclusion as the measurable outcomes in the investigation?
(These are the dependent variables.)

1. .....

2. .....

[1 mark]

Question 2

Caffeine is a drug found in coffee.

After a person drinks coffee information passes through neurones in the nervous system more quickly.

Suggest a hypothesis for the effect of caffeine concentration on reaction time.

_____

_____

[1 mark]

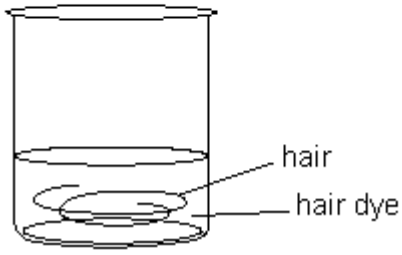
Question 3

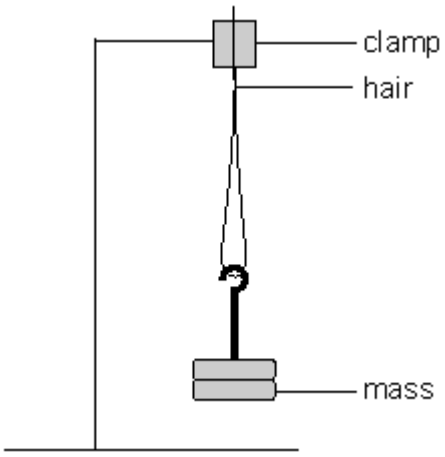
Jason wanted to find out if hair dye makes hair weaker.

He used 5 hairs of equal length.

He soaked each hair in a different concentration of hair dye for 15 minutes.

He added masses to each hair until it broke.





not to scale

(a) What was the independent variable ?

[1 mark]

(b) What was the dependent variable ?

[1 mark]

Question 4

Two groups of pupils investigated the factors affecting the time taken for an indigestion tablet to dissolve in 100 cm^3 of water.

Group 1 recorded their results in the table below.

Results of Group 1

tablet	time taken to dissolve (s)
whole tablet	34
broken tablet	28
finely crushed tablet	22

(a) What factor did Group 1 change as they carried out their investigation?

[1 mark]

(b) Group 2 investigated how the temperature of the water affects the time taken for a whole tablet to dissolve.

Here are their results.

Results of Group 2

temperature of water (ºC)	time taken to dissolve (s)
65	24
40	35
15	90
5	100

What factor did Group 2 change as they carried out their investigation?

[1 mark]

(c) What pattern do the results recorded by Group 2 show?

[1 mark]

Question 5

Neera and Tom dissolved different masses of salt in 500 cm^3 of water.

They measured the temperature at which each salt solution boiled.

(a) What is the independent variable in their investigation?

[1 mark]

(b) What is the dependent variable in their investigation?

[1 mark]

Activity 4: Psychology past paper questions (hypothesis, independent and dependent variables)

Before completing the Psychology questions, it is useful to consider how to write an effective hypothesis in Psychology.

- It should be a clear, testable statement (do **not** present in the form of a question).
- Both conditions of the independent variable are stated within the hypothesis.
- The dependent variable is operationalised (ie it is clear how it was measured).

Consider this example:

'Students who have not eaten breakfast will answer fewer questions correctly than students who have eaten breakfast.'

Hypothesis	Yes or no
Is it a testable statement?	Yes.
Are both conditions of the IV stated?	Yes – both conditions stated (eaten breakfast/not eaten breakfast).
Is it clear how the DV was measured?	Yes – measured by the number of questions answered correctly.

Complete the following past paper questions from Psychology.

Question 1

A Psychology teacher had the idea that her students were more alert in the mornings than in the afternoons. To test this idea, she conducted an experiment.

This is what she did.

- She measured alertness by giving her students a page of writing to read that contained 30 spelling errors. They had to find these errors.
- She gave each of her students two minutes to underline every error that they could find.
- She then counted the number of errors that they correctly underlined.
- 19 students took part in the experiment. She used random allocation to assign the students to either Condition A or Condition B.
- In Condition A the students completed the task in the morning.
- In Condition B the other students completed the task in the afternoon.

(a) Identify the dependent variable in this experiment.

Tick the correct box.

Whether participants worked in the morning or in the afternoon	
The 30 errors	
The number of errors correctly underlined	

[1 mark]

(b) Write a suitable hypothesis for this experiment.

_____

_____

[2 marks]

Question 2

A psychologist conducted an experiment to find out if people reacted more quickly to a ringing bell or to a flashing red light. Each participant sat in front of a machine which could make a sound like a ringing bell, or could flash a red light. The participant had to press a button on the machine immediately when they:

- heard a bell ring

or

- saw a red light flash.

The machine recorded their reaction times in milliseconds.

(a) (i) Identify the independent variable in this experiment.

[1 mark]

(ii) Identify the dependent variable in this experiment.

[1 mark]

(b) Write a suitable hypothesis for this experiment.

[2 marks]

Question 3

Read the item and then answer the questions that follow.

A psychologist conducted a memory experiment, showing people sets of numbers and then taking the numbers away and asking them to write down what they had seen.

- In Condition A, participants saw nine numbers written in groups of three for 10 seconds, for example, 746 826 392. They were then given 10 seconds to write down the numbers they had seen. This was repeated 10 times with different sets of numbers.
- In Condition B, the same participants saw nine numbers written in one group of nine for 10 seconds; for example, 746826392. The participants were given ten seconds to write down the numbers they had seen. This was repeated 10 times with different sets of numbers.

The psychologist recorded the total number of recall errors made by each participant.

(a) What is an independent variable?

[1 mark]

(b) What is a dependent variable?

[1 mark]

(c) Write a suitable hypothesis for this experiment.

[2 marks]

Question 4

A psychology teacher had an idea that students who study drama are more extravert than students who do not study drama. She wanted to find out whether or not this is true and decided to conduct an experiment. This is what she did.

- She asked all 30 members of her Year 11 psychology class whether or not they studied drama. She discovered that half of her class did study drama.
- After obtaining their consent to take part in the experiment, she asked every member of her class to complete the EPI (a personality test). The test measures extoversion. The higher the score, the more extroverted a person is.
- She calculated the mean extroversion score for the students who studied drama and the mean extraversion score for the students who did not study drama.

(a) (i) Identify the independent variable in this investigation.

Tick the correct box.

The EPI (a personality test)	☐
The extroversion score for each student	☐
Whether or not the students studied drama	☐

[1 mark]

(ii) Identify the dependent variable in this investigation.

Tick the correct box.

The EPI (a personality test)	☐
The extroversion score for each student	☐
Whether or not the students studied drama	☐

[1 mark]

(b) Write a suitable hypothesis for this study.

[2 marks]

Question 5

A Psychology teacher was worried that the temperature in her classroom was having an effect on her students' performance in tests. She thought students performed better when the temperature was cool compared with when it was warm. She decided to conduct an experiment using two of her GCSE Psychology classes as participants.

This is what she did:

- One morning, she adjusted the classroom temperature to 25 °C (the warm condition). Then she gave a test containing 30 questions to the GCSE students who were in the classroom.
- Later that day, for her other class of students, she adjusted the classroom temperature to 18 °C (the cool condition). Then she gave the same test to these GCSE students who were in the classroom.
- To measure each student's performance, she counted the total number of questions they answered correctly.
- None of the students in either class realised that they were taking part in the experiment.

(i) Identify the independent variable in this experiment.

Tick the correct box.

The test containing 30 questions	
The number of questions answered correctly	
Whether the temperature was cool or warm	

[1 mark]

(ii) From the following statements, choose the **one** that is written as a testable hypothesis for this experiment.

Tick the correct box.

More will answer questions correctly when the temperature is cool compared with when it is warm.	
Students will answer more questions correctly when the temperature is cool compared with when it is warm.	
Students are more likely to answer questions better when the temperature is cool compared with when it is warm.	

[1 mark]

Activity 5: Correlational research

Research methods 2: Correlational research

What do you need to know?

A-level Psychology specification
Correlations

- Analysis of the relationship between co-variables.
- The difference between correlations and experiments.

Three things you remember from your studies of correlation

Correlational research

- Used to establish the relationship between two variables (known as co-variables).
- The data for correlation is gathered through methods such as surveys (questionnaires and interviews),and naturalistic observation (observation of naturally occurring behaviour).
- The data collected is statistically analysed to measure the relationship between the two co-variables.
- Correlations are plotted on a type of graph called a scattergram.
- There are different types of correlational relationships, for example positive correlations and negative correlations.
- There are different strengths of correlational relationships, for example: no correlation, weak correlation, moderate correlation, strong correlation.
- Correlation is an important technique when it would not be ethical to carry out an experiment in psychology.
- A limitation of correlational research is that the researcher **cannot** conclude a cause and effect relationship from correlational research as there may be another variable that has not been controlled.

Activity 5a

Place the correct letter in the table below.

A – as one variable increases the other variable increases

B – as one variable increases the other variable decreases

C – there is no relationship between the variables

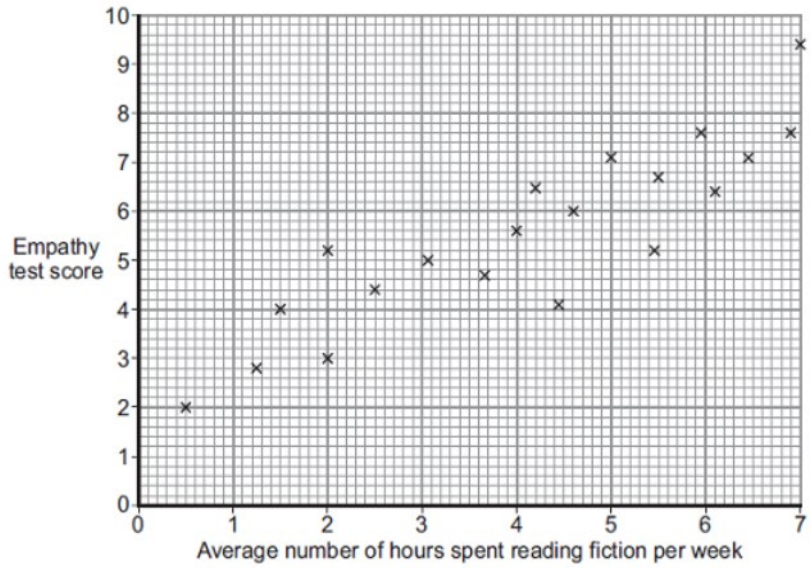
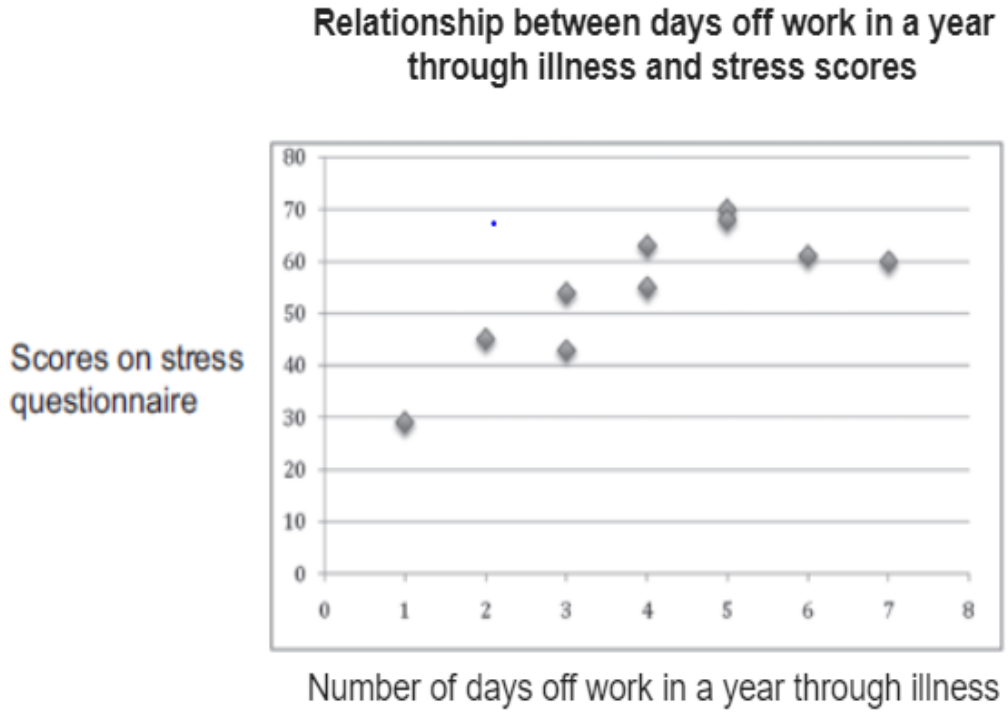
Type of correlation	Letter
Positive	
Negative	

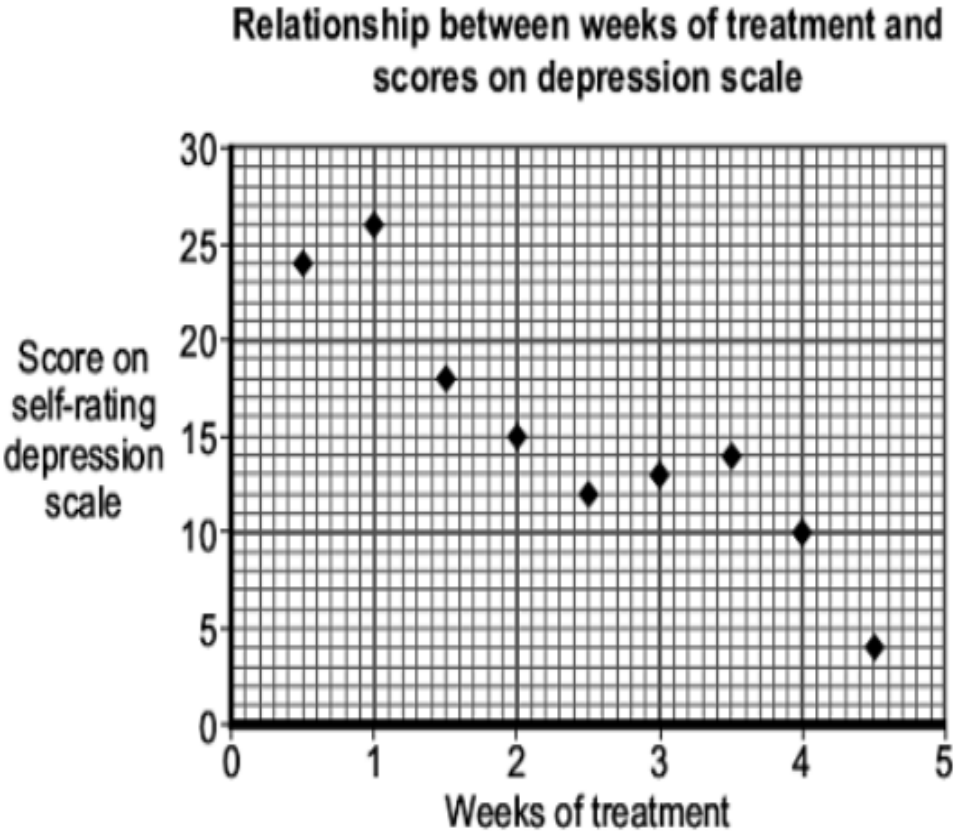
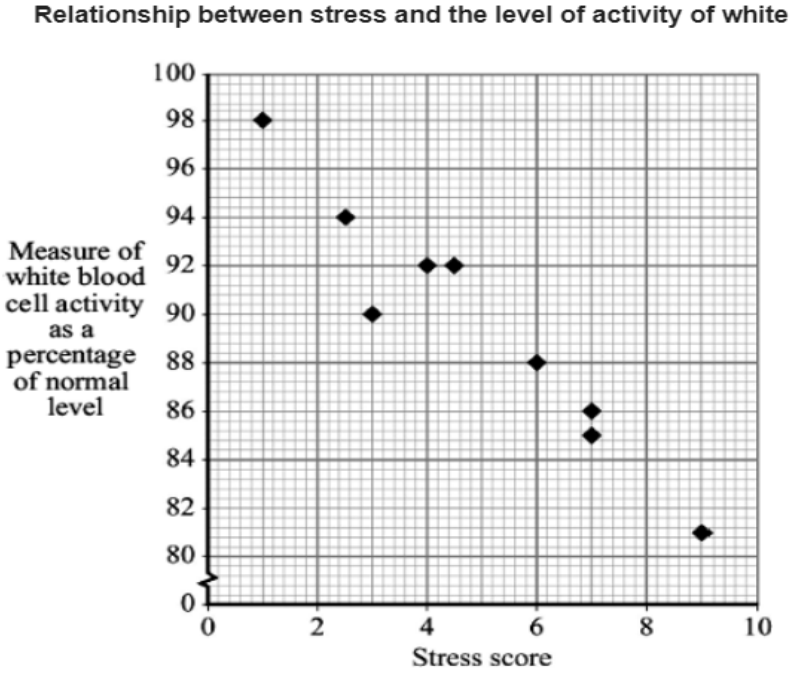
Scattergrams – correlations are plotted on a particular type of graph called a **scattergram.**

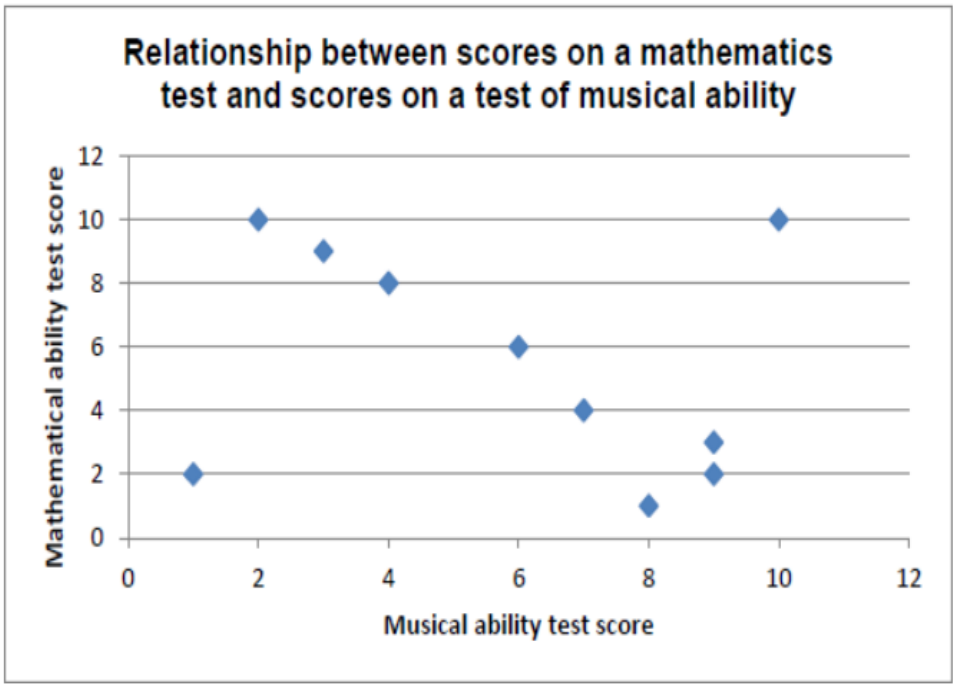
Need a reminder? BBC Bitesize have a useful summary of scattergrams.

Activity 5b: Positive and negative correlations

Identify the type of relationship shown in the graphs below – identify whether it is a positive or negative correlation.

Scattergram	Type of relationship
Scattergram of children's scores on a test of empathy and the average number of hours spent reading fiction per week.  	
 	

Scattergram	Type of relationship
	
	

Scattergram	Type of relationship
	

Activity 5c: Correlation questions

Complete the following past paper questions.

Question 1

Read the following statement and decide whether it is **TRUE** or **FALSE**. Write either **TRUE** or **FALSE** on the line below the statement.

The findings from correlations can show that a change in one variable has caused a change in the other variable.

[1 mark]

Question 2

The following statements are advantages and limitations of different research methods. Only **two** of them are about correlations. Which **two** are they?

Tick **two** boxes only.

This method provides detailed information about individuals.	
This method cannot establish cause and effect.	
This method allows a researcher to see if there is a relationship between two variables.	
This method allows the researcher to control all variables.	

[2 marks]

Question 3

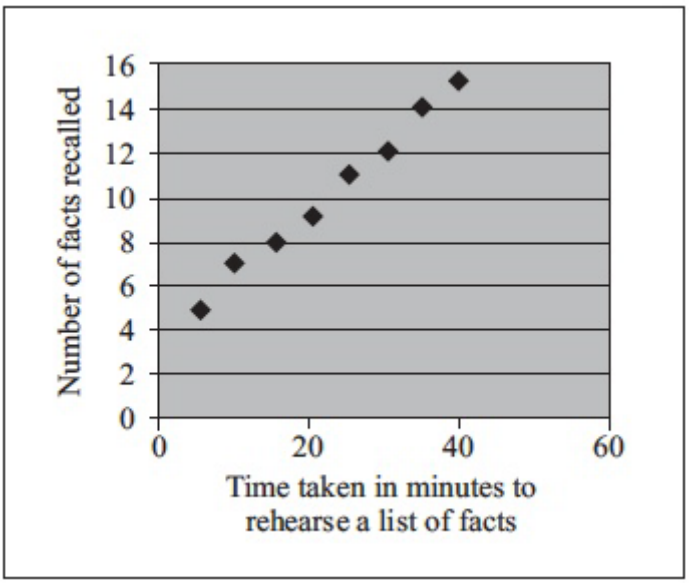
Which of the following statements is **TRUE**?
Tick the correct box.

Correlations can show the strength of a relationship between two variables.	
Correlations show the causes of behaviour.	

[1 mark]

Question 4

A teacher wanted to find out whether there was a relationship between the amount of time her students spent rehearsing a list of facts and the number of facts they could remember. She plotted her findings in a scatter graph.



Identify the type of relationship shown in the scatter graph.

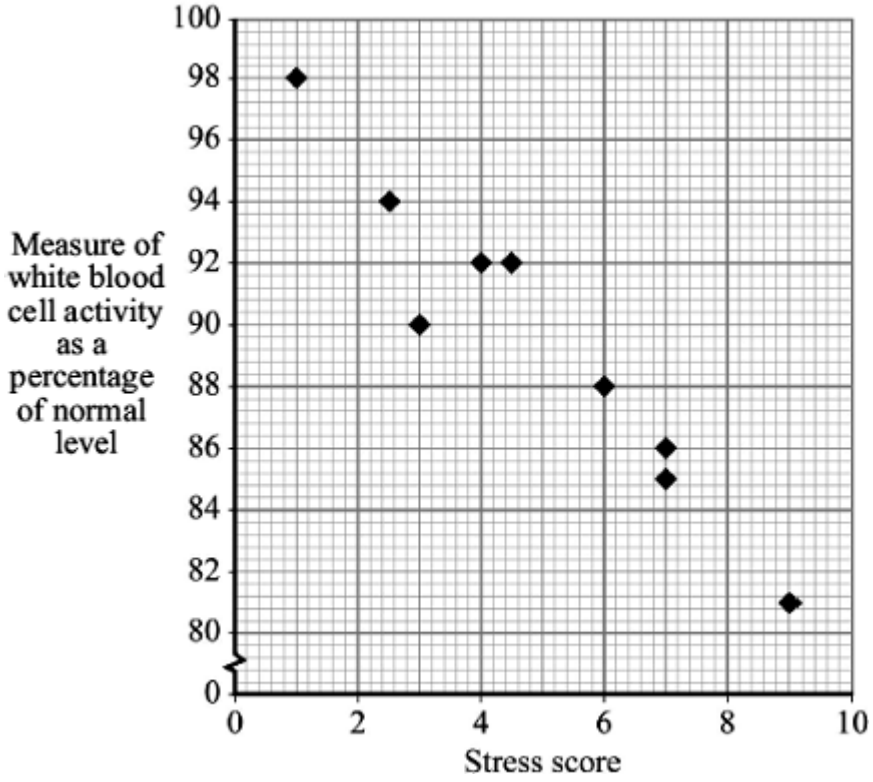
[1 mark]

Question 5

One measure of the functioning of the immune system is the level of activity of white blood cells.

What does the graph below tell you about the relationship between stress and the level of activity of white blood cells?

Relationship between stress and the level of activity of white blood cells



[2 marks]

Activity 6: Practical activity – the Stroop test

The Stroop Effect Experiment

The BPS (British Psychological Society) have a useful resource on the Stroop Effect.

In this activity, you will undertake a mini practical. You will be investigating the Stroop Effect

Using Simply Psychology's information on the Stroop Effect, answer the question below.

What is the Stroop Effect?

The Stroop task requires participants to look at colour words, such as 'blue', 'red', or 'green' and name the colour. However, the task involves naming the colour of the ink that the words are printed in, while ignoring the actual word meaning.

Participants generally find it easy to name the colour of a word eg 'black' when it is printed in black but this can be challenging when the word and the ink colour are different. The extent to which this interferes with the speed of naming the colour of the ink of this is known as the Stroop Effect.

Example of a Stroop test

Instruction – participants are asked to name the colour of ink the word is printed in.

Congruent Condition 'Congruent' means that the word and the colour of ink match.	Incongruent Condition 'Incongruent' means that the word and the ink colour do not match
Red	Red
Yellow	Yellow
Green	Green
Blue	Blue
Black	Black

Try your own Stroop test

Complete the online Stroop test and answer the questions below.

Make a note of what was measured when you receive your results.

In this research, identify the independent and dependent variable.

Independent variable	
Dependent variable	

What is the hypothesis for this research?

Using the online test, ask 10 people you know to complete the Stroop test and record their results.

Participant's speed in correct trials (milliseconds) during Stroop test for congruent (word and ink colour match) and incongruent conditions.

Participant	Congruent condition	Incongruent condition
Participant 1		
Participant 2		
Participant 3		
Participant 4		
Participant 5		
Participant 6		
Participant 7		
Participant 8		
Participant 9		
Participant 10		

Now calculate the mean and median for your results.

	Congruent condition	Incongruent condition
Mean		
Median		

Comment on your results in relation to your hypothesis.

Further resources

The following resources may be useful if you wish to carry out further independent research into the 'Research methods' topic in A-level Psychology.

Textbooks

See our website for links to AQA Approved textbooks.

Resource websites

Physics and Maths Tutor | Psychology

PsychPage

Psychlotron

Quizlet

Simply Psychology

Tutor2U

Review of learning

Topic	Total marks	Calculate your % mark for the section	How confident are you on this topic? Is there anything else you need to do?
Activity 3: Past paper questions (science /investigative skills)	**/9**		
Activity 4: Psychology past paper questions (Hypothesis, independent and dependent variables)	**/17**		
Activity 5: Correlational research	**/14**		
Activity 6: Practical activity – the Stroop test	**/3**		

Notes

Contact us

Our friendly team will be happy to support you between 8am and 5pm, Monday to Friday.

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