# Student handbook: Hypotheses

# Introduction

As students you should be familiar with the following features of planning and conducting research, you should be able to formulate:

* Research aims.
* Research questions.
* Independent variable (IV) and how this is operationalised into conditions.
* Dependent variable (DV) and how this is operationalised to measure behaviour.
* Null hypotheses.
* Alternative hypotheses
  + One tailed (directional) hypotheses
  + Two tailed (non-directional) hypotheses.

# Inductive reasoning and Deductive reasoningWhat is a hypothesis?

A hypothesis is a **statement** of what you **predict** will happen in an experiment. Researchers make predictions before carrying out research as a process of deduction.

Deductive reasoning is where you form a prediction based on a theory and then proceed to testing the hypothesis to either confirm or reject your predictions. This is scientific as it enables the researcher to use observable evidence to support their theory and narrow down the explanation for behaviour.

Due to this, experimental research uses very precise hypotheses in order to clearly confirm or reject the predictions once data has been collected and analysed.

To create a hypothesis you need an aim. Firstly, an **aim** is what you wish to find out in your research. A researcher may aim to find out whether completing revision workbooks is more effective than not doing any. Once you have your aim you then need to decide how to **operationalise** the variables in order to make a precise and testable hypothesis.

A hypothesis must include:

* The IV operationalised into different conditions.
* The DV operationalised to clearly show how behaviour is measured/ scored.
* The difference expected (e.g. higher/ lower)/ effect   
  OR if correlational
* The relationship expected (positive/ negative/ no).

There are two types of hypothesis:

**Alternative hypothesis** (abbreviated as H1)

This is a prediction that there will be a difference in behaviour of the participants in the different conditions.

**Null hypothesis** (abbreviated as H0)

This type of hypothesis predicts there will be **no** difference in behaviour of the participants in the different conditions.

Further to this there are two types of alternative hypotheses. Sometimes in research you may believe there will be a difference in the performance of conditions but you may not know what that difference will be. In this case you would write a **two tailed** hypothesis (non-directional). If you think you know which group will perform better you will write a **one tailed** hypothesis (directional) as you have a reason to believe the one condition will perform better or score higher than the other.

# Activity 1: Warm up

Match up the key terms and definitions below. Each key term only has **one** definition.

**Key terms: Definitions:**

This is the variable you manipulate to see its effect on another variable.

Independent variable

This is where you ensure that a variable is measurable by using accurate criteria.

Dependent variable

This type of variable may corrupt your results if it is allowed to influence the behaviour of participants.

Extraneous variable

### How should you write a hypothesis?

Operationalisation

This is the variable you manipulate to see its effect on another variable.

This is a type of variable that corrupts the results of the study due to the participant’s characteristics that the researcher has not measured.

A hypothesis should follow from the research question and be **operationalised** so that it is clear what is being measured and how it would be measured.

In other words, you need to include the independent variable (including the conditions) and the dependent variable (including how it is scored).

Here is an example of an undeveloped alternative hypothesis and another that details clearly how the variables are measured.

There will be a significant difference in the memory when items are shown in different forms.

There will be a significant difference in the number of items correctly recalled from a list of twenty words when they are shown as pictures as opposed to words.

Suggested writing frames to support you in including all the necessary detail:

Alternative hypotheses:

* Participants in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ condition will \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ than participants in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ condition.
* There will be a difference in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, as measured by \_\_\_\_\_\_\_\_\_\_\_\_, in \_\_\_\_\_\_\_\_\_\_\_\_\_\_ condition and the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ condition.
* There will be a significant difference in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of participants in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ condition compared to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ condition.

Null hypotheses:

* There will be no significant difference in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of participants in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ condition compared to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ condition.
* Participants in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ condition will show no differences to participants in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ condition.
* There will be no significant difference in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, as measured by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ condition and the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ condition.

Correlational hypotheses:

* There will be a significant correlation between (co-variable 1), as measured by \_\_\_\_\_\_\_\_\_\_ and (co-variable 2), as measured by \_\_\_\_\_\_\_\_\_\_\_\_.
* There will be no significant correlation between (co-variable 1), as measured by \_\_\_\_\_\_\_\_\_\_ and (co-variable 2), as measured by \_\_\_\_\_\_\_\_\_\_\_\_.

# Activity 2

If you find it tricky to identify the independent variable and the dependent variable have a go at doing so in the following pieces of research first.

Remember that the IV and DV may not be stated, you may have to work out what is changing between the conditions for the IV and also what the DV is by what a test/ score is trying to compare.

|  |  |  |
| --- | --- | --- |
| **Research aim/ scenario/ hypothesis**. | **Independent variable?**  *This will be operationalised by being put into groups.* | **Dependent variable?**  *This will be the behaviour being measured/ scored/ compared.* |
| a) Do boys and girls like different music? | Sex – operationalised into boys and girls | Music |
| b) A researcher has conducted an experiment to see if people recall more words from a list of ten words when they learn and recall in a warm room rather than a cold room. | Temperature of the room – operationalised into warm and cold. | Memory – operationalised by the recall from a list of 10 words. |
| c) Is there less attention in classes on a Friday afternoon compared to a Monday morning? |  |  |
| d) There will be a significant difference in the speed with which people react to visual and auditory stimuli. |  |  |
| e) There will be no significant effect of chewing gum on concentration in secondary school children. |  |  |
| f) The noise level in a room will not affect how many words people remember from a list of 20 words. |  |  |
| g) There will be a difference between the enjoyment of year 7 students compared to year 10 students when watching Blue Peter. |  |  |

You may also want to try the following tasks using the above research:

* Annotate which are research aims compared to hypotheses
* Improve the hypotheses that are not fully operationalised
* Write the alternative and null hypothesis for each

# Activity 3 Become the examiner

Read the following hypotheses and then mark them using the following criteria:

* The IV operationalised into different conditions.
* The DV operationalised to clearly show how behaviour is measured.
* The difference expected (e.g. higher/lower/effect.)

|  |  |  |
| --- | --- | --- |
| **Hypothesis** | **Correct? Type?** | **Improvements?** |
| a) People will be happier when attending a yoga class compared to when attending a boxing class as measured by their rating on a 9 point scale with 9 being the happiest. | *This is a one tailed alternative hypothesis that clearly gives the IV and the DV and both are operationalised.* | *None.* |
| b) There will be a significant difference in the memory of participants who have 8 hours or less sleep compared to those who have over 8 hours. |  |  |
| c) There will be no significant difference in the ability to solve crossword problems depending on the noise. |  |  |
| d) There will be a difference between personality types in their aggression as measured by an aggression checklist out of 10 with a score of 10 being the highest. |  |  |
| e) Participants with higher self-esteem will be more assertive than participants with low self-esteem. |  |  |
| f) Women will not remember details of clothing better than men. |  |  |
| g) Participants will remember items from a shopping list better if they visualise them. |  |  |

# Activity 4 Constructing hypotheses

Read the following research and write hypotheses using the aims below.

The first one has been done for you.

1. **Aim:** To see if the age of an individual affects their ability to remember.

Independent variable: *The age*

Dependent variable: *The memory*

Null hypothesis: *There will be no significant difference between young people and old people in their ability to remember items from a list of 20.*

Alternative one tailed hypothesis: *Old people will recall significantly less than young people from a list of 20 items.*

Alternative two tailed hypothesis: *There will be a significant difference between young people and old people in their ability to remember items from a list of 20.*

Note that you can be a bit creative in this activity and **operationalise** the variables yourself.

1. **Aim:** To see if the sex of an individual affects their ability to drive.

Independent variable:

Dependent variable:

Null hypothesis:

Alternative hypothesis:

1. **Aim:** To see if the amount of alcohol consumed affects the reaction times of bus drivers.

Independent variable:

Dependent variable:

Null hypothesis:

Alternative hypothesis:

1. **Aim:** To see if students recall more information in the morning than in the afternoon.

Independent variable:

Dependent variable:

Null hypothesis:

Alternative hypothesis:

1. **Aim:** To see if people feel happier in summer than in winter.

Independent variable:

Dependent variable:

Null hypothesis:

Alternative hypothesis:

1. **Aim:** To see if women remember emotional events better than men.

Independent variable:

Dependent variable:

Null hypothesis:

Alternative hypothesis:

# Activity 5 Multiple choice

In this activity you are given a variety of multiple choice questions about various aspects of a hypothesis. Have a go at answering them and see what you remember from your lessons.

1. Which of the following is an experimental alternative hypothesis?
   1. ‘There will be no significant difference in the ability to recall 20 words between participants who have taken a single dose of the drug Fluoxetine and those who have had no drug.’
   2. ‘There will be a significant positive correlation between how much Fluoxetine is taken and the number of words recalled on a list.’
   3. ‘People who take Fluoxetine will not perform significantly better than those who don’t when recalling a list of 20 words.’
   4. ‘There will be a significant improvement in the ability to recall 20 words when Fluoxetine is taken compared to when no drug is taken.’
2. What is the independent variable in the following hypothesis?
   1. “Extroverted people will not perform significantly differently in front of an audience than introverted people.”
   2. Extroverted
   3. Performance
   4. Personality type
   5. Confidence
3. Which of the following is an alternative directional hypothesis?
   1. ‘There will be a significant correlation between UMS points achieved and the number of A Levels studied.’
   2. ‘There will be no significant difference between those who study 3 A Levels and those who study 4 A Levels in the UMS points they gain at the end of the A Levels.’
   3. ‘There will be an increase in the number of UMS points gained in A Level studies when participants study 4 A Levels compared to those who study 3 A Levels.’
   4. ‘There will be a difference in the number of UMS points gained in A Level studies when participants study 4 A Levels compared to those who study 3 A Levels.’
4. What is missing from the following null hypothesis?

“There will be a significant difference in the ability of 15 year old boys sleep compared to 7 year old boys.”

* 1. Independent variable not operationalised
  2. Dependent variable not operationalised
  3. Not clearly defined the type of hypothesis
  4. Missed the term relationship

1. Which of the following is a research aim?
   1. ‘There will be a difference between men and women in terms of IQ.’
   2. ‘Are women smarter than men?’
   3. ‘To find out if women and men differ in terms of IQ.’
   4. ‘To establish if IQ can be tested in women and men.’
2. Which of the following is an appropriate definition of a correlational alternative hypothesis?
   1. A prediction of the link between variables.
   2. A prediction of how variables will co-vary.
   3. A statement of what you wish to correlate.
   4. A prediction of what the effect will be.
3. Read the following hypothesis.

H1: “There will be a significant difference between participants who drink one unit of alcohol and those who drink two units of alcohol in their ability to pass 10 challenges in a driving simulator task.”

What is the independent variable in this hypothesis?

* 1. The driving skill
  2. The type of alcohol
  3. The speed of drinking
  4. The quantity of alcohol

1. Read the following hypothesis.

H1: “There will be no significant difference in the number of questions answered correctly when given leading questions following a video of a robbery compared to no leading questions following the video.”

What is the dependent variable in this hypothesis?

* 1. The number of leading questions
  2. The number of correct answers
  3. The type of robbery
  4. The leading questions

1. What is a feature of an experimental hypothesis but not a correlational hypothesis?
   1. The operationalisation of variables
   2. The statement of cause and effect
   3. The statement of a relationship
   4. The measurement of behaviour in quantities
2. A researcher manipulates the independent variable ‘hunger’ to see the effect it has on memory recall of food related words. Which of the following is a suitable alternative hypothesis?
   1. ‘Participants who are hungry will recall more food related words than those who are not hungry.’
   2. ‘There will be no significant difference between those in the hungry condition and those in the not hungry condition in their memory recall of food related words.’
   3. ‘There will be significant correlation between hunger and recall of food related words.’
   4. ‘Participants will like food much more when hungry compared to when not hungry.’

# Answers boxActivity 6 Annotate away

Read the following hypotheses and highlight and annotate where the IV and DV or co-variables are and what keywords signify the type of hypothesis and direction where appropriate.

*Alternative as states a difference*

*DV is the speed measured in mph.*

1. There will be a significant difference in the speed a car is driven in mph between   
   males and females.

*The different conditions are male and female so the IV is sex.*

1. There will be no difference between different social classes of lower, middle and upper class in the IQ scores obtained on the Wechsler IQ test.
2. There will be a significant relationship between the days students attend their sixth form and the number of marks obtained in their A Level Psychology exam.
3. Infants will be significantly more alert, as measured by how long they engage in play, in the morning compared to the evening.
4. There will be an increase in the number of words participants recall when they chunk words together compared to when they learn them individually.
5. There will be an increase in the level of help a confederate receives, as measured by how many individuals offer assistance, after a news story about bystander apathy compared to before the news story is broadcast.

# Activity 7 Operationalising variables

In order to write hypotheses you need to be able to clearly operationalise your variables. Read the researchers ideas below and state how they could operationalise each variable.

This will also be useful when considering how you could measure variables in potential research you may design in section B.

| **Research** | **How you could operationalise the IV?** | **How you could operationalise the DV?** |
| --- | --- | --- |
| Jordan thinks people are happier when it is really sunny. She wants to find out whether your mood changes depending on how sunny it is. |  |  |
| Kerri-Ann is interested in the effect caffeine has on driving skill. |  |  |
| Carlie wants to find out if there is a difference between people who are friendly or not in terms of how happy they are. |  |  |
| Maggie wants to find out if people who study art procrastinate more than people who study maths. |  |  |
| Chloe wants to know if people dream more if they are worried about something. |  |  |
| Billy wants to find out if studying Geography increases IQ. |  |  |
| Alan wants to find out if people with schizophrenia feel better when taking medication prescribed by psychiatrists than before they take it. |  |  |
| Katie wants to find out if star wars fans chew more gum than star trek fans. |  |  |
| Cane wants to find out if people are more sarcastic in England than other countries. |  |  |
| Phoebe wants to know if people who bicker stay married longer than those who don’t. |  |  |
| Emily wants to find out if people in the seventies had more free time than people in the noughties. |  |  |
| Ellis wants to know if there is a difference between people who learn their lines daily compared to those who learn their lines once a week. |  |  |
| Atlanta aims to find out if there is there is a difference in age between those who go to One Direction concerts and those who go to Lady Gaga concerts. |  |  |
| Daniel wants to find out if the level of aggression shown by Arsenal fans is different to Newcastle fans. |  |  |
| Abbey wants to know if people prefer shopping when there is music to when there is not. |  |  |

Once you have thought of ways to measure the variables consider the following:

* What may be good about measuring the variables in this way?
* Does your method of operationalising the DV provide valid results? Why?

Does your method of operationalising the IV provide reliable results? Why?

* Can you write a null hypothesis for some of the above pieces of research?
* Do you think you would write a one or two tailed alternative hypothesis for each piece of research? Why?

# Activity 8 Self-evaluation - RAG time

Rate your understanding of the following elements of hypotheses using the codes below:

|  |  |  |  |
| --- | --- | --- | --- |
| **Element** | **Red = *I do not understand this element.*** | **Amber = *I understand this element but struggle in some exam style questions.*** | **Green *= I understand this element and I can answer exam style questions appropriately*.** |
| Research aims |  |  |  |
| Research questions |  |  |  |
| Independent variable (IV) and how this is operationalised into conditions |  |  |  |
| Dependent variable (DV) and how this is operationalised to measure behaviour |  |  |  |
| Null hypotheses |  |  |  |
| Alternative hypotheses  - One tailed (directional) hypotheses  - Two tailed (non-directional) hypotheses |  |  |  |

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