



# Research Methods

Year 11/12  
Psychology

**Author: Roslyn Green**

**Blog page: <http://psychologyrats.edublogs.org/research-methods/>**

**Pictures mainly from [pixabay.com](http://pixabay.com)**



# Topics in this Presentation:

\*Becoming sceptical - how researchers can make mistakes

\*Five kinds of psychological studies:

① Case studies and their uses

② Experiments and their pitfalls and complexities

Three experimental designs:

(a) Independent groups (b) Repeated measures

(c) Matched participants

③ Naturalistic observational studies

④ Correlational studies

⑤ Surveys and questionnaires





Yeah,  
right.

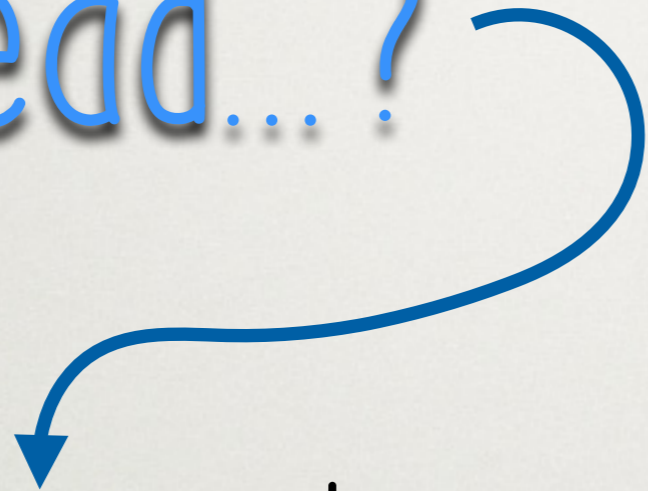
# Becoming a sceptic...

- ◆ It's your job as a **teenager**.
- ◆ It's your role as an **young adult**.
- ◆ It's your task as a **psychology student**.

Go ahead, roll your eyes and question everything that you read that purports to be science. The deeper you dig, the more skilful you will become in turning up questionable results, suspect conclusions and dubious generalisations.



# How many times have you heard or read...?



- Studies have shown that...
- Scientists have reached the conclusion that...
- Based on the latest research, it is clear that..

If a scientist says something, it must be true, right?





But like, if a scientist says something, it must be true, right?



# Not necessarily!

Science is about what conclusions can most probably be drawn from the evidence.

That evidence must be carefully gathered and meticulously interpreted.

Even then, a scientist is not "proving the truth" but testing a hypothesis and stating a conclusion that, according to the evidence, is highly probable.



# So, what can go wrong?

Biased  
experimenters

Suspect operational  
definitions of IV and DV

Failure to control  
extraneous  
variables

Faulty  
interpretation of  
results

Unrepresentative  
sampling

Non-random  
allocation to groups

These are just a few examples.



# Practise your scepticism...

---



The Pepsi-Cola Company once conducted a study to see whether people preferred Pepsi or Coke.



# Practise your scepticism...

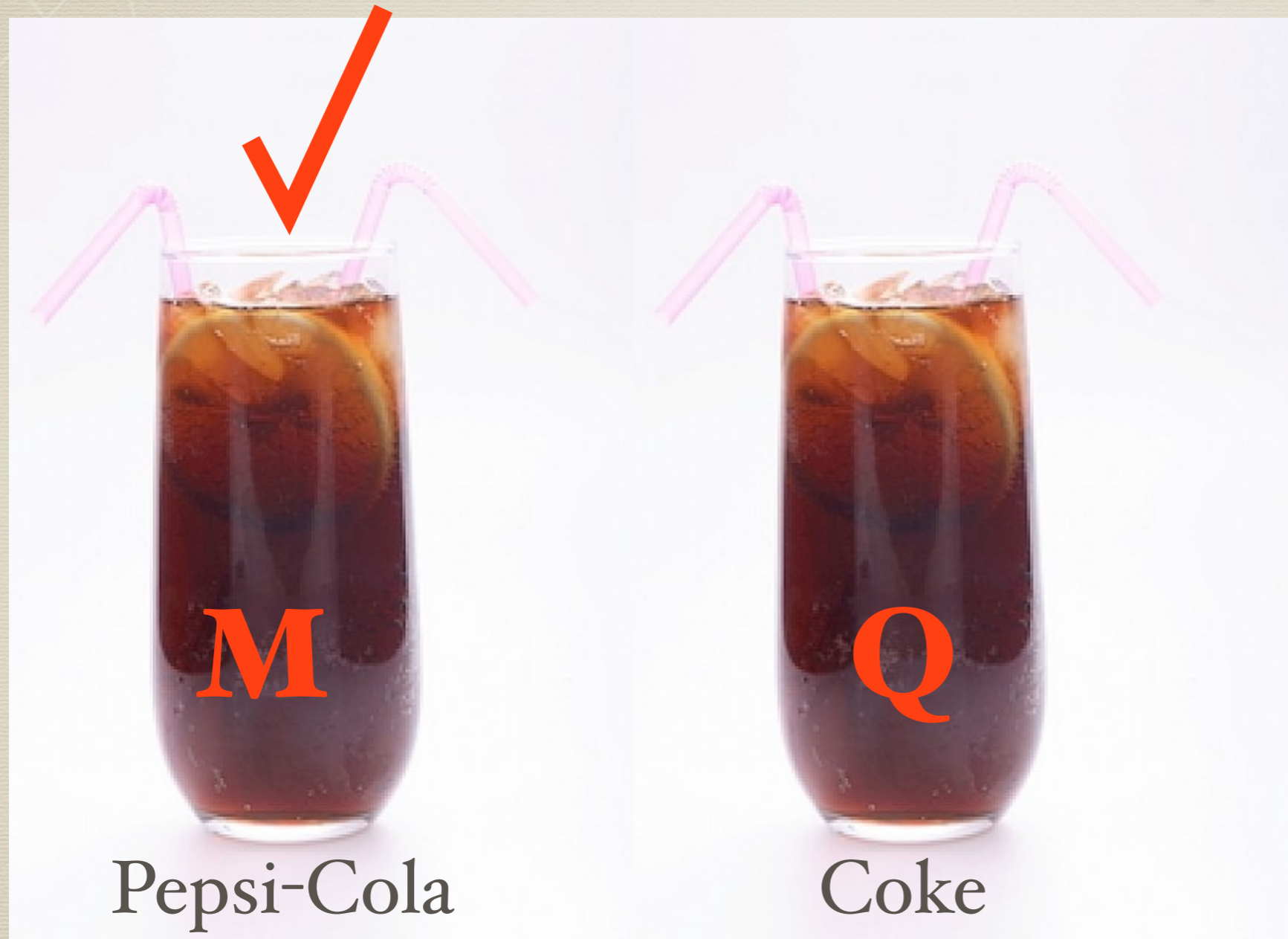
---



The only identifying marks on the glasses were as shown: an M on the Pepsi-Cola and a Q on the Coke.



# Practise your scepticism...



The results showed that the participants preferred the cola in Glass M to the cola in Glass Q.

What could possibly be wrong with this conclusion?



# Pepsi-Cola Experiment

- ❖ It was later determined through research that the participants had simply preferred the letter M to the letter Q.
- ❖ In this experiment, therefore, the letters on the glasses interfered with the participants' response. The letters became a **confounding variable**.
- ❖ You can see that it can be extremely tricky to run an experiment that delivers clear, unequivocal results leading to valid, unquestionable conclusions.





# Five Methods of Psychological Research

❖ Case Studies

❖ Experiments

❖ Naturalistic Observational Studies

❖ Correlational Studies

❖ Surveys/Questionnaires





# Case Studies

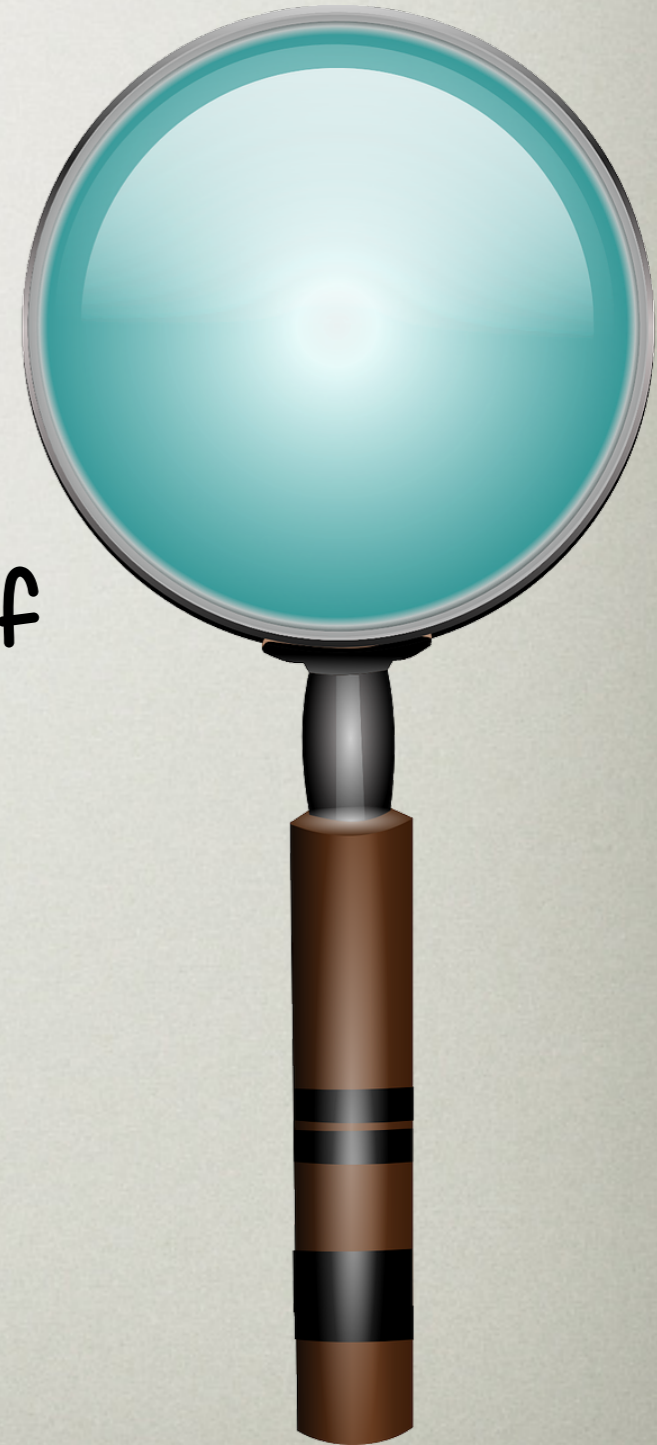
Genie Wiley was locked in a tiny room for 12 years as a young child.

A case study is a logical choice when investigating a person who has a rare experience, disorder or disease.



# Advantages of Case Studies

- ❖ An intensive study of a person which can yield in-depth, largely qualitative information
- ❖ Particularly useful for studying unusual experiences or diseases which could not be studied in any other way: for example, the trauma of a torture victim, the experiences of a person with Dissociative Identity Disorder (only 300 documented cases in history), etc.
- ❖ By collecting a number of case studies on a particular topic, researchers can often tease out similarities in the cases or find common threads that they might never have anticipated.





# Experiments

- a** An experiment allows a probable [redacted] relationship to be established.
- b** In the simplest form of an experiment, the researcher wishes to find out how the [redacted] variable (the hypothesised cause) affects the [redacted] variable (the measured effect).
- c** The researcher exposes one group to the IV, while the other group does not experience it. The researcher [redacted] the IV to discover its effect.

dependent cause-effect independent isolates



# Experiments: Cause and Effect

IV



Hypothesised Cause:  
Sleep deprivation

DV

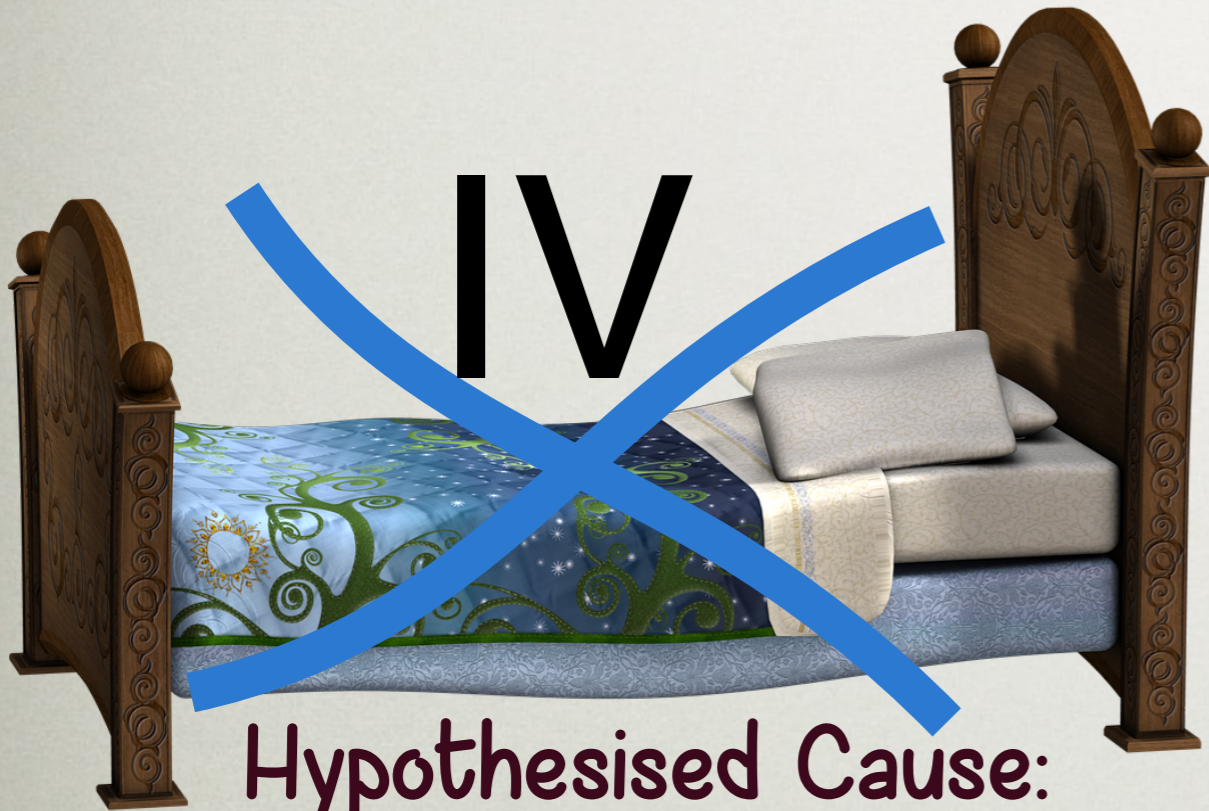


Measured Effect:  
Performance on  
monotonous task



# Experiments: Cause and Effect

Now let's operationalise the variables:



IV

Hypothesised Cause:  
Sleep deprivation

- Experimental Group 1: Total sleep deprivation
- Experimental Group 2: REM sleep deprivation
- Experimental Group 3: Deep sleep deprivation
- Control Group: No deprivation



DV

Measured Effect:  
Performance on  
monotonous task  
...defined as the  
number of pencils  
sharpened in 15  
minutes



# Quick Quiz: The Story So Far 1

(See answers at end of presentation)

① Scientists search for...

a certain truth    b highly probable, evidence-based conclusions

---

② In Psychology, an individual with an unusual experience or disorder may be investigated through...

a a case study    b an experiment    c a correlational study

---

③ In an experiment, the variable that represents the hypothesised cause is called the...

a dependent variable    b independent variable

---

④ The only type of study that can establish a probable cause-effect relationship is a/n

a correlational study    b case study    c experiment

---



# Quick Quiz: The Story So Far 1

5 The variable that represents the effect in an experiment is...

a the independent variable    b the dependent variable

6 An outside variable that should be controlled in an experiment

a is called an extraneous variable.    b is called a dependent variable.

7 A variable that clearly interferes in the IV->DV relationship is

a a confounding variable    b an independent variable

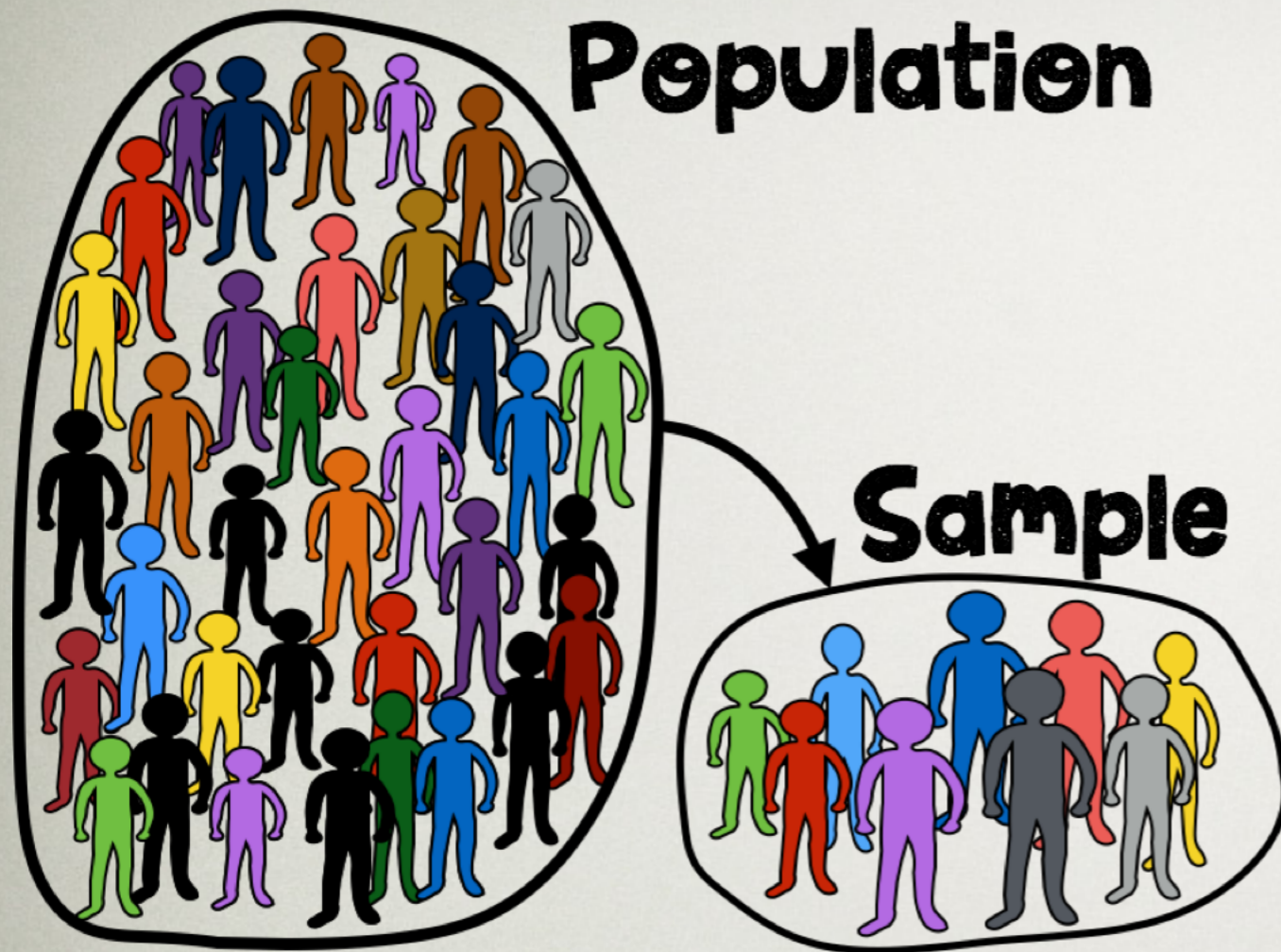
8 A case study provides largely...

a comparable quantitative data    b in-depth qualitative data

9 An operational definition of a variable...

a is a general indication of its meaning    b shows exactly how it is being defined and measured in the current study





The population is the group of people or events that the researcher wishes to investigate.

e.g. students at BHHS, parents of school-age children in Victoria, cycling accidents in Melbourne in 2018

The sample is the smaller group that is drawn from the larger group for study purposes. The theory is that the results gained from the sample group can then be applied to the whole population, provided that the sample is representative of the population.



# Convenience Sample



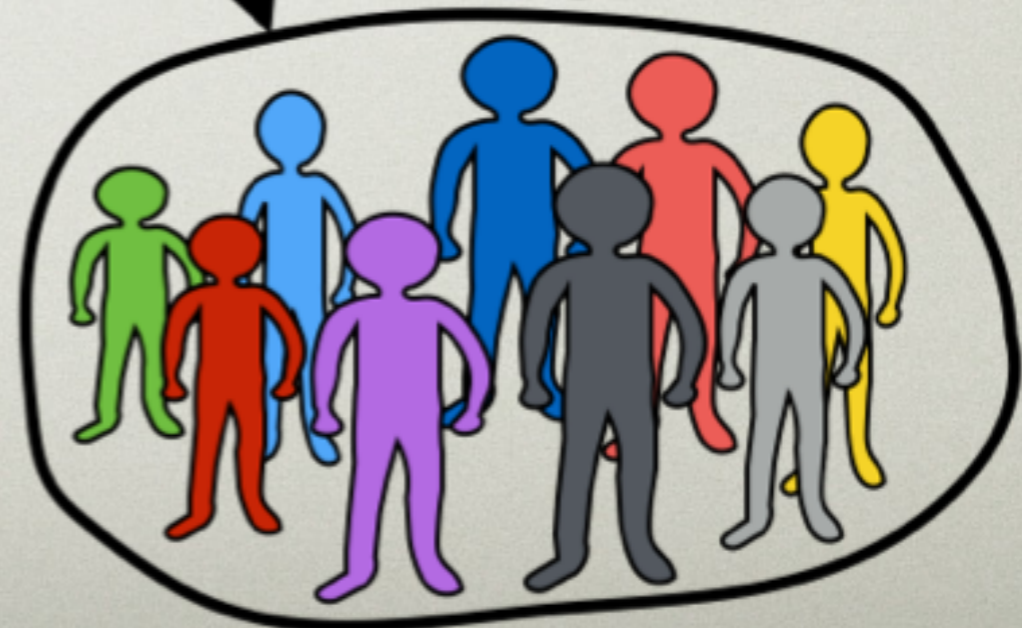
Any person who is easily available to a researcher may become a part of the sample.



# Random Sample



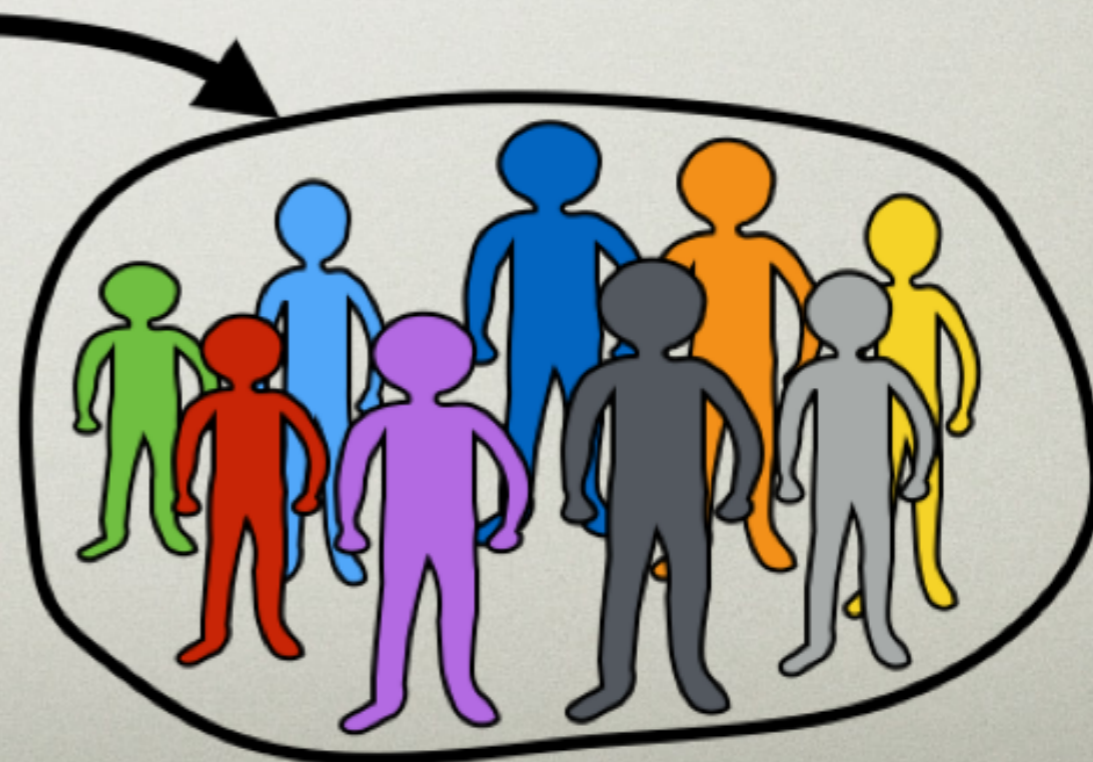
**Everyone in the population has an equal chance of being in the sample.**





# Stratified Sample

**The sample is proportionately chosen to represent key characteristics of the population.**





# How stratified sampling works

The aim is to ensure that all relevant groups within a population are proportionately represented in the sample.

For instance, the sample could be chosen to represent the same gender proportions as the population. Age-groups, socioeconomic status, religion and ethnic background could also be proportionately sampled.

If the sample doesn't represent the population in some vital way, then the results won't be very **useful**, **valid**, **applicable**, **conclusive** or **meaningful**.



# Whoops!

## Obvious Examples of Poor Sampling

You would like to study attitudes to abortion but have no Catholics in your sample.

You wish to discover how students at BHHS deal with problems but only include girls in your sample.

You aim to gain feedback from the school community and base your conclusions on the 25 parents who responded.

You hope to study people with eating disorders yet you draw your entire sample from people admitted to hospital with eating disorders.

You want to discover how teachers use computers but only select teachers over the age of 50.

What is wrong with each sample?

(See end of presentation for suggested answers.)



# Another whoops factor...

## Biased Allocation to Groups

You compare the reading results of a new program at Surrey Hills Primary School with those at Footscray Primary School.

You have 40 participants and place all the volunteers in the experimental group.

You want to test a new teaching method for Maths and choose 7B (M) and 51Z (Acc) as the two groups in your experiment.

You wish to investigate the impact of an eLearning program on teachers and so you compare a group of older teachers with a group of younger teachers.

What is wrong with each allocation to groups?  
(See end of presentation for suggested answers.)



# The Pitfalls of Non-Equivalent Groups

- If you allocate participants to groups in a biased way, then whatever happens in the experiment might be caused by the differences between your groups.



**Group 1**



**Group 2**

Having non-equivalent groups means that any difference between them could be due to a factor other than the independent variable.



In a completely theoretical perfect experiment...

the only difference between the control and experimental groups would be...

...the independent variable.

In reality, it is almost impossible to achieve this. But one purpose of good experimental design is to get as close as you can.



# The pitfalls of non-equivalent groups



It is very difficult or even impossible to find two equivalent groups of people, in any case. Even sets of identical twins might differ in motivation, mood or prior experience.





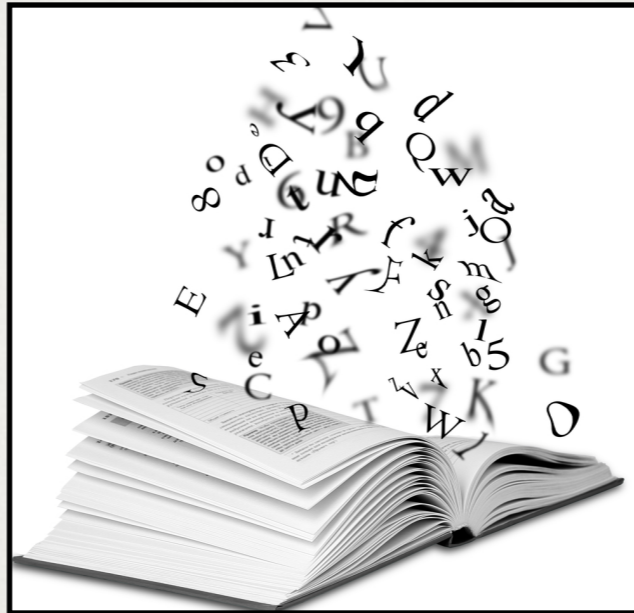
Differences between participants that could affect the results of an experiment are called **participant variables.**



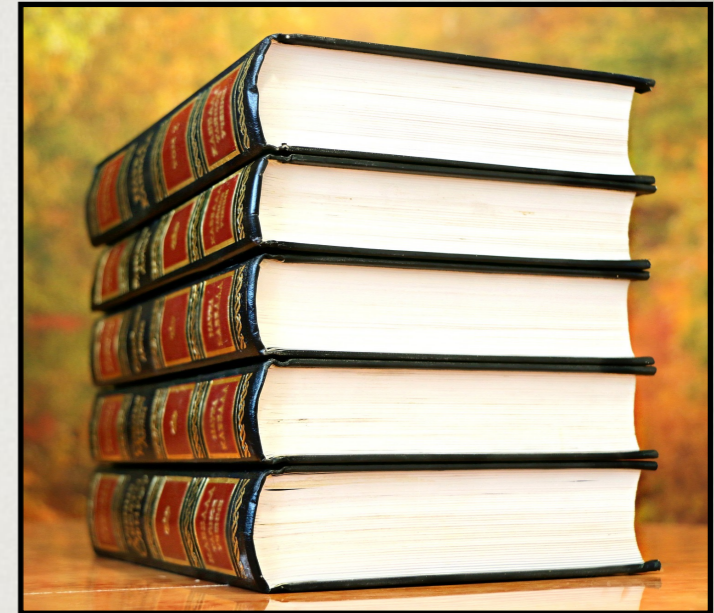
# Participant variables include...



intelligence



prior knowledge



education



motivation



anxiety levels



mood



# 3 Experimental Designs

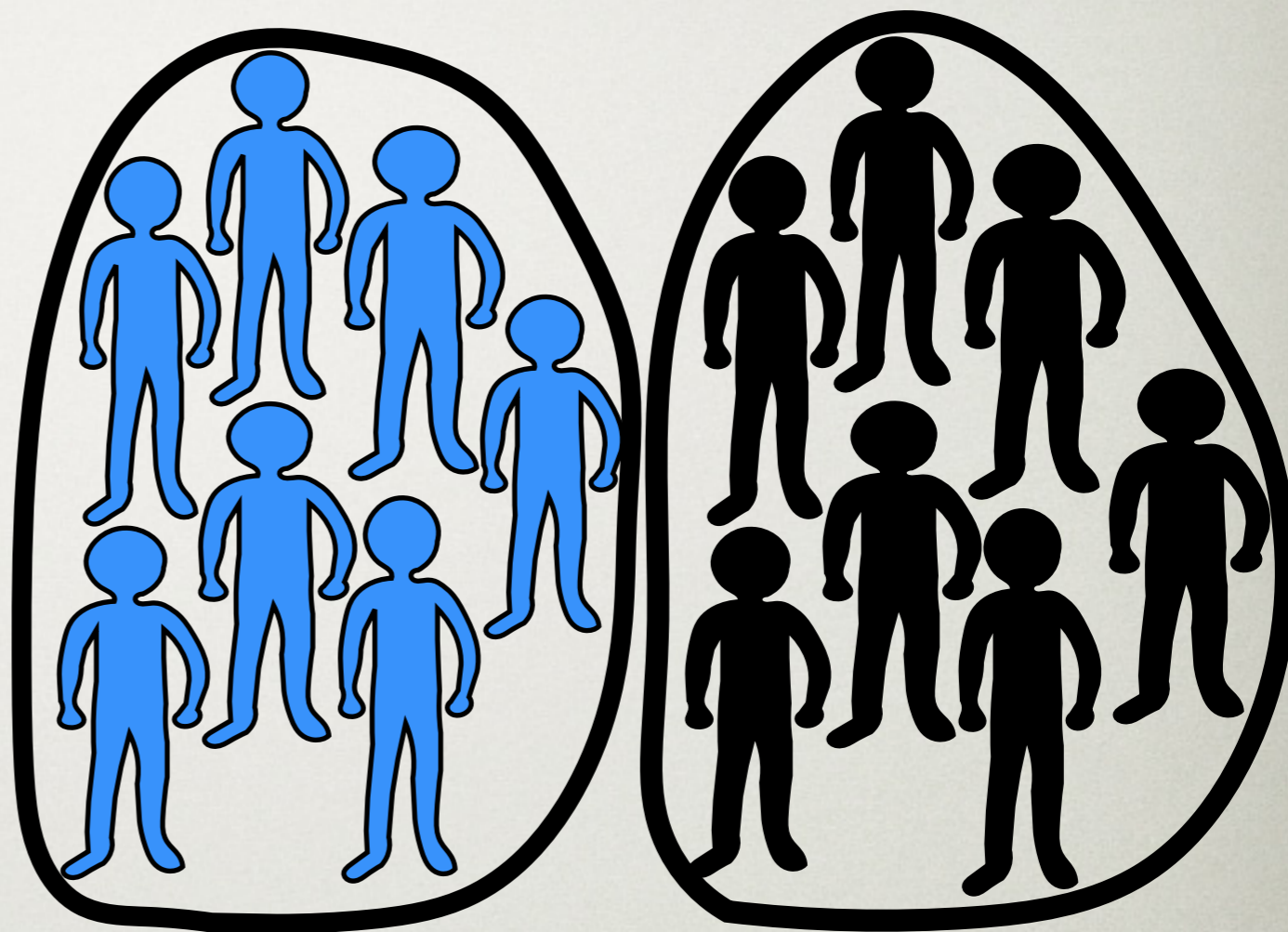
Researchers aim to control for the effects of participant variables by employing an appropriate experimental design. There are 3 main types:

- independent groups
- repeated measures
- matched participants



# Independent Groups

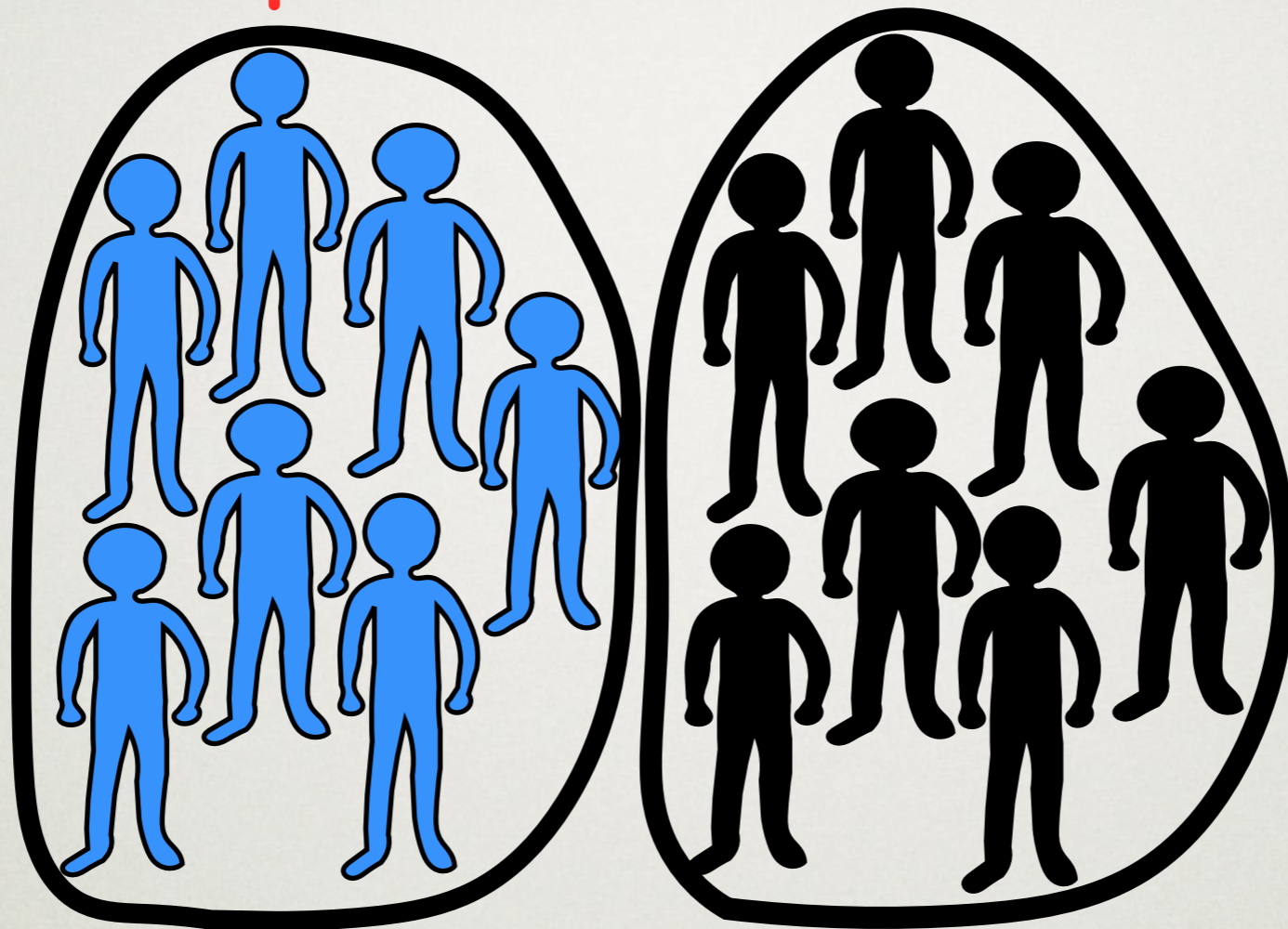
The groups in the experiment are separate and unrelated.



The participants are randomly allocated to groups, which is intended to control for and minimise possible differences between participants.



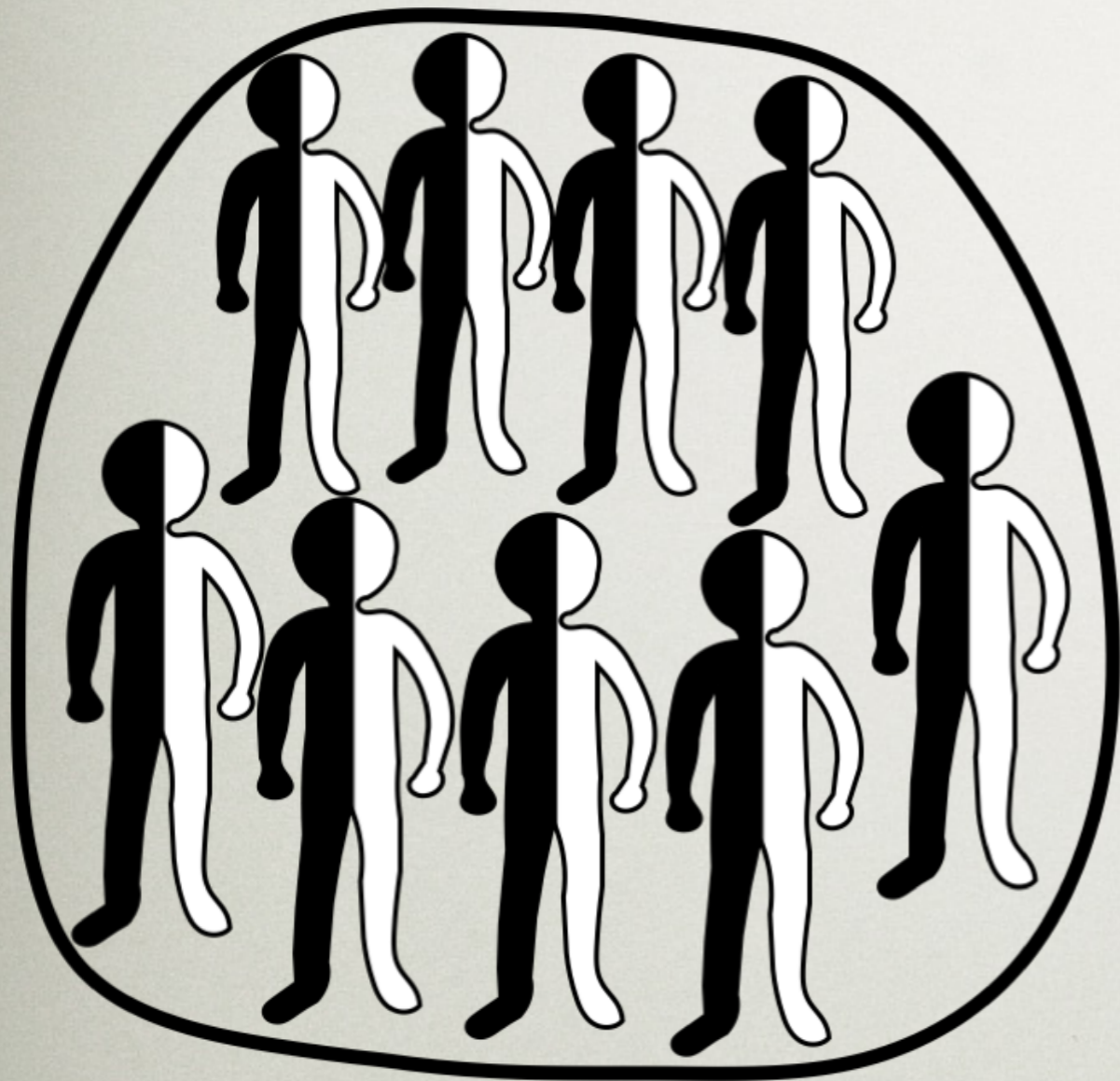
# Independent Groups



The larger the sample and the selected groups, the more likely it is that the random allocation method will in fact minimise the differences between groups.



# Repeated Measures

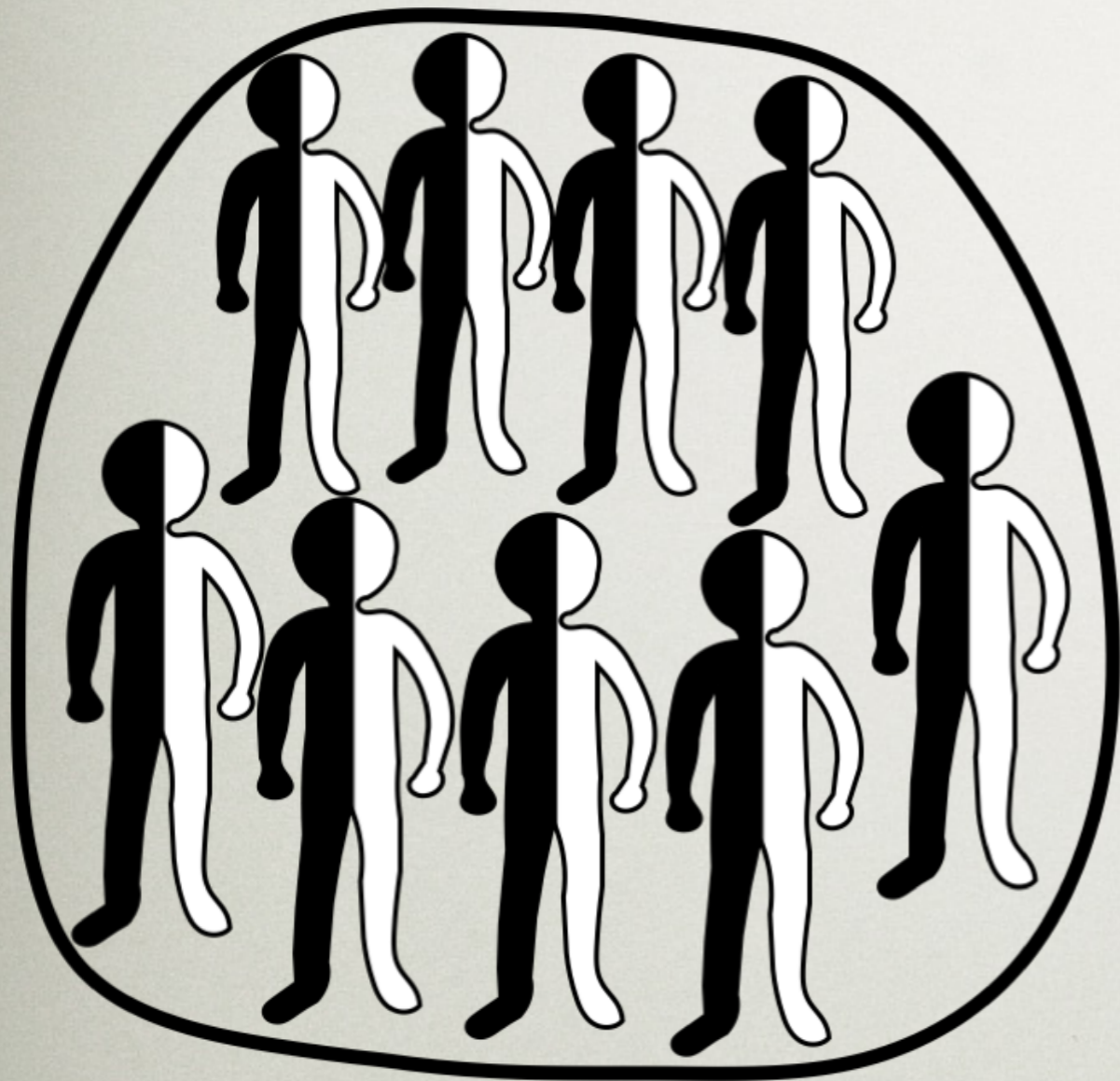


**All participants experience each condition.**

This type of experiment has no control and experimental group. Instead, there is a control and an experimental condition, which all participants experience (theoretically in random order).



# Repeated Measures



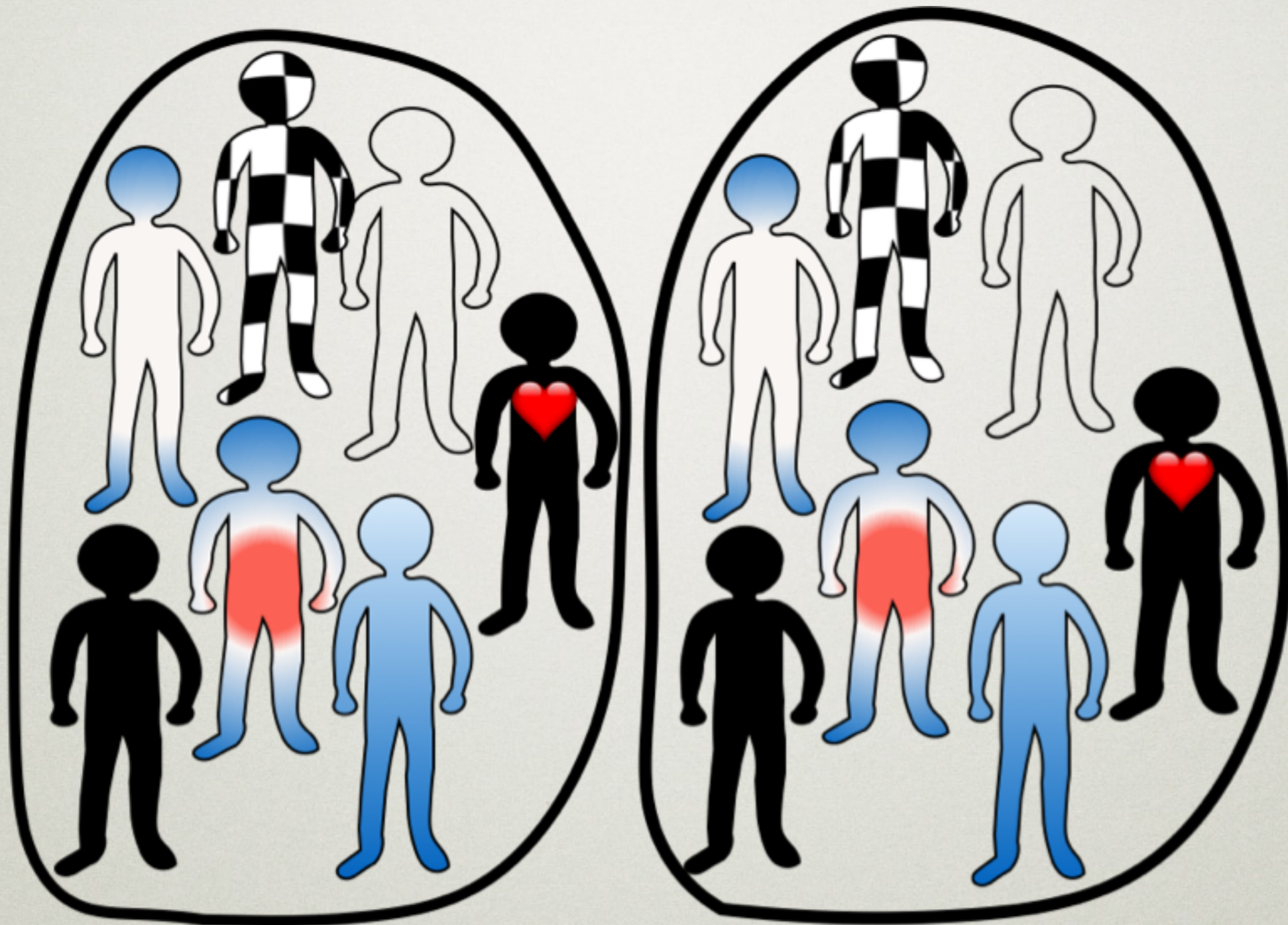
**All participants experience each condition.**

The conditions could be two (+) tasks, two (+) tastings, two varied situations (+), two tests of driving simulation (+), etc.

One of these tasks will be affected by the IV, while the other will not.



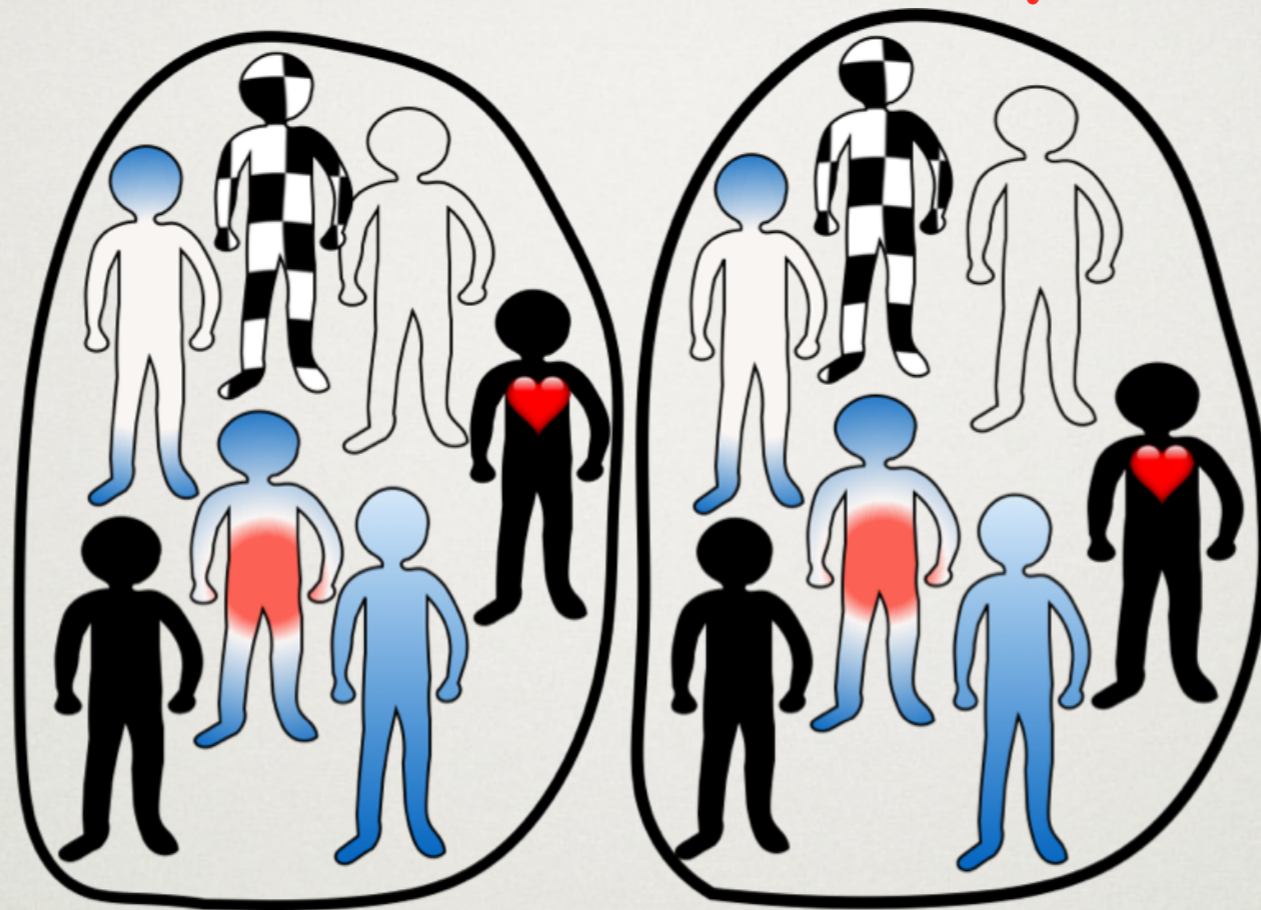
# Matched Participants



**After pairing, participants are randomly allocated to groups.**



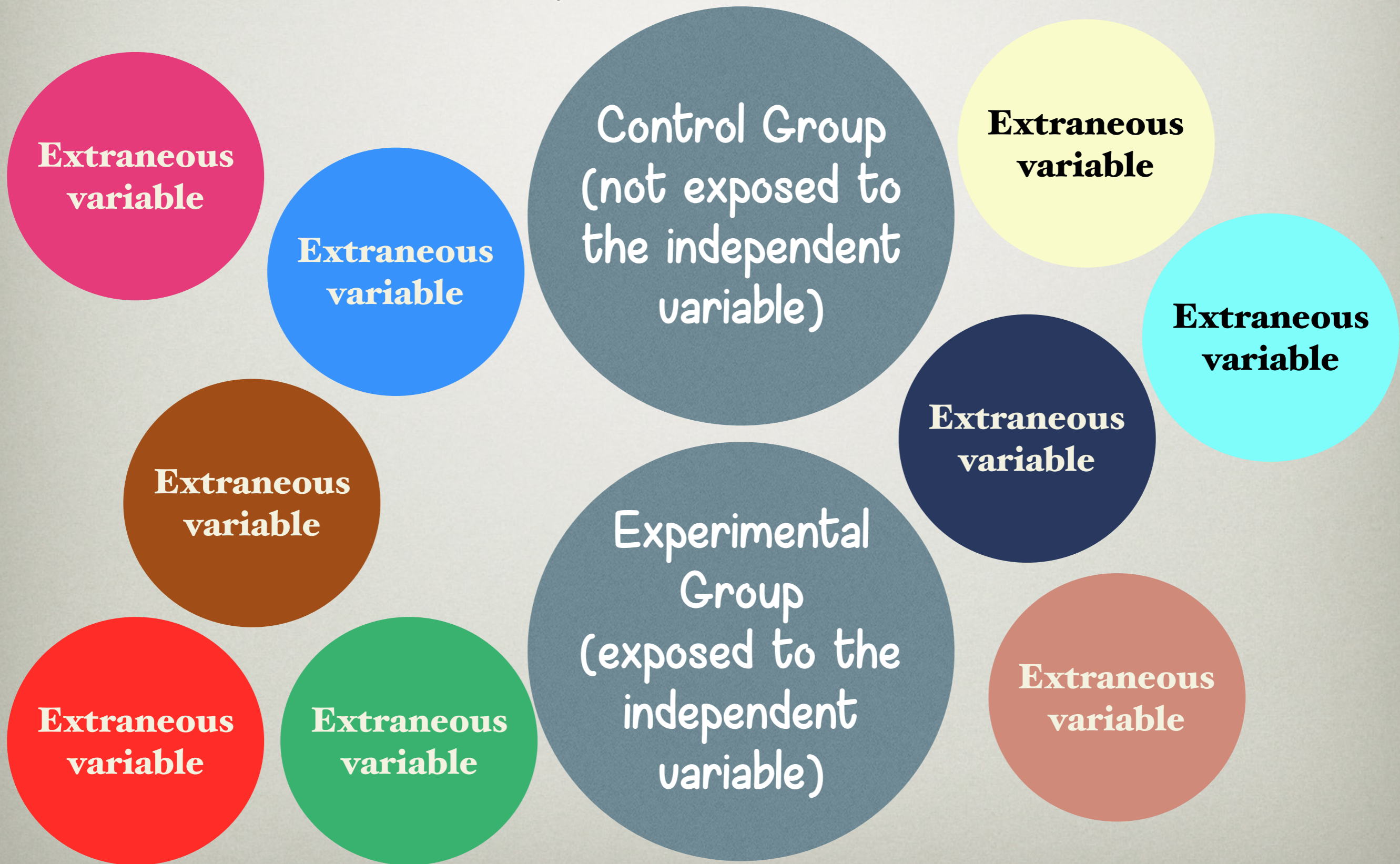
# Matched Participants



Participants are matched or paired on one or more relevant factors, such as prior knowledge, age, intelligence, driving experience, etc. Then one member of each pair is randomly assigned to either the control group or the experimental group.



# There are always extraneous variables...









If the extraneous variables are lined up with the IV or consistently influence one group more than the other, then they can become confounding variables.

**Control Group**  
(not exposed to the independent variable)

**Confounding variable**

**Confounding variable**

**Confounding variable**

**Confounding variable**

**Experimental Group**  
(exposed to the independent variable)



# Quick Quiz: The Story So Far 2

Match the definitions with the terms.

- a** Outside variables that might influence an experiment if they are not controlled or minimised
- b** A variable that clearly interferes in the causal relationship between the IV and the DV
- c** Experimental design in which there are two (+) unrelated groups
- d** The sole factor that should be different between the control and experimental groups (in an ideal situation)
- e** Experimental design in which all participants experience both the control and the experimental condition

independent  
variable

repeated  
measures

independent  
groups

extraneous  
variables

confounding  
variable



# Quick Quiz: The Story So Far 2

Identify the confounding variables...  
(see answers at end of presentation)

a Ms Green tries out 2 different types of handouts on her psych students and compares their results in the following outcome. She gives all the boys her new-style handouts and all the girls her standard handout.

b Ms Willshire compares the self-rated well-being of a standard Year 7 class taking the RESPECT module with the same ratings from a Year 10 class who is not taking the RESPECT module.

c Mr Innes compares the results of his Year 8 class (S2Z) with those of the Year 8 class in his previous school, to whom he had taught the same unit. He wants to discover whether his most recent teaching methods have been effective.



# Independent Groups Design

## Advantages

Relatively simple (—> cheap) to organise and administer

Doesn't require intrusive pretesting of participants

No order effects

## Disadvantages

Potential for participant differences to influence results

The randomising effect of random allocation to groups may be limited if groups are small

Less control over relevant participant differences, such as prior knowledge



# Repeated Measures Design

## Advantages

Allows researchers to control participant-related extraneous variables, e.g. variations in motivation, intelligence, prior knowledge, etc.

Potentially simpler to administer than a matched participants design

## Disadvantages

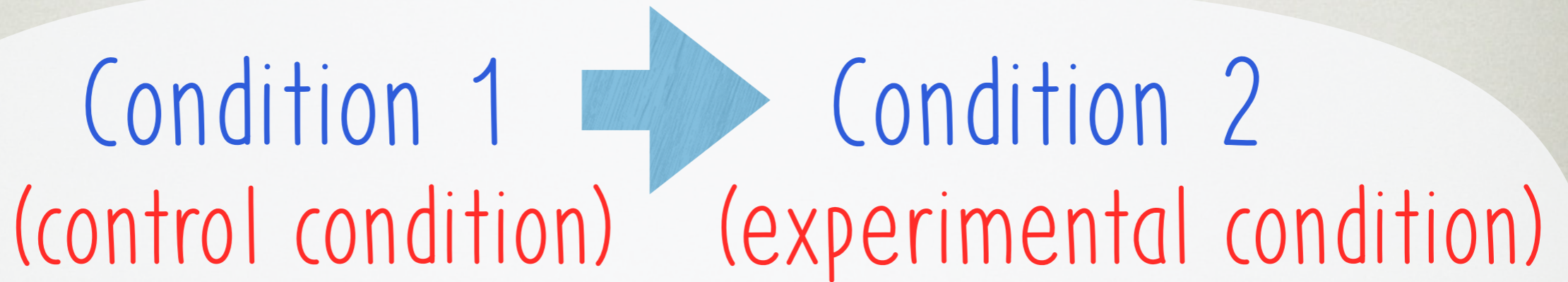
Introduces the possibility of order effects, which may become a confounding variable

Since the two different conditions might need to be conducted at different times, situational factors could affect the results, e.g. time of day, room used, etc.

Potentially time-consuming and more complex to administer than an independent groups design.



# The Meaning of Order Effects



When there are 2 tasks or 2 conditions, experiencing the second condition may be influenced by one's experience in the first condition.

For instance, there might be practice effects, if a participant becomes better at doing a task through having done it once before.

Conversely, fatigue or boredom might play a role. In this case, the participant might complete the second condition with less motivation, zest or concentration.



# Repeated Measures Design Example

Are shift workers more productive if allowed to listen to music?



## Procedure:

- First four hours of shift, all wear headphones
- Second four hours of shift, no one wears headphones
- Compare productivity in each time slot

What problem can you identify with this study?



# Repeated Measures Design

Are shift workers more productive if allowed to listen to music?



## Problems:

The shift workers might be more or less productive because of the time of day, rather than as a result of listening to music.

The “time of shift” has become a confounding variable.

There is a way of overcoming this problem...



# Counterbalancing



## How it works...

- Half of the shift-workers listen to music in the first half of their shift.
- The other half listen to music in the second half of their shift.
- The shift period when music may be heard is randomly determined.
- In this way, the “time of day” or “time of shift” variable is balanced out and controlled.

### **Another potential problem:**

Participants are likely to ascertain what the researchers are investigating and be influenced by this. Participants' and researchers' expectations can play a part in the outcome of experiments.



# Examples of Situational Variables



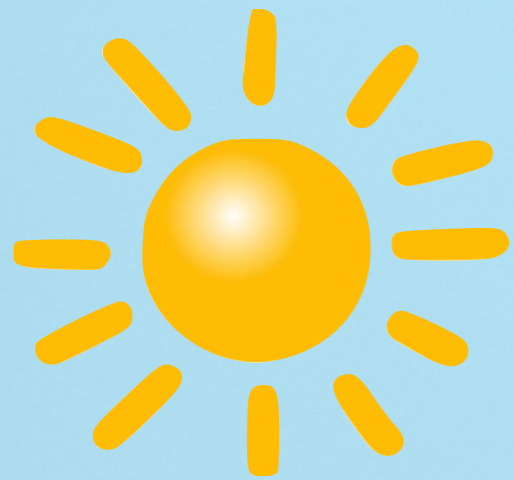
light conditions



noise conditions



temperature



time of day



environment



# Matched Participants Design

## Advantages

Allows researchers to control participant-related extraneous variables, e.g. variations in motivation, intelligence, prior knowledge, etc.

Avoids the pitfalls of the repeated measures design, since order effects should not be a concern

## Disadvantages

Quite complex and potentially costly to administer

May involve time-consuming and potentially intrusive pretesting of participants



# A Word about Matched Participants



Even 40 sets of identical twins, randomly allocated to control and experimental groups, would not guarantee that there were no participant variables at work. Prior experience and motivation might still have an influence. Nevertheless, the matched participants design is an effective way to control for participant variables. The downside is that this design is administratively complex and may involve intrusive pretesting.



# Quick Quiz: The Story So Far 3

Which experimental design...?

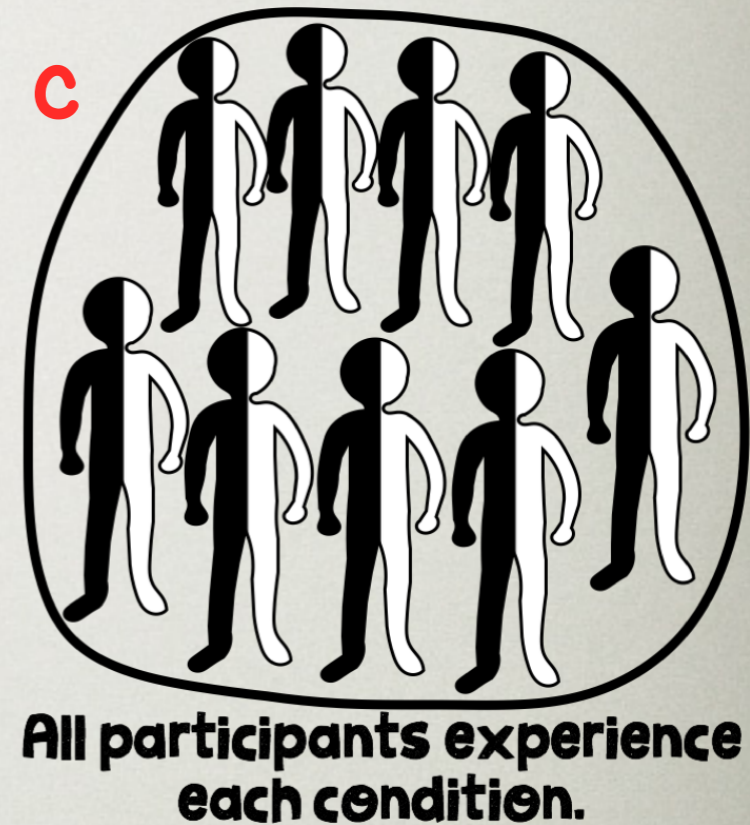
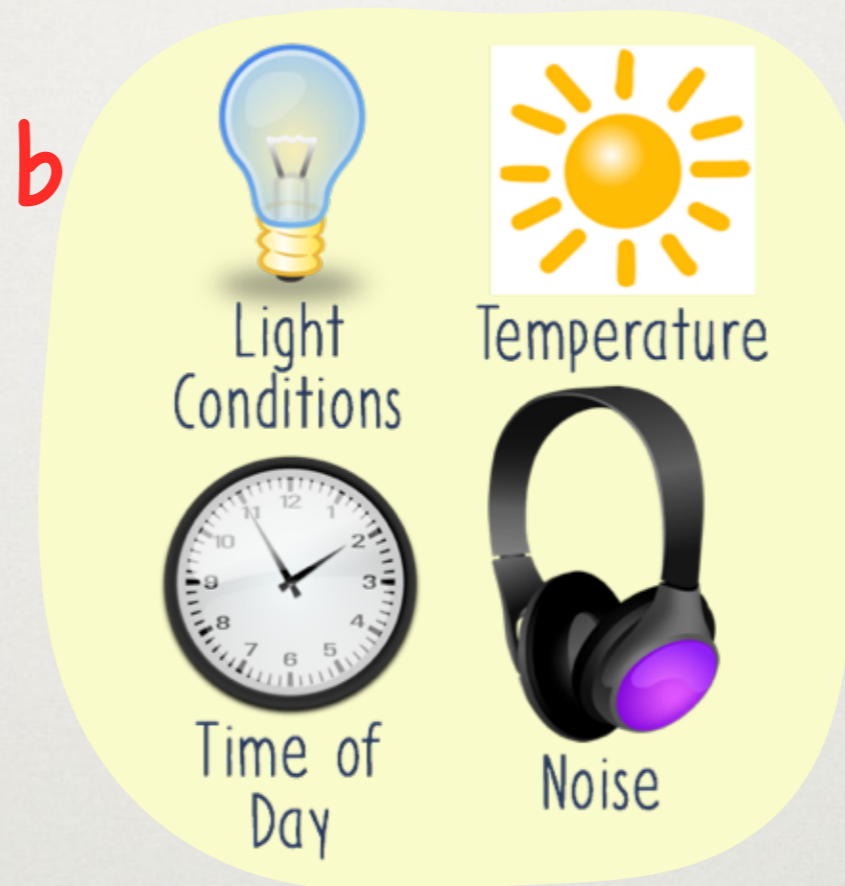
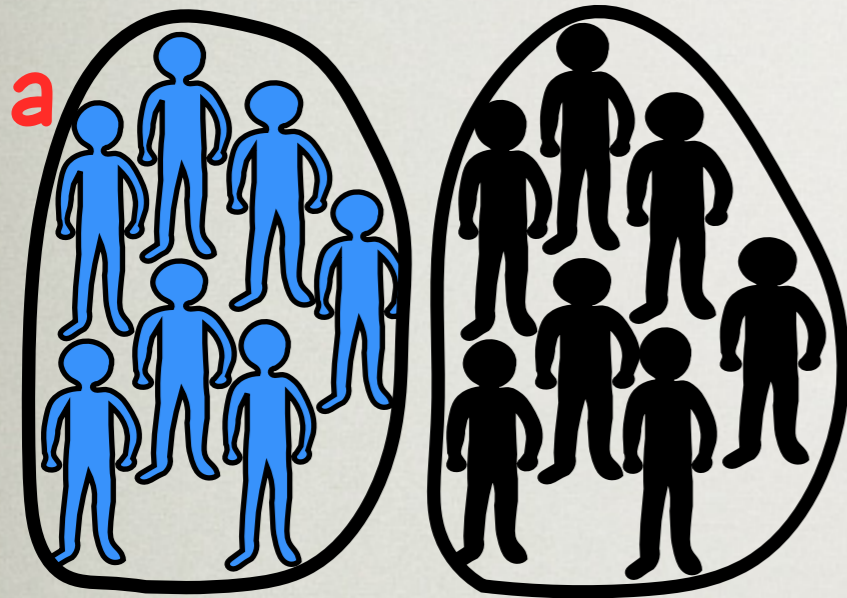
(see end of presentation for answers)

- a ...is the simplest to administer?
- b ...is prone to order effects?
- c ...might call on sets of identical twins?
- d ...is most likely to be affected by extraneous participant variables, particularly if groups are small?
- e ...may require a counterbalancing technique?
- f ...requires pairing of participants on particular variables?
- g ...requires no separate control and experimental groups?
- h ...may require pretesting of participants?

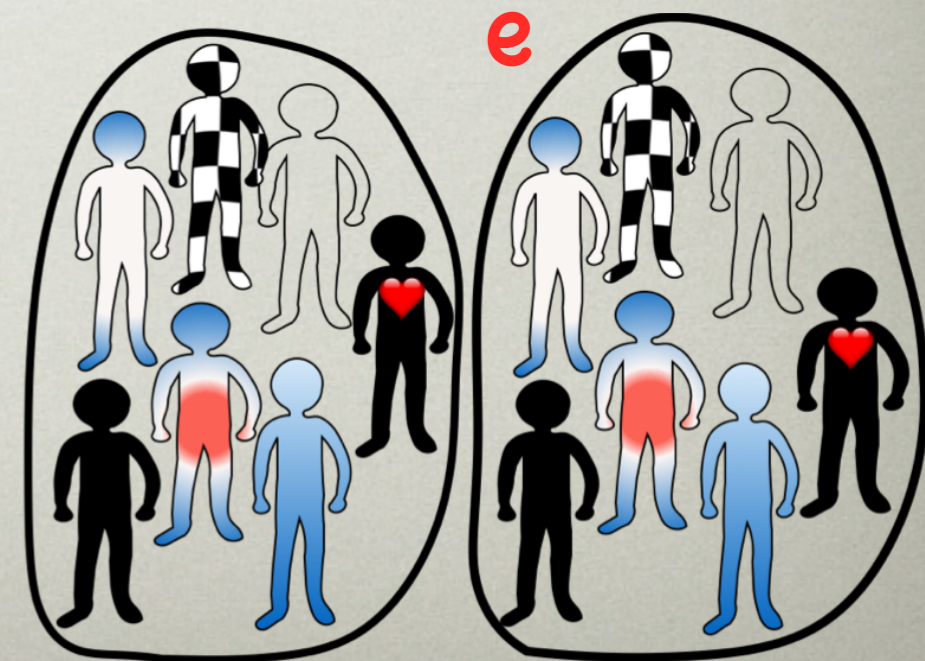


# Quick Quiz: The Story So Far 3

Which concept matches each image/symbol?




- 1** matched participants
- 2** independent groups
- 3** participant variables
- 4** repeated measures
- 5** situational variables





# Naturalistic Observational Studies

A photograph of two chimpanzees. On the left is a young chimpanzee looking towards the right. On the right is an adult chimpanzee looking towards the left. They are both looking at each other. The background is dark.

Ideal for observing people and animals in their normal environment  
Should be carried out in a systematic fashion, with defined behaviours and checklists so that behaviours can be classified and counted. This allows quantitative analysis to be carried out and comparisons to be made.

Not conducive to establishing cause-effect relationships, since the variables that affect behaviour cannot easily be controlled.

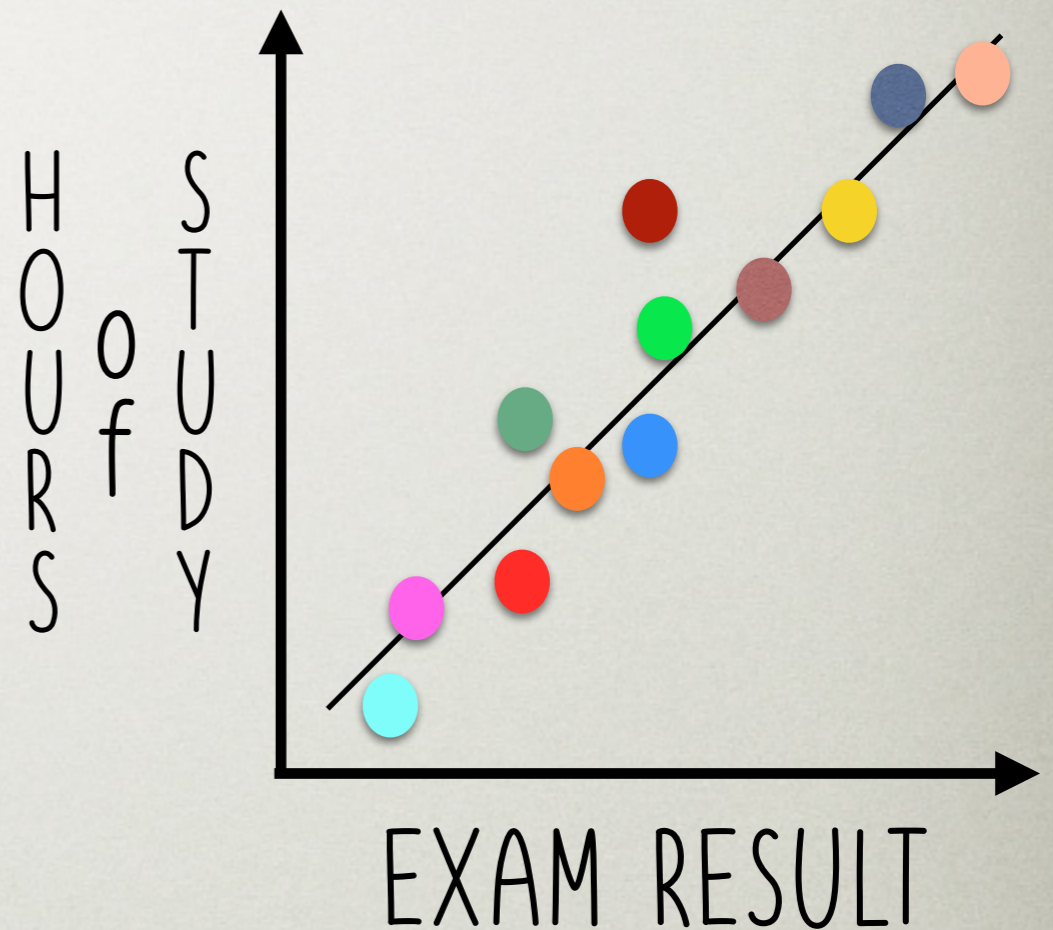


# Correlational Studies

Allow researchers to investigate the link between two linear variables, such as temperature and number of heart attacks, number of exams and self-ratings of stress, self-esteem and academic success, etc.

A relationship may exist between these sets of variables, but you cannot conclude that one causes the other. Sometimes the variables might influence each other or other factors may influence each of them.

## Scattergram



A diagrammatic representation of a graph that could be based on correlational data - a **strong positive correlation**



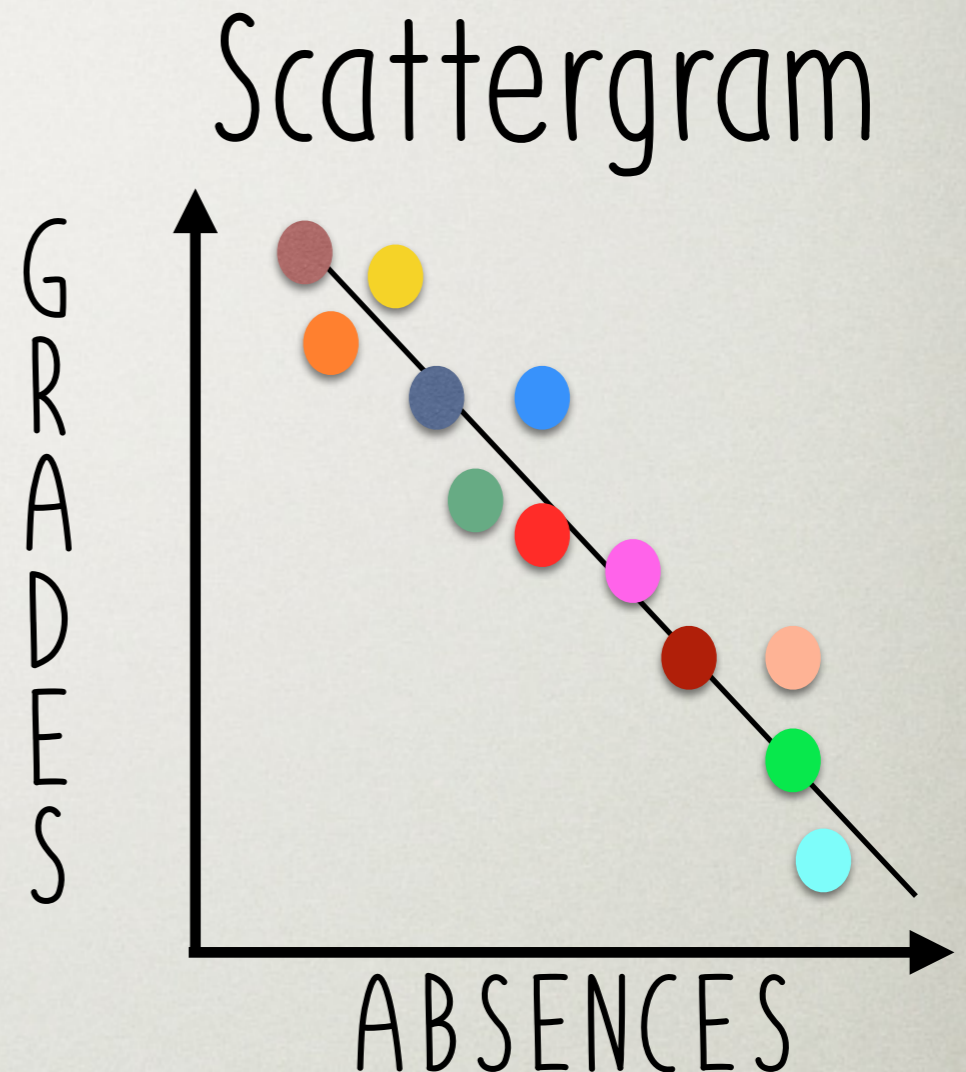
# Correlational Studies

After completing statistical analysis in a correlational study, the result is a **CORRELATION COEFFICIENT**.

A perfect positive correlation has a correlation coefficient of 1.00.

A perfect negative correlation has a correlation coefficient of -1.00.

No correlation yields a correlation coefficient of 0.



A diagrammatic representation of a graph that could be based on correlational data - a **strong negative correlation**



# Surveys/Questionnaires

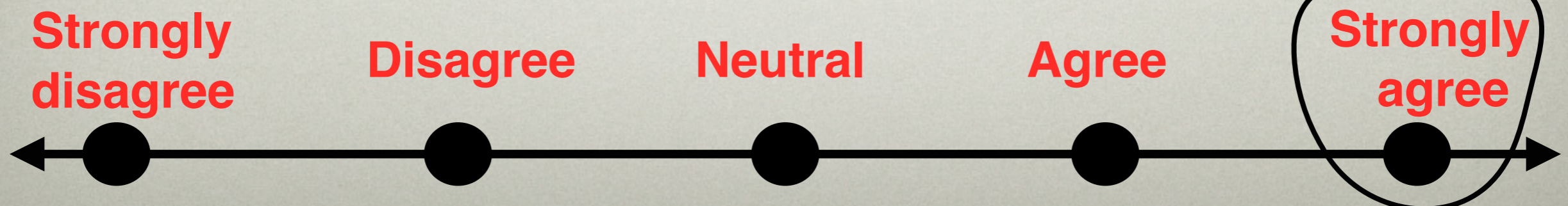
Surveys allow a large number of people to respond. They are useful for investigating attitudes to a particular topic.

A Likert Scale is one example of how a survey can be presented.

Since this method is entirely based on self-report, people may give socially desirable answers. This must be remembered when analysing data based on surveys.

This method also requires a literate population, which can limit its usefulness.

Now I've learned enough about Research Methods.





# Quick Quiz: The Story So Far 1

(See answers at end of presentation)

① Scientists search for...

- a certain truth    b highly probable, evidence-based conclusions
- 

② In Psychology, an individual with an unusual experience or disorder may be investigated through...

- a a case study    b an experiment    c a correlational study
- 

③ In an experiment, the variable that represents the hypothesised cause is called the...

- a dependent variable    b independent variable
- 

④ The only type of study that can establish a cause-effect relationship is a/n

- a correlational study    b case study    c experiment
-



# Quick Quiz: The Story So Far 1

5 The variable that represents the effect in an experiment is...

a the independent variable    b the dependent variable

6 An outside variable that should be controlled in an experiment

a is called an extraneous variable.    b is called a dependent variable.

7 A variable that clearly interferes in the IV->DV relationship is

a a confounding variable    b an independent variable

8 A case study provides largely...

a comparable quantitative data    b in-depth qualitative data

9 An operational definition of a variable...

a is a general indication of its meaning    b shows exactly how it is being defined and measured in the current study



# Whoops! - Suggested Answers

## Obvious Examples of Poor Sampling

You want to study attitudes to abortion but have no Catholics in your sample. **Since Catholics tend to oppose abortion, they must form a part of the sample.**

You wish to discover how students at BHHS deal with problems but only include girls in your sample. **The experiences of boys have been completely overlooked (over 60% of our school's population!).**

You aim to gain feedback from the school community and base your conclusions on the 25 parents who responded. **Those parents are the most motivated and therefore they are not representative of the whole.**

You want to discover how teachers use computers but only select teachers over the age of 50. **Obviously older teachers are not representative of the whole group, especially when it comes to computer use.**

You hope to study all people with eating disorders yet you draw your entire sample from people admitted to hospital with eating disorders.

**Only the most serious patients are admitted to hospital. This is therefore not a representative sample.**



# Another whoops factor... - Suggested Answers

## Biased Allocation to Groups

You compare the reading results of a new program at Surrey Hills Primary School with those at Footscray Primary School. **Different ethnic and socioeconomic backgrounds of children could lead to a confounding variable.**

You want to test a new teaching method for Maths and choose 7B and S1Z as the two groups in your experiment. **One class is accelerated — certain confounding variable.**

You have 40 participants and place all the volunteers in the experimental group. **The volunteers are more motivated; putting them all in one group might make motivation a confounding variable.**

You wish to investigate the impact of an eLearning program on teachers and so you compare a group of older teachers with a group of younger teachers. **The age of teachers is likely to influence their confidence with computers and online materials. One group is likely to find eLearning naturally more challenging.**



# Quick Quiz: The Story So Far 2

Match the definitions with the terms.

**a** outside variables that might influence an experiment if they are not controlled or minimised

**b** a variable that clearly interferes in the causal relationship between the IV and the DV

**c** experimental design in which there are two (+) unrelated groups

**d** the sole factor that should be different between the control and experimental groups (in an ideal situation)

**e** experimental design in which all participants experience both the control and the experimental condition

**d**  
independent  
variable

**e**  
repeated  
measures

**c**  
independent  
groups

**a**  
extraneous  
variables

**b**  
confounding  
variable



# Quick Quiz: The Story So Far 2

## Identify the confounding variables...ANSWERS

**a** Ms Green tries out 2 different types of handouts on her psych students and compares their results in the following outcome. She gives all the boys her new-style handouts and all the girls her standard handout.

Confounding variable: GENDER

**b** Ms Willshire compares the self-rated well-being of a standard Year 7 class taking the RESPECT module with the same ratings from a Year 10 class who is not taking the RESPECT module.

Confounding variable/s: AGE, YEAR LEVEL OF STUDENTS, etc.

**c** Mr Innes compares the results of his Year 8 class (S2Z) with those of the Year 8 class in his previous school, to whom he had taught the same unit. He wants to discover whether his most recent teaching methods have been effective.

Confounding variable/s: SCHOOL ENVIRONMENT, POTENTIALLY SOCIO-ECONOMIC BACKGROUND, ACCELERATED versus STANDARD CLASS



# Quick Quiz: The Story So Far 3

Which experimental design...?

(see end of presentation for answers)

a ...is the simplest to administer? - independent groups

b ...is prone to order effects? - repeated measures

c ...might call on sets of identical twins? - matched participants

d ...is most likely to be affected by extraneous participant variables, particularly if groups are small? - independent groups

e ...may require a counterbalancing technique? - repeated measures

f ...requires pairing of participants on particular variables? - matched participants

g ...requires no separate control and experimental groups? - repeated measures

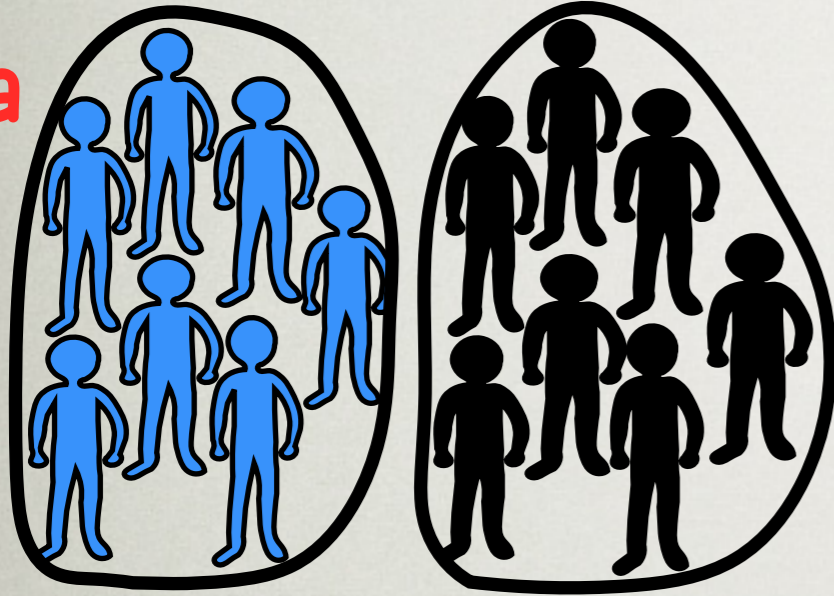
h ...may require pretesting of participants? - matched participants



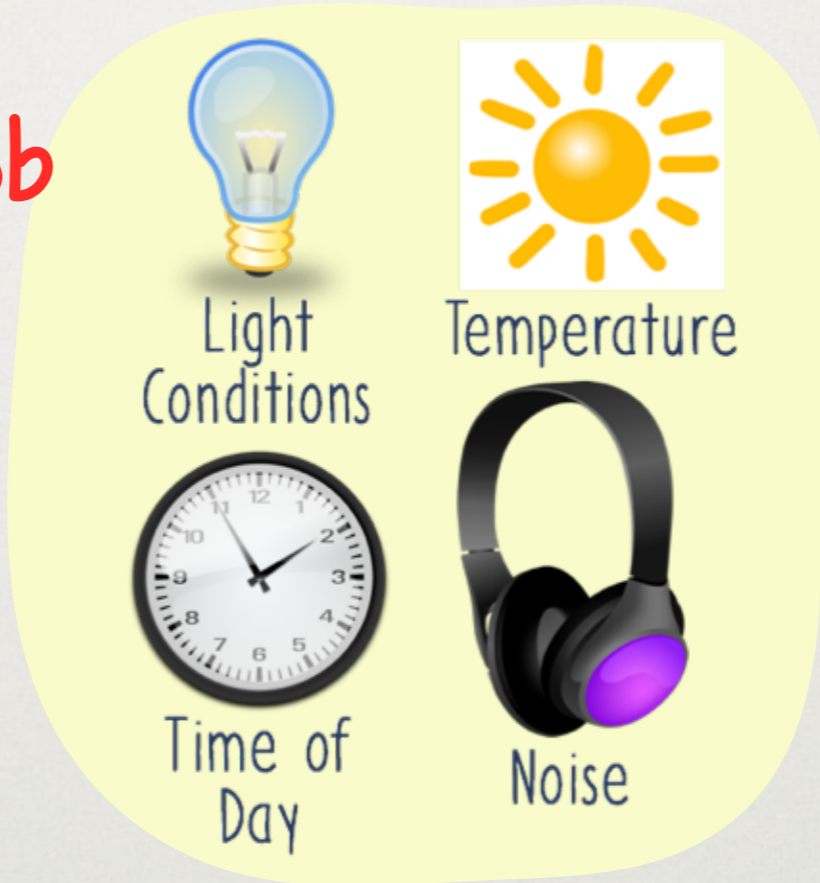
# Quick Quiz: The Story So Far 3

Which concept matches which image/symbol?

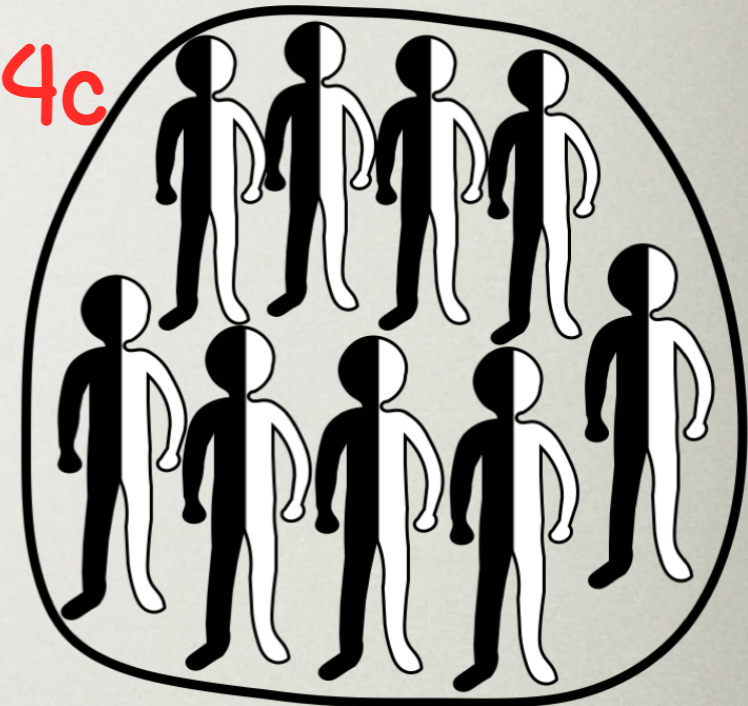
2a



5b



4c



All participants experience each condition.

3d



- 1 matched participants
- 2 independent groups
- 3 participant variables
- 4 repeated measures
- 5 situational variables

1e

