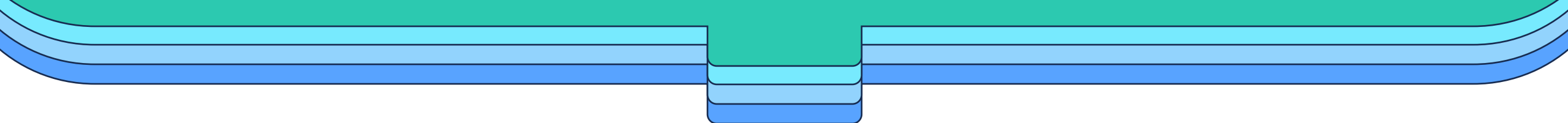


Research Methods I

Types of Design

Stacey Coleman



RECAP

Variables

Independent (IV's)

Can be manipulated/controlled by the researcher
'Cause' variables

Dependent (DV's)

Dependent on an IV
'Effect' variables

Extraneous

Any variable that is not the IV that could have affected the DV (but may or may not have been accounted for in the initial study design)

Confounding

A variable that causes confusion in understanding the relationship between two variables (as can influence both the IV and the DV). Aim as much as possible to eliminate these in experimental research through controlled conditions

Study Design



Often several potential ways of exploring a psychological question



Need to weigh up the benefits and problems of each possible approach



Must make sure the design chosen will enable you to answer your research question, and reject or accept your hypotheses

Scientific Approach (Empiricism)

Definable subject matter

- What are you interested in?

Theory construction

- An explanation of a particular behaviour/cognitive process

Hypothesis testing

- A testable statement which makes a prediction about that behaviour/cognitive process

Empirical methods

- Ways of collecting data to see if your hypothesis/prediction is correct & if your theory is supported.

Quantitative Research Designs

1

Experimental

2

Non-Experimental

3

Quasi-Experimental



Experimental Designs

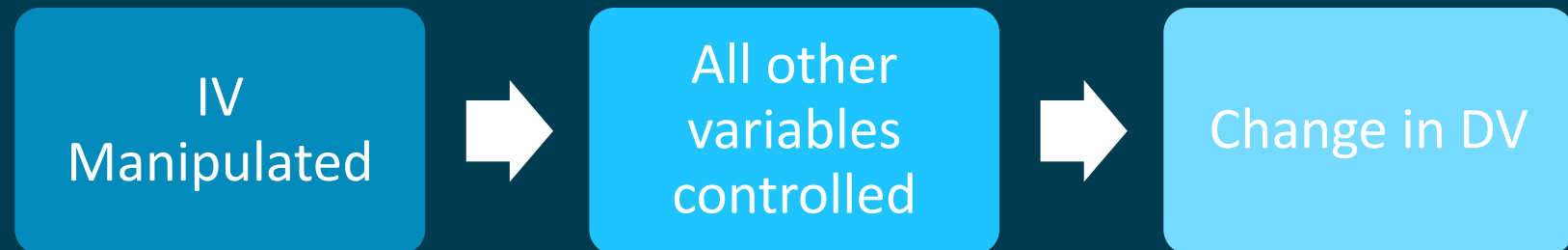
When we are looking for **differences** between two or more groups, we will normally use an **experimental design**

Important in exploring causal relationship between variables

An experiment is generally assumed to be the most reliable and effective method for demonstrating that one *variable* has an effect on another *variable* to change

True Experiments

- 1 • Researcher manipulates (controls) one or more variables
- 2 • Researcher measures whether this manipulation influences other variables
- 3 • Researcher attempts to control extraneous factors that might influence the outcome of the experiment



We can systematically alter the level of an IV to see if it effects the DV

Experimental Designs

Procedures in true experiments must be standardised

Exactly the same procedure is followed with each individual participant

The instructions given to participants must also be exactly the same

Participants are usually tested individually (avoid distraction)

1

Between-subjects

2

Within-subjects

3

Mixed-design

Between-Subjects



Two (or more) distinct groups

Any one participant can only belong to ONE group

E.g., a research study exploring differences in perceptions of body image between males and females.

MALE

OR

FEMALE

Often randomly assigned to one group or another (not the case with certain demographics such as gender, age, etc)

Between-Subjects

Systematic manipulation of an IV

Experimental groups:

- Those who receive a particular manipulation
- To assess whether the manipulation has altered behaviour/outcome in any way, another group who do not receive the manipulation is needed to compare...

E.g., an experimental group are given caffeine to assess memory whilst a control group are not given caffeine – memory performance is then compared.

Control groups:

- Used as a **baseline** measure of the behaviour/outcome without the manipulation





Between-Subjects

E.g., an experimental group are given caffeine to assess memory whilst a control group are not given caffeine – memory performance is then compared.



Knowing you are in a **control group** can lead to unwanted psychological expectations

Placebo groups

Experience the same conditions as the experimental groups, except that they only think they are receiving the manipulation when they are not



Deception?

Within-Subjects



One group of participants that take part in **all conditions**

All participants do everything – in relation to **one IV**

E.g., a research study exploring participants reactions to warning signs in vehicles.

CIRCLE

AND

SQUARE

AND

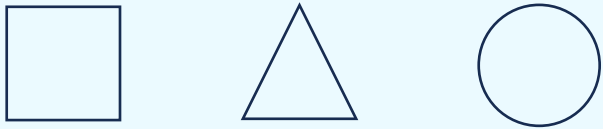
TRIANGLE

The same participants take part in **all conditions**

Within-Subjects

Main Issues: **Order / Practice Effects**

The order in which the conditions are completed can naturally influence the outcome due to **practice or fatigue**



Solution: **Counterbalancing**

Random order of conditions assigned to participants

1	2	3
---	---	---

1	3	2
---	---	---

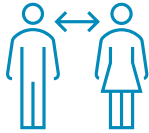
2	3	1
---	---	---

2	1	3
---	---	---

3	1	2
---	---	---

3	2	1
---	---	---

The disadvantages of a between-subjects design are often the advantages of a within-subjects design, and vice versa



Between subjects

Advantages:

- Eliminates practice effects and fatigue effects
- Shorter duration

Limitations:

- Requires more participants
- Individual differences can threaten validity



Within subjects

Advantages:

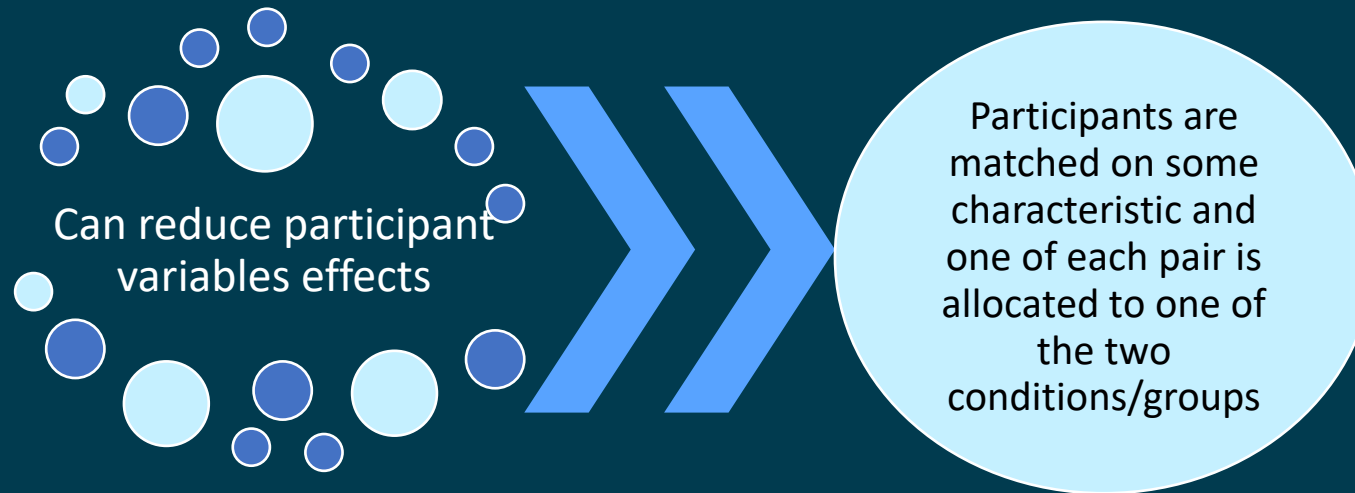
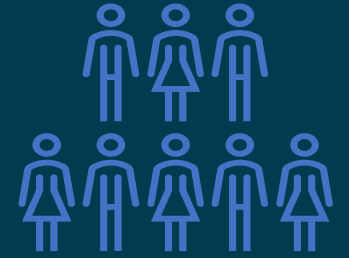
- Requires fewer participants
- Eliminates participant variables (individual differences are not an issue)

Limitations:

- Time consuming / more for participants to do
- Higher dropout rates
- Practice/order effects

We can use a **Matched-pairs design** as a compromise

Compare each participant in the 'treatment' group with a participant from a 'control' group that is like them in characteristics. For each pair, the difference from pre- to post-test should be clear based on them being in different groups



Advantages:

Participant variables unlikely to affect results

Limitations:

Expensive and time consuming
Dropout of one participant means the other in the 'pair' must be removed, also

Experimental Designs: Key Terms!

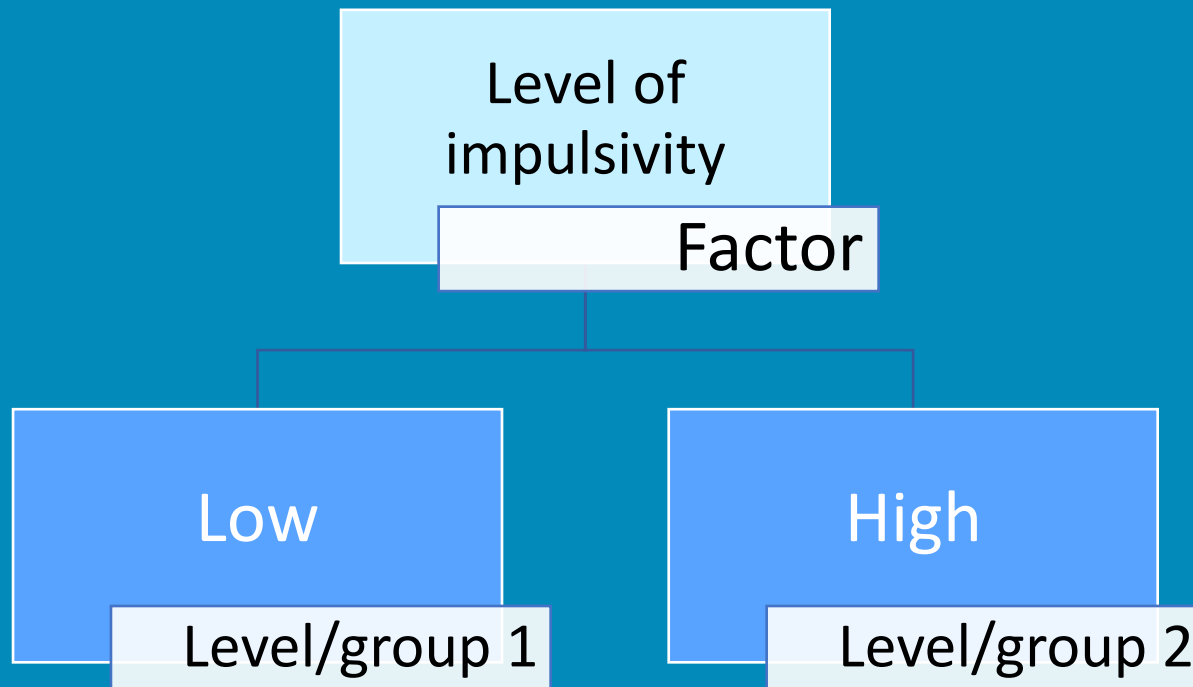
Factors:

These are the independent variables (IV's)

Levels of factors:

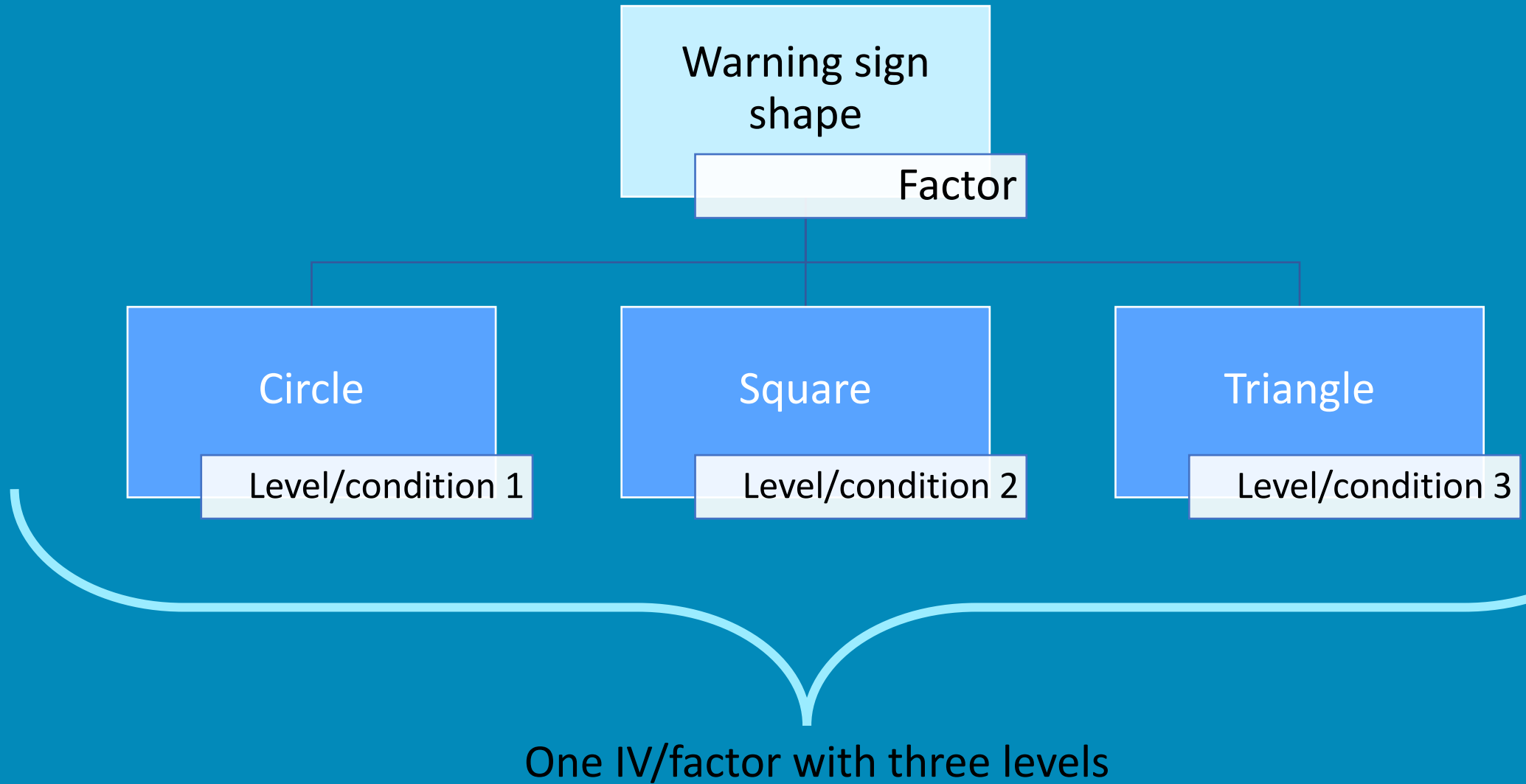
Conditions/groups of the IV

Experimental Designs: Key Terms!



**One IV (factor) with
two levels**

Experimental Designs: Key Terms!



Experimental Designs

So far, we have worked on the assumption that only one factor (IV) is being manipulated in a research study

But the number of factors included in a study can be **more than one**

Generally advised not to have more than four

The number of levels in our factors can also vary

Again, usually advised to have no more than four

Experimental Designs

There is a specific way in which we then refer to the design of a study based on these key terms of **factors** and **levels**

E.g., we want to include **two IV's** that are both between-subjects, and both have **two levels**

IV1 = Gender [male or female]

IV2 = Impulsivity score [low or high]

This is then called a **2 x 2 between-subjects design**

Experimental Designs

2 x 2 between-subjects design



There are two numbers here which tell us we have **two IV's**

The specific value of the numbers themselves refer to the number of **levels** associated with each IV

Additional examples:

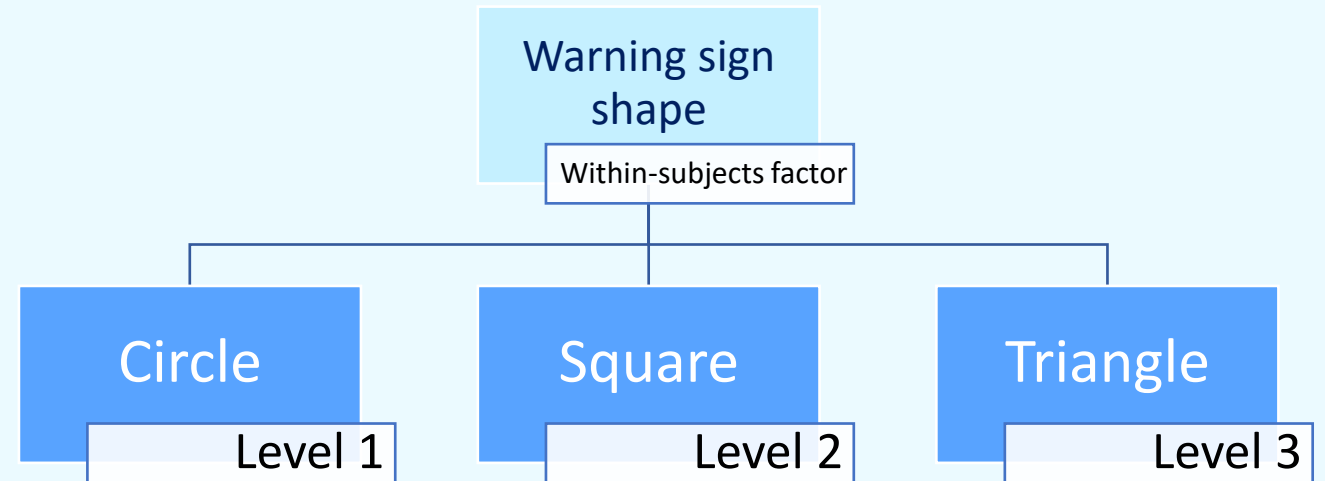
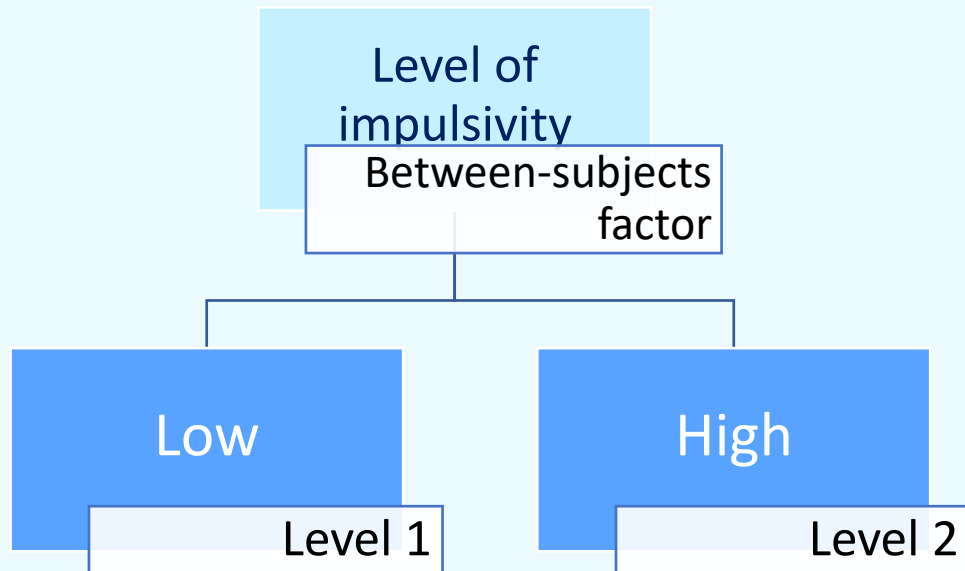
$2 \times 2 \times 2$ = three IV's, each with two levels

2×3 = two IV's, one with two levels and one with three levels

Mixed Designs?

Sometimes research will include both a between-subjects variable AND a within-subjects variable in the study...

E.g., a 2 x 3 mixed design



Participants are EITHER in the low or high group for level of impulsivity, but ALL participants complete all three conditions of warning signs.



Evaluation of Experimental Designs



Strengths	Limitations
Can establish cause and effect Shows direct link and can demonstrate the direction of a cause	Reactivity effects if people know they are taking part in an experiment but possible ethical issues if they do not know
High level of control and standardisation	Prescribed participant contribution – no unique view from participant or explanation/reasoning behind why
Easy to replicate	Cannot always be completed in practical or ethical manner to answer a specific question
High validity	Highly artificial – low ecological validity
Alternative explanations can be investigated	Limits to the type of phenomenon that can be investigated – and if study is not designed correctly it will lack scientific credibility



Non- Experimental Designs

Some research questions **do not suit** an experimental design

We can still use quantitative methods (numbers), but we can employ a non-experimental method to answer our research questions

Non-experimental methods investigate variables that exist among people irrespective of any researcher intervention

Correlation

Group differences

Non-Experimental Designs

In non-experimental studies, there is no **manipulation** of an IV

- *In the case of correlation, there is no IV!*

Group differences

Often used in practical work

A group defined by biology, demographics, personality, etc are compared with members of another group

There is no 'treatment' applied – instead, any differences are simply examined.

Can also be called 'Post-facto' research

Non-Experimental Designs

Correlation

- ✓ Looks for a relationship between variables
 - ✓ *But does not permit inferences about the cause or direction*
- ✓ Can test hypotheses
- ✓ Can establish generalisation outside the laboratory
- ✓ Can generate ideas for further laboratory study
- ✓ Allows the examination of variables that may not be practical or ethical to study in the laboratory
- ✓ Measuring not manipulating..

Non-Experimental Designs

Three components to correlational research:

1. Researcher measures one variable (X)
2. Researcher measures a second variable (Y)
3. Researcher statistically determines whether (X) and (Y) are related

More on correlational research later in the semester

Quasi-Experimental Designs

Quasi experimentation is common in many fields of psychology:
Social, Health, Education, Sports, Occupational

We sometimes face the dilemma of wishing to research in realistic, everyday settings, but recognise the lack of control this can involve
E.g., on real or therapeutic programmes

Quasi-Experimental Designs

The term **quasi-experiment** refers to well-controlled research designs that are 'almost' experiments

However, they lack many of the essential features of a true experiment – two of the most critical being:

1. Random allocation of participants to conditions
 - Without this we are far more likely to have non-equivalent groups
2. Full experimenter control over the IV

Research Example

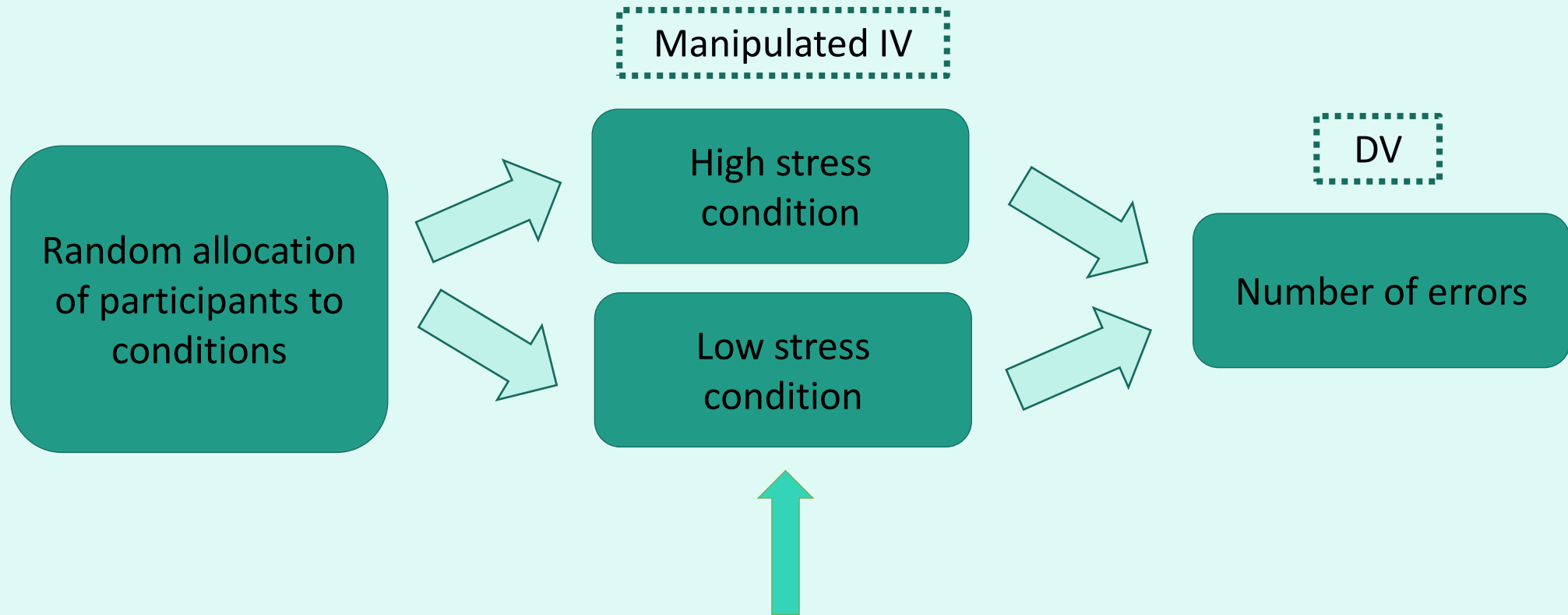
Researchers want to look at a group of workers and determine the numbers of errors they make during their work shift.

They want to include levels of stress as a variable in their study.

There are four ways they can assess this one idea...

1

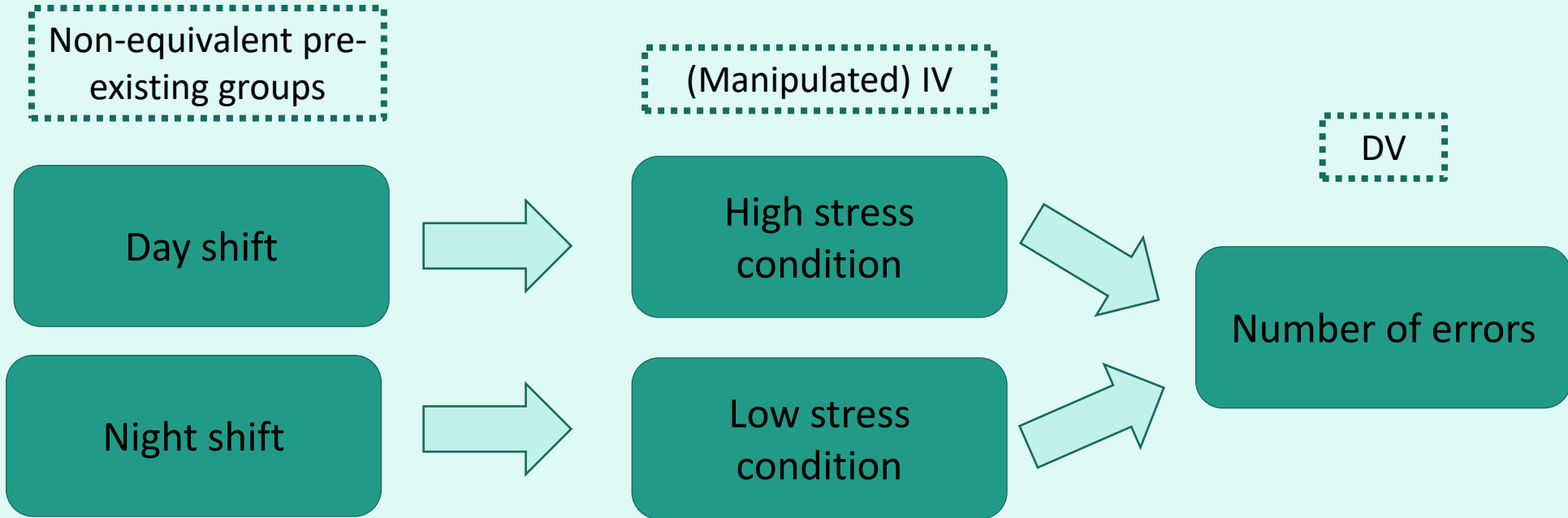
True experiment



Researcher manipulates/controls the stress groups –
high stress = high speed of production,
and low stress = low speed

2

Quasi-experiment

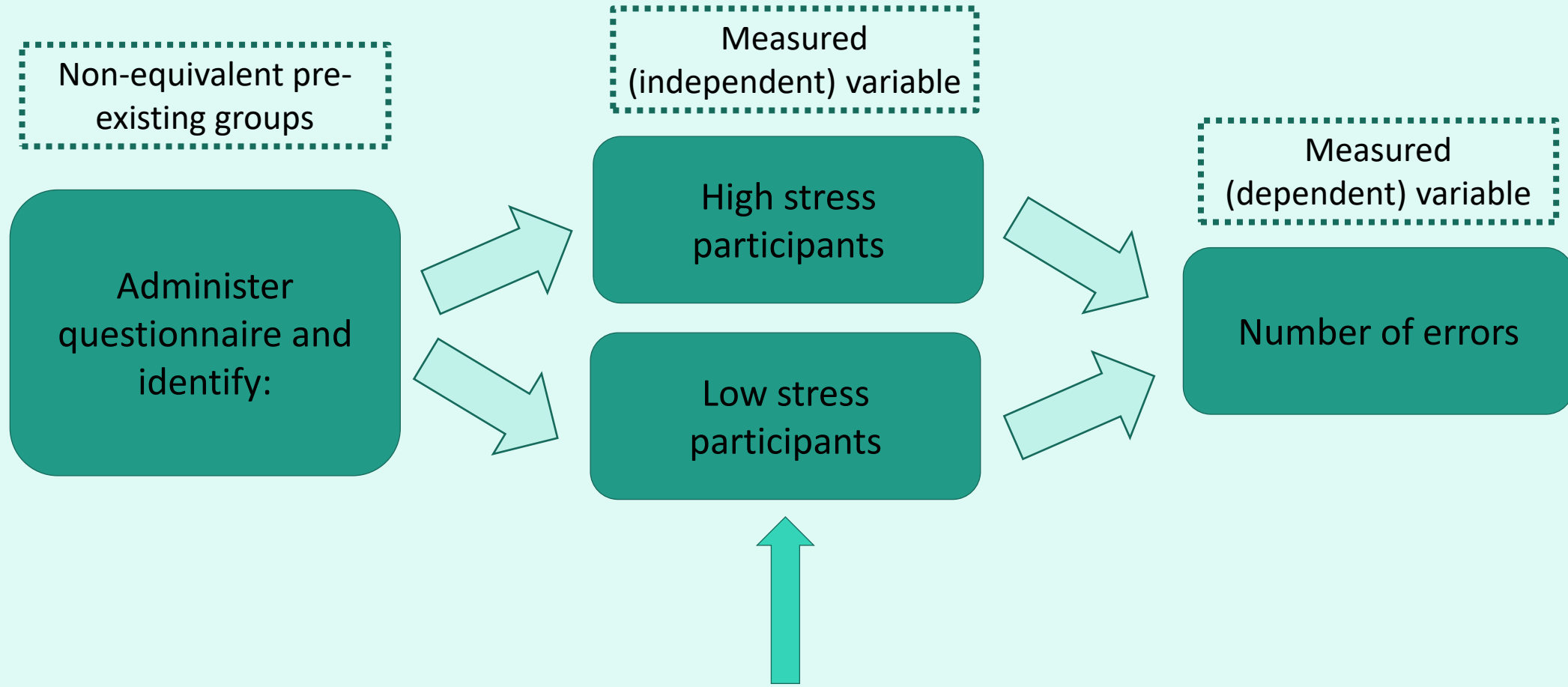


There may not be the option to allocate participants into the two stress conditions, so use pre-existing groups

Problem? Workers might already be more error prone working on the night shift, for example. Can't control for ID's

3

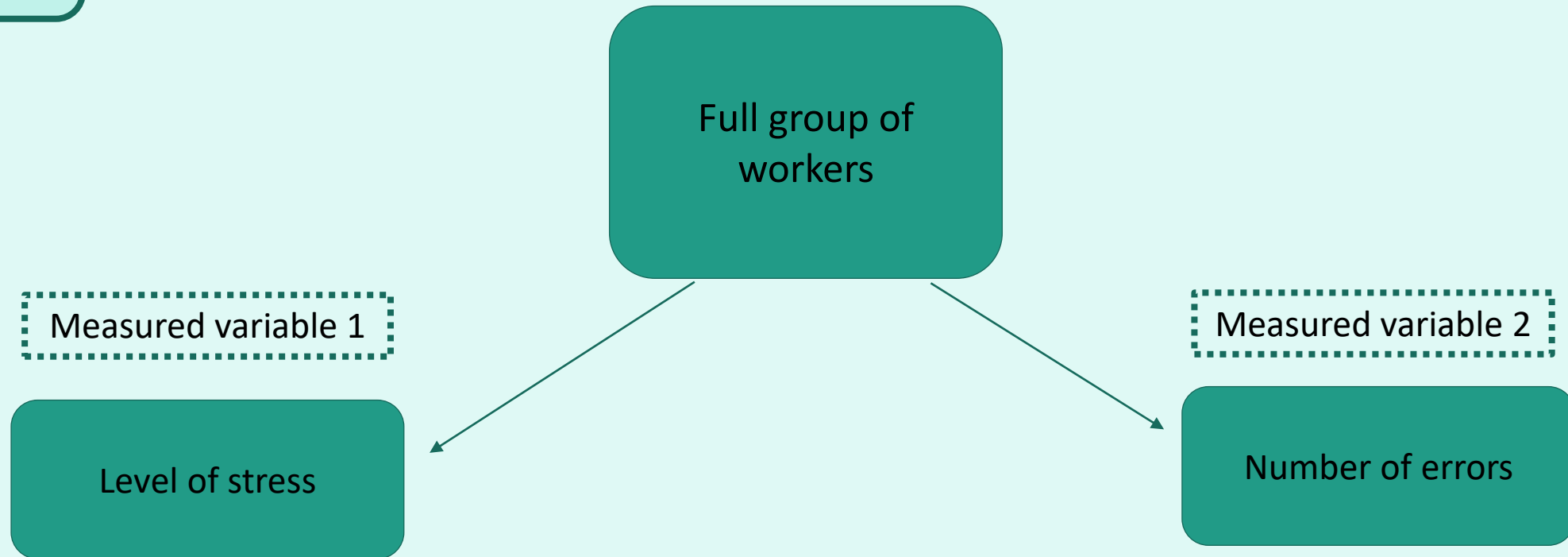
Group difference study



No manipulated conditions to produce stress – simply identifies low- and high-stress participants

4

Correlation



Simply determines whether there is a relationship between the two, and the direction of that relationship (positive or negative)



Summary

Research questions can be explored in a number of different (quantitative) ways

Experimental and non-experimental

Strengths and limitations to each

Main point is to answer the research question(s) as best you can using the most effective method!