



RESEARCH METHODS I

**EXPERIMENTAL AND NON-
EXPERIMENTAL DESIGNS**

VARIABLES - RECAP

IV's

- Can be manipulated/controlled by the researcher

DV

- Dependent on the IV

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. 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
- Have 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

EMPIRICISM I.E. A SCIENTIFIC APPROACH

- 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.

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THE ROLE OF EXPERIMENTS IN GATHERING EVIDENCE

EXPERIMENTS

- Experiments are considered a powerful way to gather evidence to support – or contradict – theories
- Experiments are fair, efficient, and have the ability to eliminate alternative explanations for a given research outcome
- Can identify whether one type of variable affects another
 - *Cause and effect!*
 - *More likely than other methods to show this relationship clearly*

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

EXPERIMENTAL VS. NON-EXPERIMENTAL

- The 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
- The term **VARIABLE** is used to describe the empirical object or phenomenon that we are observing

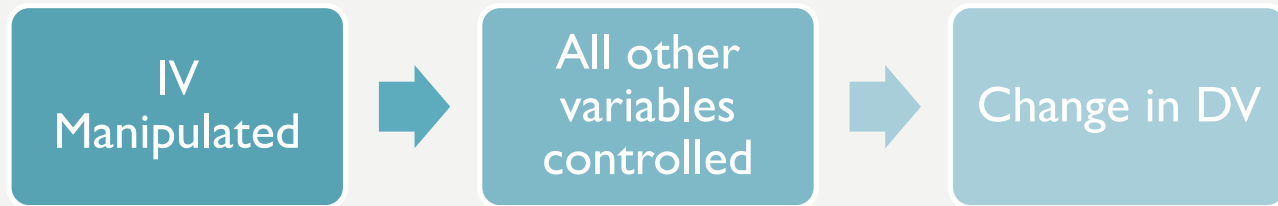


EXPERIMENTAL DESIGN

CHARACTERISTICS OF TRUE EXPERIMENTS

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

EXPERIMENTS



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

EXPERIMENTAL DESIGNS

- Simple experimental designs often reflect key demographic differences
 - E.g.,

Gender differences in body image

Two groups:
Male / Female

Age differences in prejudice

Three groups:
18-30 / 31-40 / 41 and over

EXPERIMENTAL DESIGN

- Or, participants can be (randomly) allocated to different groups whereby the researcher manipulates the IV

Memory recall task

Two **groups**:

1. Distraction
2. No distraction

OR

Attitudes towards smoking

Two **conditions**:

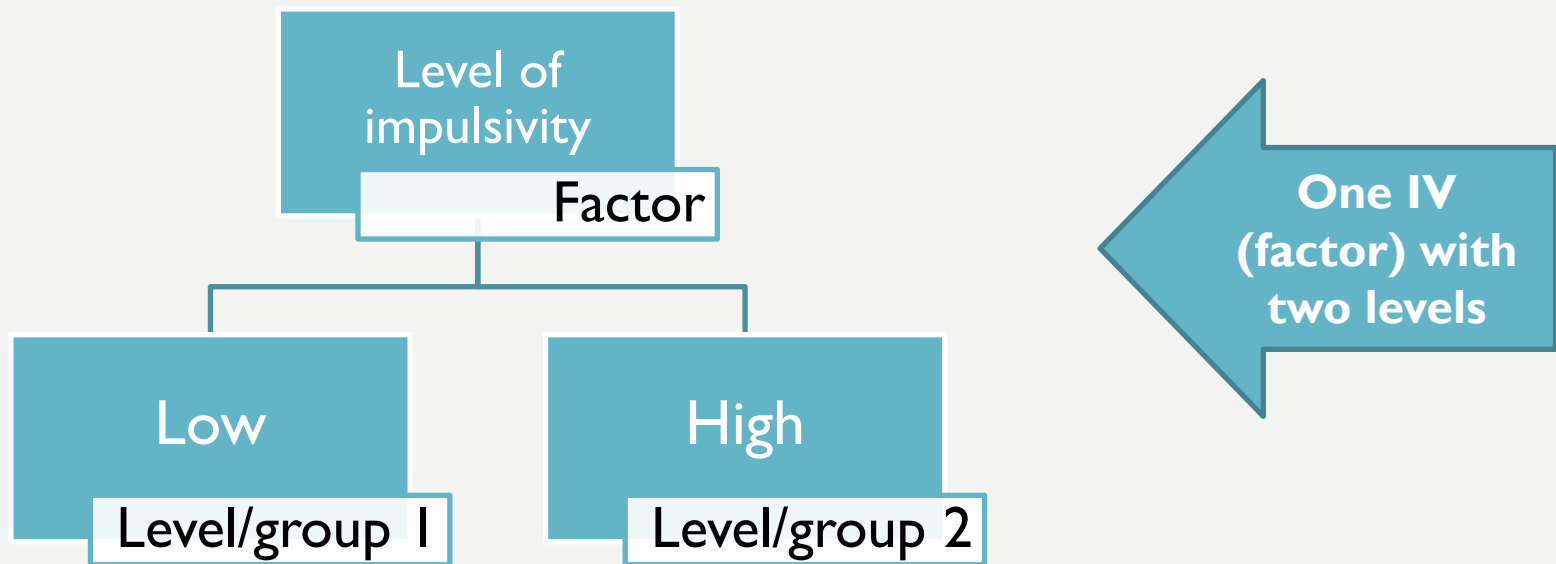
1. Before and 2. after reading an anti-smoking message

EXPERIMENTAL DESIGNS

- The 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
 - To avoid distraction

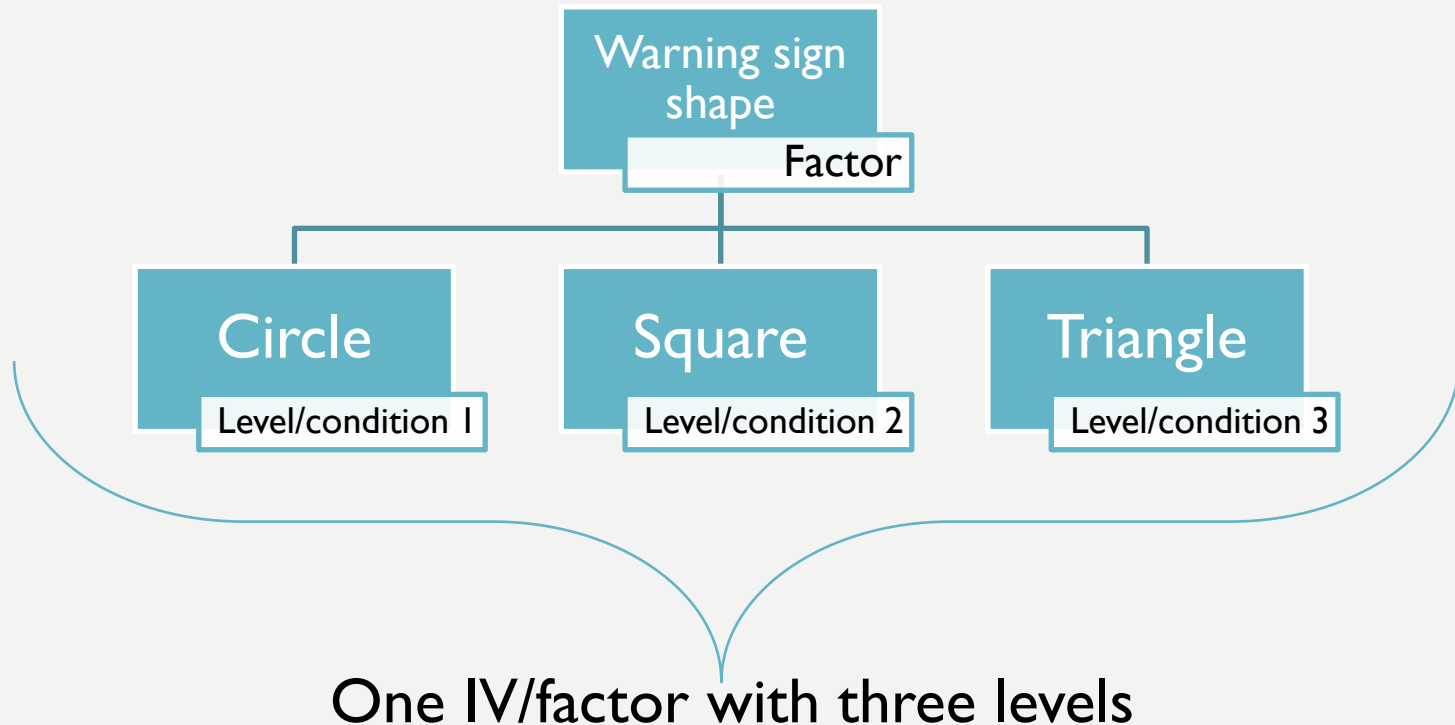
EXPERIMENTAL DESIGNS: KEY TERMS

- **Factors:** These are the independent variables (IV's)
- **Levels** of factors: Conditions/groups of the IV



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TYPES OF EXPERIMENTAL DESIGN

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Between-subjects

Within-subjects

Mixed design (bit of both!)

- I. Are you exploring differences between two (or more) groups?
 - E.g., a research study exploring differences in perceptions of body image between males and females.

TYPES OF EXPERIMENTAL DESIGN

Between-subjects

Within-subjects

Mixed design (bit of both!)

2. Are you exploring changes within the same group of participants?

- E.g., a research study exploring changes in people's attitudes towards gambling when given an editorial article on gambling in society.

BETWEEN- OR WITHIN-SUBJECTS DESIGN?

- Sounds simple – but this is one of the areas that students get most confused about!





BETWEEN- SUBJECTS

BETWEEN-SUBJECTS?

- Many different terms used to refer to this type of design:
 - Independent groups
 - Independent samples
 - Independent measures
 - Between groups
 - Between participants
 - Between subjects

BETWEEN-SUBJECTS

Are you exploring differences between two (or more) groups?

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

Participants are **either** in one group or another group

MALE

OR

FEMALE

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

BETWEEN-SUBJECTS

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..

Control groups:

- Used as a **baseline** measure of the behaviour/outcome without the manipulation
- E.g., an experimental group are given caffeine to assess memory whilst the control group are not given caffeine – performance is then compared.

BETWEEN-SUBJECTS

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

– Placebo groups

- Experience exactly the same conditions as the experimental groups, except that they only **think** they are receiving the manipulation when actually they are not
 - They don't receive nothing – they receive *something* that is like the manipulation but is ineffective
 - E.g., decaff coffee
 - But – consideration of ethics required, specifically element of deception

BETWEEN-SUBJECTS

- One of the main issues related to between-subjects designs is participant variables or non-equivalent groups.
- Certain procedures can be implemented to deal with this, including:
 - Random allocation of participants to groups
 - Pre-testing to demonstrate initial similarity
 - Representative allocation to ensure similarity



WITHIN- SUBJECTS

WITHIN-SUBJECTS

Explores changes within the same group of participants

- Can either be over time or before/after experimental manipulation or intervention
 - Example 1: a research study exploring changes in people's attitudes towards gambling when given an editorial article on gambling in society.
- The same participants take part in **all conditions**

BEFORE

AND

AFTER

WITHIN-SUBJECTS

- Example 2: a research study exploring participants reaction times to warning signs in vehicles.
- The same participants take part in **all conditions**

CIRCLE

AND

SQUARE

AND

TRIANGLE

WITHIN-SUBJECTS

- Also called **Repeated-Measures**
- Main issues: **Order / Practice effects**
 - Order in which the conditions are completed can naturally influence outcome due to practice
- Solution: **Counterbalancing**
 - Random order of conditions assigned to participants
 - E.g., with two conditions;
 - Half of participants complete condition 1 and then 2
 - The other half complete condition 2 and then 1

EXPERIMENTAL DESIGNS

- The disadvantages of a between-subjects design are often the advantages of a within-subjects design, and vice versa
- 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 similar to them in characteristics.
 - For each pair, the difference from pre- to post test should be clear based on them being in different groups

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 range
 - 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

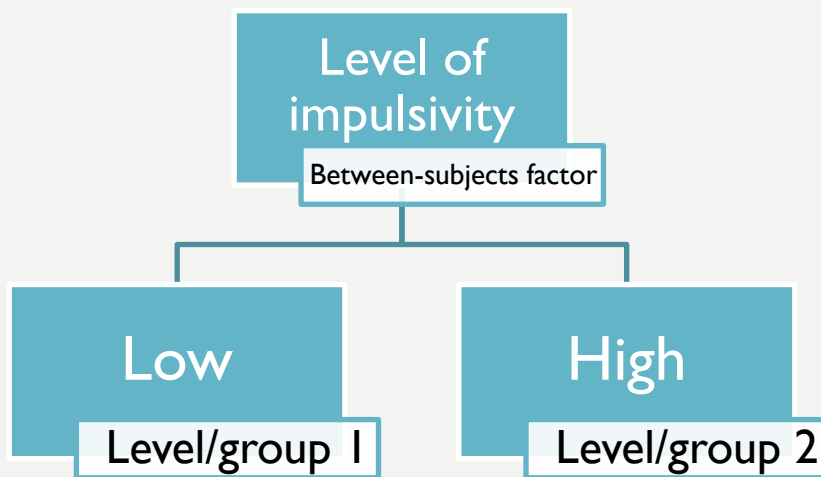
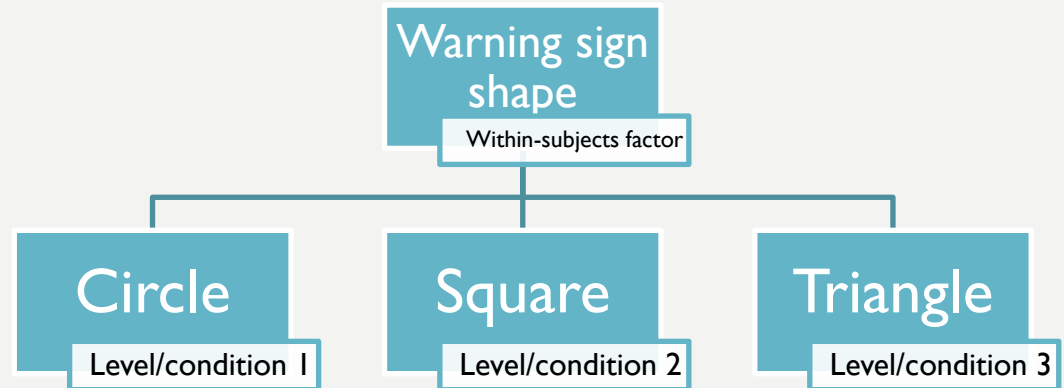
2×3 = two IV's, one with two levels and one with three levels

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MIXED DESIGNS

MIXED DESIGNS

- Sometimes research will include both a between-subjects variable AND a within-subjects variable in the study...
- E.g., a 2x3 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



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Strengths

Can establish cause and effect
Shows direct link and can demonstrate the direction of a cause

High level of control and standardisation

Easy to replicate

High validity

Alternative explanations can be investigated

Limitations

Reactivity effects if people know they are taking part in an experiment but possible ethical issues if they do not know

Prescribed participant contribution – no unique view from participant or explanation/reasoning behind why

Cannot always be completed in practical or ethical manner to answer a specific question

Highly artificial – low ecological validity

Limits to the type of phenomenon that can be investigated – and if study is not designed correctly it will lack scientific credibility



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NON- EXPERIMENTAL DESIGNS

PROBLEMS WITH THE “SCIENCE” OF PSYCHOLOGY

Objectivity

- impossible to achieve?
- The social nature of what we study = subjective

Experimenter bias

- We are influenced by our own expectations & beliefs
- We may act in a certain way that influences the thing we are studying

Demand characteristics

- Participants are problem-solvers
- Will try and act in a way they think is expected of them – may not be their normal behaviour

PROBLEMS WITH THE “SCIENCE” OF PSYCHOLOGY

Representativeness

- can we “generalise” from small samples to the wider population?
- Does our sample represent all sections of the population we are interested in?

Artificiality

- Is the way people behave in a laboratory experiment the same as they would behave normally?

Validity

- Ecological/external validity — is the study situation similar to the real-life situation of interest?
- Internal validity — the degree of scientific control within a study

NON-EXPERIMENTAL DESIGN

- 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 DESIGN

- Non-experimental methods investigate variables that exist among people irrespective of any researcher intervention
- Often using correlation, or by the investigation of existing group differences
- In these studies, no IV is manipulated

RECAP: FIELD STUDIES

- • Research conducted outside the laboratory -often in an everyday environment
 - Advantage: Able to capture natural behaviour
 - Also, called a naturalistic study
- Observational study: records freely produced behaviour in a naturalistic setting
- Can also run field experiments
 - However, where there is an advantage of studying behaviour in a natural setting, this incurs threats to validity
 - Loss of control and unable to create equivalent groups

NON-EXPERIMENTAL DESIGN

- Group differences research
 - Often used in practical work
 - A group defined by biology, demographics, personality are compared with members of another group
 - Introverts vs. extroverts
 - Between occupations
 - Between economic class
- There is no 'treatment' applied – instead any differences are simply examined.
- Can also be called 'Post-facto' research

NON-EXPERIMENTAL DESIGN

Correlational Research

- ✓ 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..

CORRELATIONAL DESIGN

Three components to correlation 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

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QUASI- EXPERIMENTS

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- Quasi-experimentation takes place in a number of different fields of psychology
 - e.g., Social and Applied psychology
 - health, education, sport...
- Face the dilemma of wishing to research in realistic everyday settings, but recognise the lack of control this can involve
 - E.g., on real training or therapeutic programmes

QUASI-EXPERIMENTS

- 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
 - o Without this we have non-equivalent groups
 2. Full experimenter control over the IV

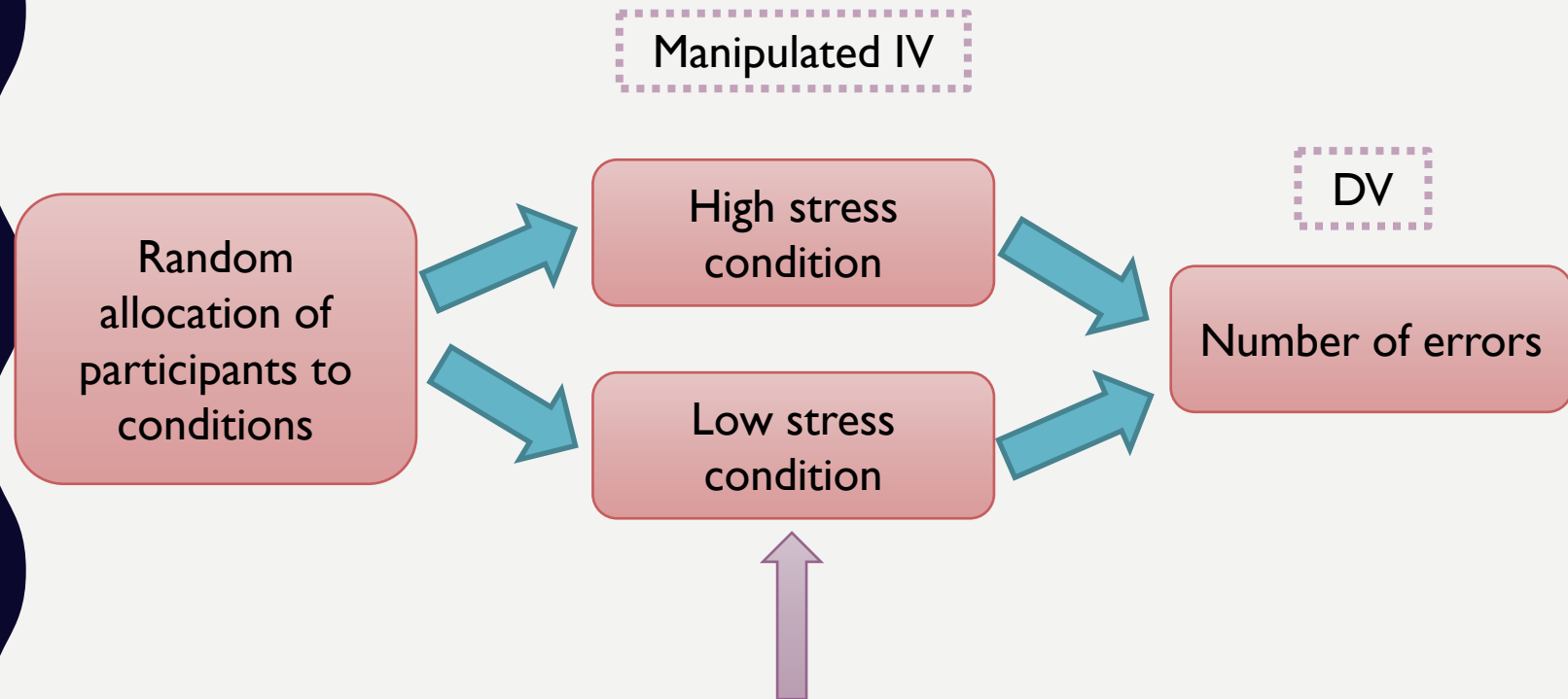
EXAMPLE

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.

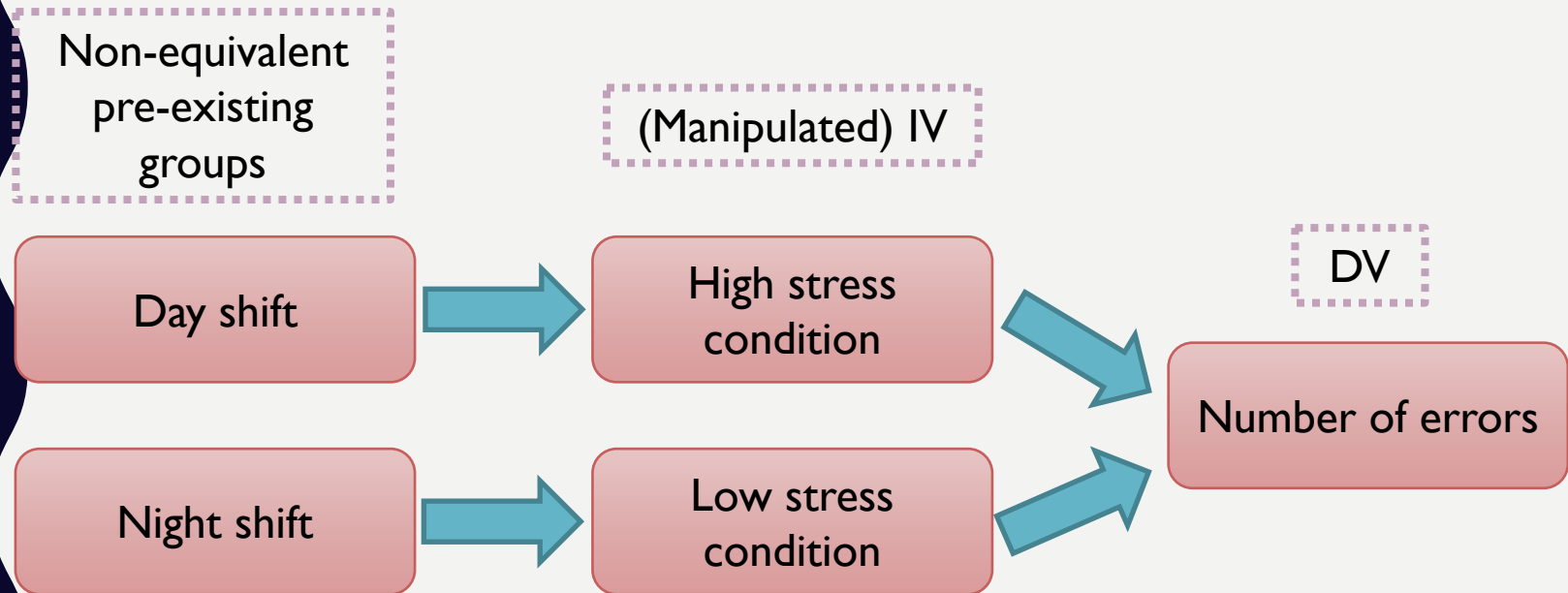
There are four ways they can assess this one idea...

1. TRUE EXPERIMENT



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

2. QUASI-EXPERIMENT

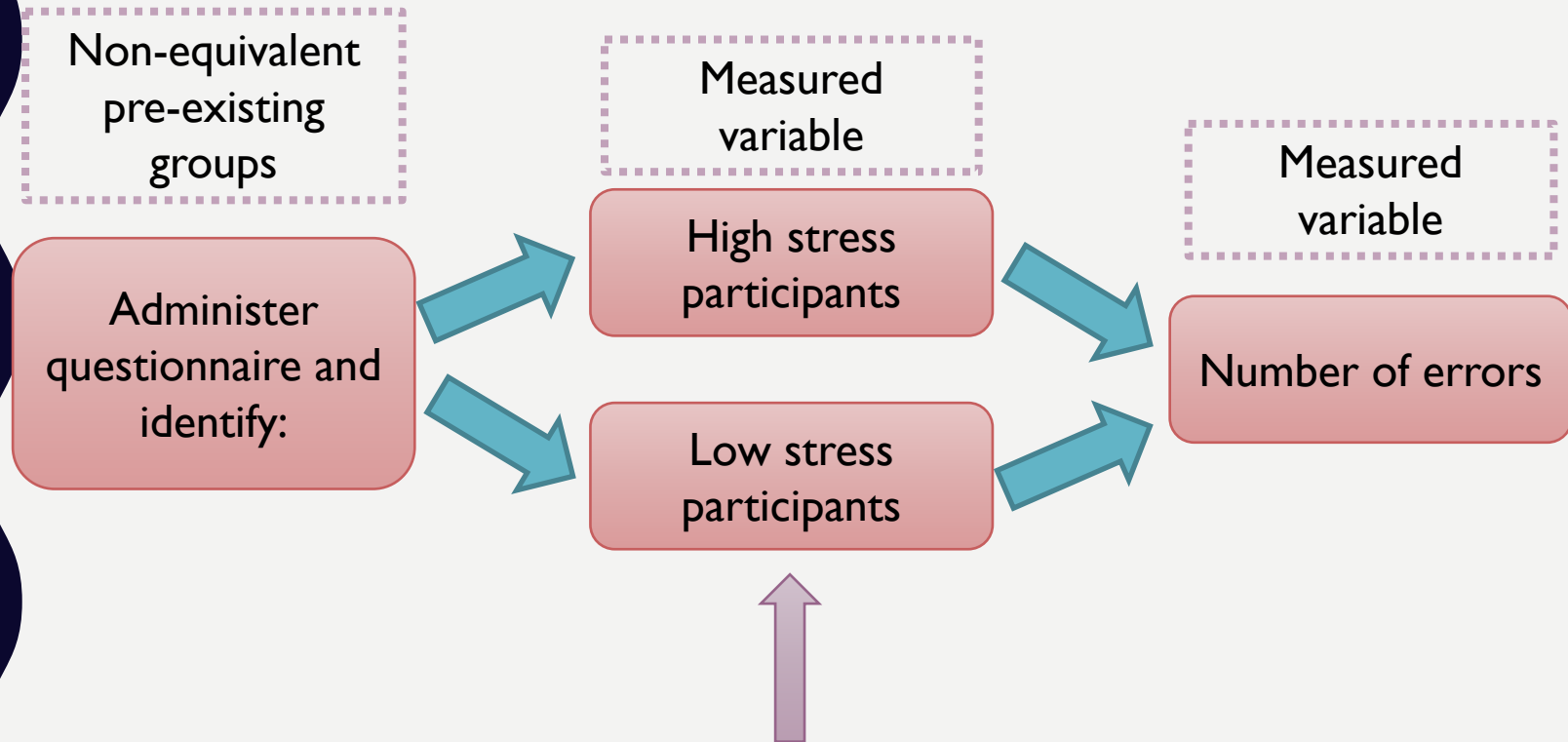


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There may not be the option to allocate participants into the two stress conditions, so use pre-existing groups

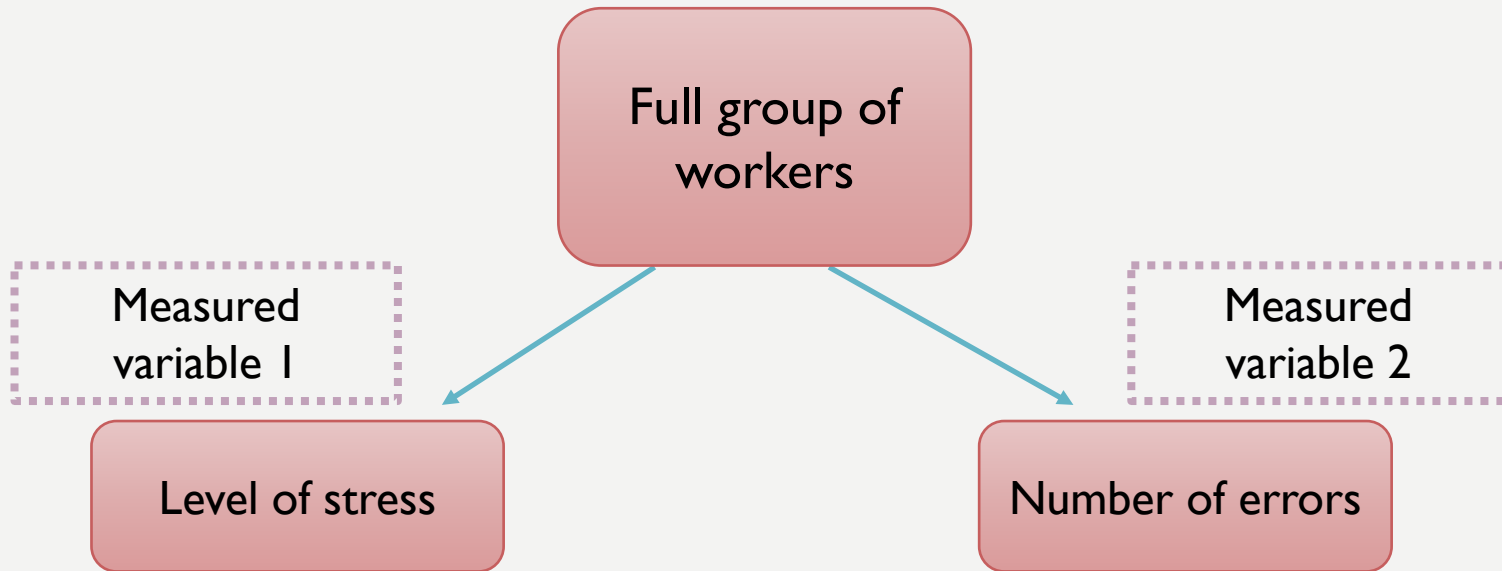
Problem? Workers might already be more error prone working on the night shift, for example. Can't control for ID's

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!