

Research Methods II

The background of the slide is white, decorated with numerous splatters of blue, light blue, and purple paint. A large, semi-transparent blue circle is positioned in the center-left area. The text 'Research Methods II' is written in a bold, black, serif font at the top. Below it, the text 'Quantitative Recap' is written in a white, sans-serif font inside a solid black rectangular box.

Quantitative Recap

Aims of the module

- To provide an in-depth exploration of qualitative and quantitative research design and the application of analysis techniques to further understanding of the ethical, practical, and theoretical issues in research and how these are applied in creating strong research studies.

Learning Outcomes

- Upon the successful completion of this module, the student should be able to:
 - Demonstrate a critical understanding of a variety of research designs including both experimental and non-experimental designs;
 - Identify and apply a range of quantitative and qualitative data collection techniques and methods across a variety of research settings;
 - Demonstrate strong awareness of good practice in data management and the ethical issues associated with qualitative and quantitative research design;
 - Take responsibility for their own learning and skill development; including effective personal planning, self-reflection and project management skills.

Getting back up to speed...

Read the book chapters from last year
Engage with the resources provided for you
(SPSS, Qualtrics)



What you should look over...

- | | |
|---|---|
| <ul style="list-style-type: none">• Hypotheses<ul style="list-style-type: none">• One-tailed, two-tailed, null• Variables!<ul style="list-style-type: none">• Independent, dependent, extraneous, confounding• Types of design<ul style="list-style-type: none">• Within-subjects, between-subjects, mixed design• Levels of measurement<ul style="list-style-type: none">• Categorical and continuous | <ul style="list-style-type: none">• Descriptive statistics<ul style="list-style-type: none">• Central tendency, variance and standard deviation, distribution• Inferential statistics<ul style="list-style-type: none">• Probability, errors, parametric (e.g., t-test, correlation) and non-parametric (e.g., chi-square.),• Ethics! |
|---|---|

Design Choices in Research

- Study design choices need to be considered carefully
- Choice of variables should be based on appropriate theory and/or empirical evidence
- You need to think carefully about the type of data you need to collect BEFORE you collect it

Hypotheses

A prediction about the outcome of the research

E.g., there will be a difference / association between conditions / variables

One-tailed hypothesis

- Makes a prediction regarding both the presence of an effect *and* the direction of this effect

Two-tailed hypothesis

- Only predicts the presence of an effect, not its direction

Null hypothesis

- Predicts a possibility that there will be no effect or association between variables

INDEPENDENT VARIABLE (IV)

The variable(s) the researcher controls/manipulates

The IV is assumed to have a direct effect on the dependent variable

DEPENDENT VARIABLE (DV)

Scores or measurements taken

Assumed to be directly affected by changes in the IV

EXTRANEOUS VARIABLE

Anything other than the IV that could affect the DV; it may or may not have been allowed for and/or controlled

CONFOUNDING VARIABLE

An uncontrolled variable that obscures the effect sought

It may have an affect on both the IV and the DV

WITHIN-SUBJECTS DESIGN

Within-subjects / repeated measures

Same participants in all conditions of the study

Issues include order effects, practice effects, fatigue

Counterbalancing is important in within-subjects designs

BETWEEN-SUBJECTS DESIGN

Between-subjects / independent samples

Different participants in different conditions

Issues include individual differences between groups

Match individuals as much as possible in groups, conduct pre-test to check for differences

VARITAION

Within-subject variation:

- Variation in the responses of the same individual on ore than one occasion

Between-subject variation:

- Variation between measures of different individuals

CONDITIONS AND GROUPS

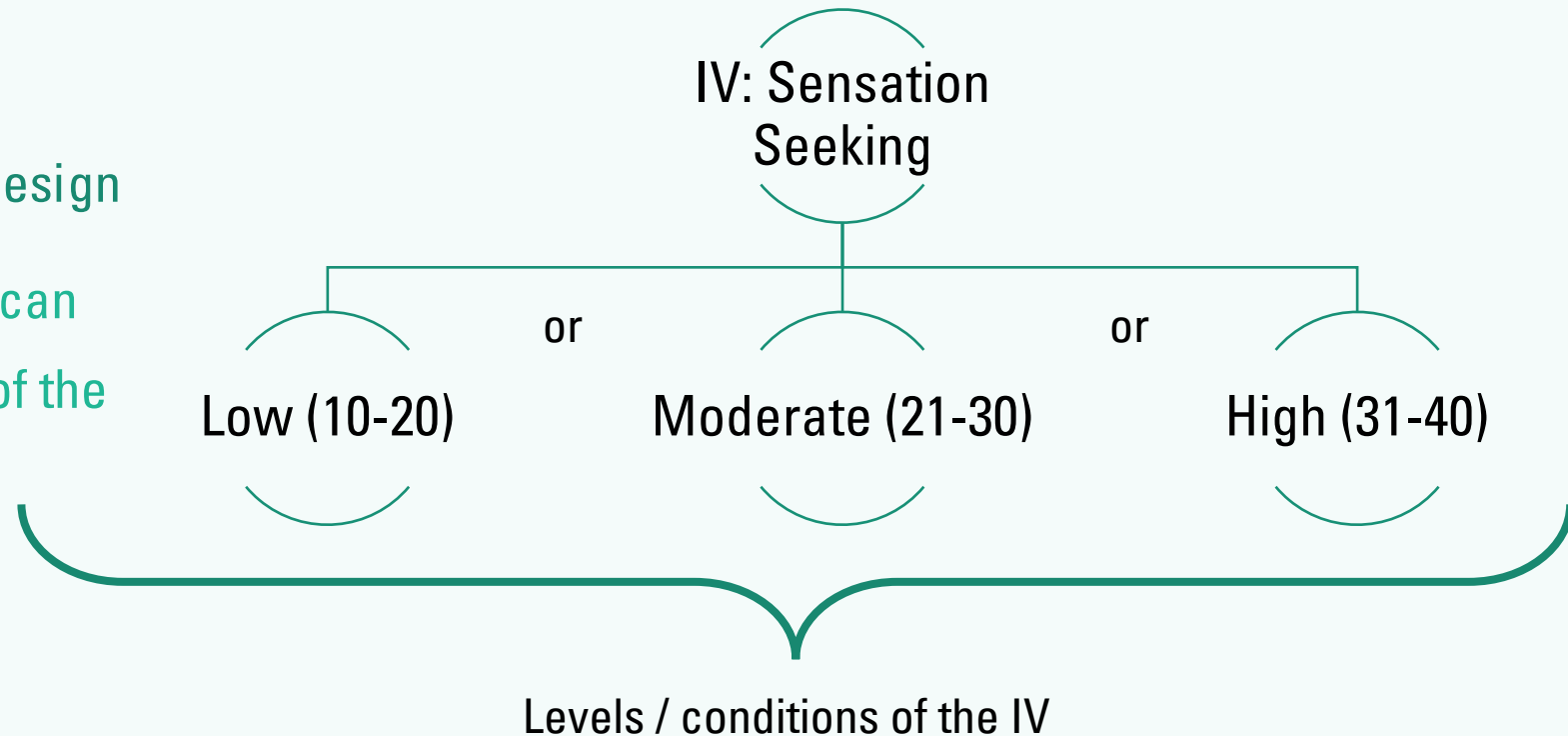
- Use the manipulation, control or collation of the IV(s) to produce conditions or groups
 - This is called the 'levels' of the IV
 - An IV can have many levels
- The number of levels (and type) are usually determined by the researcher
 - There is a consequence of the design of the study and research question
- IV's are not always directly manipulated
 - E.g., Gender; male and female

CONDITIONS AND GROUPS

- To illustrate...

Between-subjects design

Any one participant can only belong to **ONE** of the three groups

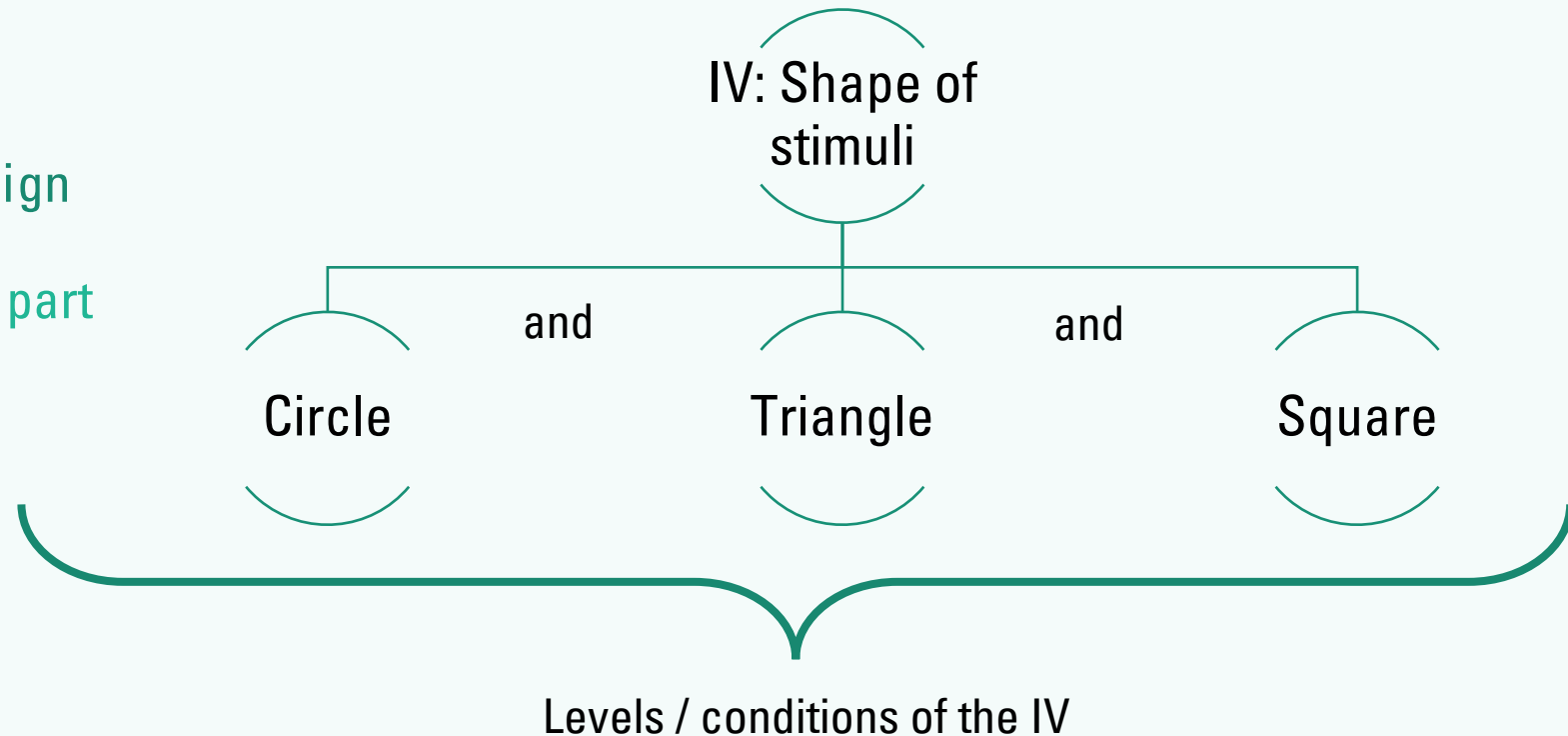


CONDITIONS AND GROUPS

- To illustrate...

Within-subjects design

All participants take part
in all conditions



CATEGORICAL DATA

Frequency counts

Limited number of groups to which people can belong to OR can only belong to one group

e.g., gender, personality type

CONTINUOUS DATA

Can take a vast range of values (often from zero) to an infinite number of different values

E.g, age, scores on a stress scale, seconds to complete a task

QUANTITATIVE DATA

- All data is measured in a numerical format; value or count expressed in numbers
- Measurement is precise (rather than interpretative)
- Quantitative data comes in different forms and it is incredibly important to consider which type of data is required prior to conducting a study.
- Why.....?

QUANTITATIVE DATA

- The type of data...
 - Impacts the quality of results
 - Influences the statistical analyses that are able to be conducted
 - Impacts conclusions that can be made
 - Impact ability to answer research question
- How do you decide whether to collect continuous or categorical data?

QUANTITATIVE DATA

Continuous data can be changed to categorical data, but categorical data CANNOT be changed to continuous data.

- Categorical – we can describe frequencies and possibly percentages
 - Results showed that a higher proportion of people in Group B (60%) were anxious compared to those in Group A (10%).
- Continuous – we can use mean scores which allows for more sophisticated options for statistical analyses
 - Results showed that the mean anxiety score of Group A was 2.3 and Group B was 24.7 (on a scale of 0-30)

LEVELS OF MEASUREMENT

NOMINAL	Records differences A is red, B is blue
ORDINAL	Records differences and magnitudes A is larger than B
INTERVAL	Records differences, magnitudes and has equal intervals A is two units larger than B
RATIO	Records differences, magnitudes, has equal intervals and has a true zero A is twice as large as B

LEVELS OF MEASUREMENT AND VARIABLES

- All types of data can be captured and used as a variable.
- Variable = aspect you are measuring; a quantity that can change
- Datasets usually consists of several/many variables – E.g.,
 - Height: varies as you grow older and between individuals
 - Time: e.g., in seconds to respond to a stimulus
 - Extraversion: measured using a psychological scale to produce a 'score'
- Variables can vary both:
 - Within the same person from one time point to another
 - Between different people

DESCRIPTIVE STATISTICS

Descriptive statistics are used to describe the basic features of the data in a study

They provide simple summaries about the sample and the measures, and provide the reader with an understanding of data (e.g., which group/condition did better/worse)

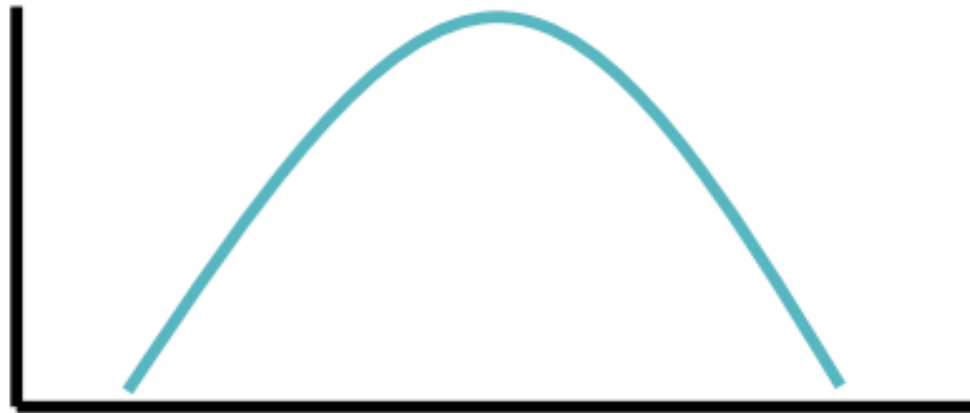
DESCRIPTIVE STATISTICS

CALCULATION OF CENTRAL TENDENCY

- **MEAN:**
 - Sum all scores and divide by the number of participants/data points
- **MODE:**
 - The most commonly occurring score
- **MEDIAN:**
 - The middle score when all scores are ranked from lowest to highest

VARIANCE AND STANDARD DEVIATION

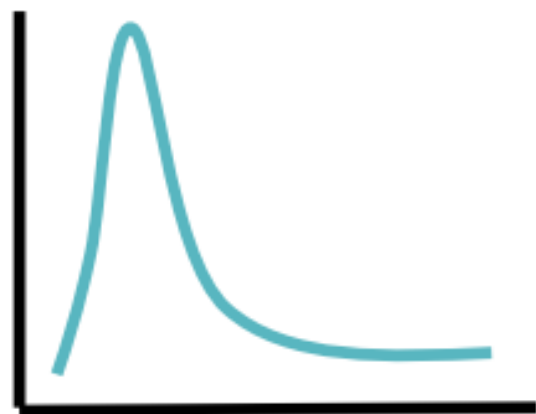
- **VARIANCE:**
 - Extent to which each score deviates from the mean
 - The larger the deviation, the greater the variability of scores
- **STANDARD DEVIATION:**
 - Square root of the variance
 - An 'average' of the deviations of scores from the mean



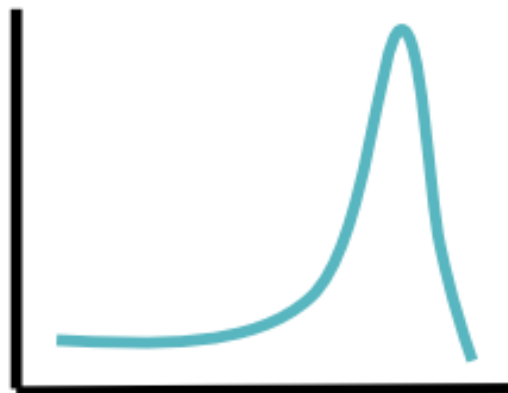
Bell shape
Inverted U curve

DISTRIBUTION

We need to check whether
our data is normally
distributed



Positive



Negative

Or whether it is
skewed

DISTRIBUTION

DISTRIBUTION

- Distribution is important because;
 - It impacts the type of analyses that can be conducted
 - If data are normally distributed (and other relevant assumptions are met) it is safe to use parametric analyses
 - If data are not normally distributed, non-parametric tests should be used

INFERENTIAL STATISTICS

Allow us to go beyond simply describing data

Mathematical / statistical procedure that allow us to make inferences about collected data, and to make conclusions about whether a hypothesis can be accepted or must be rejected.

PROBABILITY

- Are we ever certain of an effect or a relation shown in the data we have collected?
 - No – so, we deal in the area of *probability* of an effect / association
- Two main things tested in statistics:
 1. Difference between scores
e.g., male mean RT versus female mean RT – normally sets of scores calculated as grand means
Analysed using t-test for example
 2. Association between scores
e.g., score on extraversion and altruism
Analysed using correlation for example

PROBABILITY

P-value is also called the 'sig.' or 'sig-value'

- The p-value – what does this represent in an analysis?
 - It represents the probability of the results occurring if the null hypothesis were true
 - E.g., if a null hypothesis was 'there is no association between extraversion and altruism', the p-value would give an indication of how likely it that these results occur if we assume the null hypothesis is true
 - The smaller the p-value, the lower the probability of getting that result is the null hypothesis were true
 - A statistically significant result (where p is less than .05) allows us to reject the null hypothesis; smaller p-values are then seen as stronger evidence against the null hypothesis

PROBABILITY

- Difference testing:
 - Smaller p-value = more likely that a difference was due to your manipulation of the IV
 - Smaller p-value = more likely that a difference is significant
 - This seems counter-intuitive , so is a common point of error!
- P-values range between 0 and 1.0
 - i.e., between 0% and 100% that the null hypothesis is true
- P-value less than .05 is significant
- P-value more than .05 is non-significant

Remember this! and don't neglect the decimal place!

ERRORS

- TYPE I (1) ERROR:
 - Where we find a significant p-value and reject the null hypothesis when it is, in fact, correct
 - Accept the alternative hypothesis in error
- TYPE II (2) ERROR:
 - Where we find a non-significant p-value and reject the alternative hypothesis in error
 - Accept the null hypothesis by mistake when there really is an underlying effect

PARAMETRIC TESTS

Statistical tests which make certain assumptions about the parameters of the population distribution from which the sample is drawn

Assume normal distribution of data

PARAMETRIC TESTS

- Most people use parametric tests to analyse data because:
 - They are a much stronger and robust type of test
 - If there is a difference or association, parametric tests can detect it easily
 - They're powerful tests
 - E.g., t-tests, ANOVAs
- But – there are many key assumptions that are important to remember about parametric tests
 - Data are interval or ratio
 - Data are normally distributed
 - Variance between groups is homogenous (equal/close)

PARAMETRIC TESTS

- You must check the assumptions for EVERY test you do!
 - Validity of conclusions depend upon appropriate analysis and that assumptions have been satisfied
 - Analyses are only robust if they have not been affected by violation of assumptions
 - Sample size and power are also important aspects of 'robustness'
- Non-parametric alternatives should be used if data does not satisfy key assumptions
 - E.g., Friedman, Mann Whitney, Spearman's Rho

PARAMETRIC TESTS

Common assumptions

- Normal distribution of data
 - Histogram or stem-and-leaf plot
- Equal variances (two or more)
 - Variability of observations in each group the same?
 - Between-subjects – Levene's test in SPSS – we want a *non-significant* value!
- Linearity (linear relationship)
 - Scatterplot

If not met, *use non-parametric test or transform data!*

NON-PARAMETRIC TESTS

- Typically based on ranks of the data
- Used when assumptions for parametrics are broken
- Can be referred to as 'distribution free' procedures
- Advantages:
 - No assumptions are made about the data
 - Can be used on small samples
 - Generalises across samples drawn from populations with different distributions
 - Less likely to lead to errors in outcomes

PARAMETRIC AND NON- PARAMETRIC TESTS

T-test

Correlation

Chi-square

ETHICS

BPS Code of Human Research Ethics (2021)

BPS Code of Internet-Mediated Ethics (2021)

BPS Code of Ethics and Conduct (2018)

BPS ETHICS

Respect

Responsibility

Integrity

Beneficence

Non-
maleficence

Privacy and
confidentiality

Right to
withdraw

Deception

Informed
consent

Debriefing

Risk

Research Documents & Links



Psychology and Counselling: Referencing and Report Writing - House Rules



Link to Experiment Management System (EMS)



BPS Code of Human Research Ethics (2021)



BPS Code of Ethics and Conduct (2018)



BPS Ethics for Internet-Mediated Research (2021)



UWTSO Research Ethics & Integrity Code of Practice

To do: View



UWTSD Research Data Management Policy

To do: View



Glossary of Terms



APA 7th Edition Updates

IMPORTANT DOCUMENTS

IMPORTANT DOCUMENTS

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