



Prifysgol Cymru
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Trawsnewid Addysg; Trawsnewid Bywydau
Transforming Education; Transforming Lives

Research Methods: Quantitative Analysis

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Quantitative Research

- Quantitative research is the process of collecting and analysing numerical data. It can be used to find:
 - Patterns and averages
 - Make predictions
 - Test causal relationships
 - Generalise results to wider populations
- Quantitative research relies on data that are observed or measured to examine questions about the sample population

The Scientific Method

1. Understand the problem area
2. Identify the research question
3. Formulate one or more hypotheses
4. Plan the research methodology
5. Collect the data
6. Analyse the data with statistical tools
7. Interpret the results & discuss
8. Derive conclusions from the results

Identify the question

Firstly you **NEED** to identify your variables

- **Independent**

- The variable you manipulate
- Manipulation or variation of this is the cause of change in the other variables

- **Dependent**

- The variable of primary interest
- The variable being measured in order to determine the effects of the independent variable

- The number and type of variables will determine which statistical test you will use

The effect of SKIP Cymru (**independent variable**) on Children's
Motor Competence levels (**dependent variable**)

Identify the question

3 Types of research questions

- Descriptive

- Aim to describe the variables you are measuring e.g. number of girls and boys

- Difference/ Comparative

- Aim to examine the differences between two or more groups on one or more dependent variables e.g. treatment v control, pre v post, girls v boys

- Relationship

- The casual relationship, associations, trends and/ or interactions amongst two or more variables on one or more groups. To what extent are the variables relate e.g. does motor competence levels predict physical activity levels?

Examples

- Descriptive

Question: *How many calories do Americans consume per day?*

Variable: Daily calorific intake

Group: Americans

- Difference/ Comparative

Question: *What is the difference in the daily calorific intake of American men and women?*

Dependent Variable: Daily calorific intake

Group: 1. American men
2. American women

- Relationship

Question: *What is the relationship between study time and exam scores amongst university students?*

Dependent Variable: Exam scores

Independent Variable: Study time

Group: University students

Research Design

One shot study design



- Teacher collects data from end of term exam (D) and draws conclusions about the quality of instruction received (T)

One group pre-test- post-test design

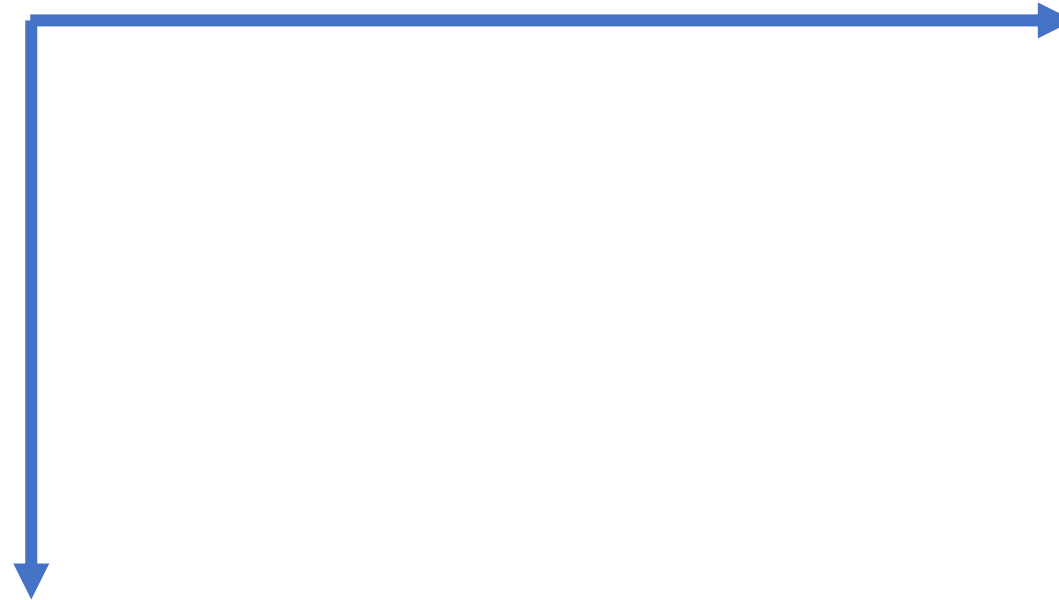


- PE teacher measure fitness at start of term (D1) and end of school year as test of effectiveness of the PE programme

Which stats for which research design?

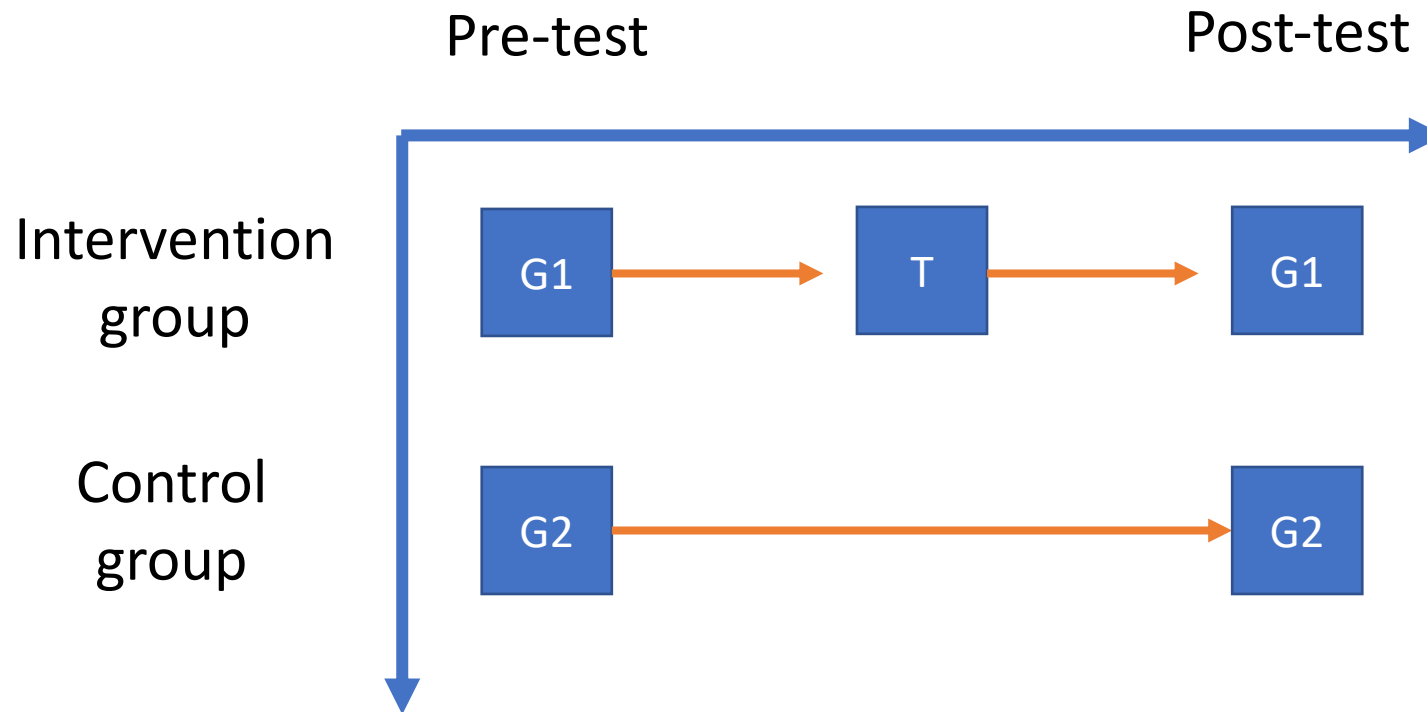
Draw it....

Number of different
groups/ variables
e.g. intervention v
control, girls v boys



Same group/
variable repeated
overtime e.g pre
and post- test,
seconds, minutes,
months etc

Research Design



Two Questions that Statistics can Answer.....

- Is there a difference....
 - between girls and boys
 - between the intervention group and control group
- Is there a relationship.....
 - between motor competence and physical activity levels
 - between BMI and physical activity levels

Statistical Tests: Levels of Data

Nominal Data

- Non-numerical measures labelled by name (e.g. gender 1= girls, 2= boys)
- Frequency count

Ordinal Data

- Ranked measures
- Sit on a scale (0-5, likert scales)

Interval Data

- Numerical measures of quantities where zero does not indicate complete absence of the measure (e.g. temperature)

Ratio Data

- Highest order of data
- Numerical measures of quantities for which zero indicates absence of the measure (e.g. height, weight, distance, time, age)

Parametric & Non- Parametric Statistics

All statistical tests fall in to two broad categories

- Parametric

- Category of statistical test used for sets of Interval & Ratio data

- Non-Parametric

- Category of statistical tests used for Nominal and Ordinal Data

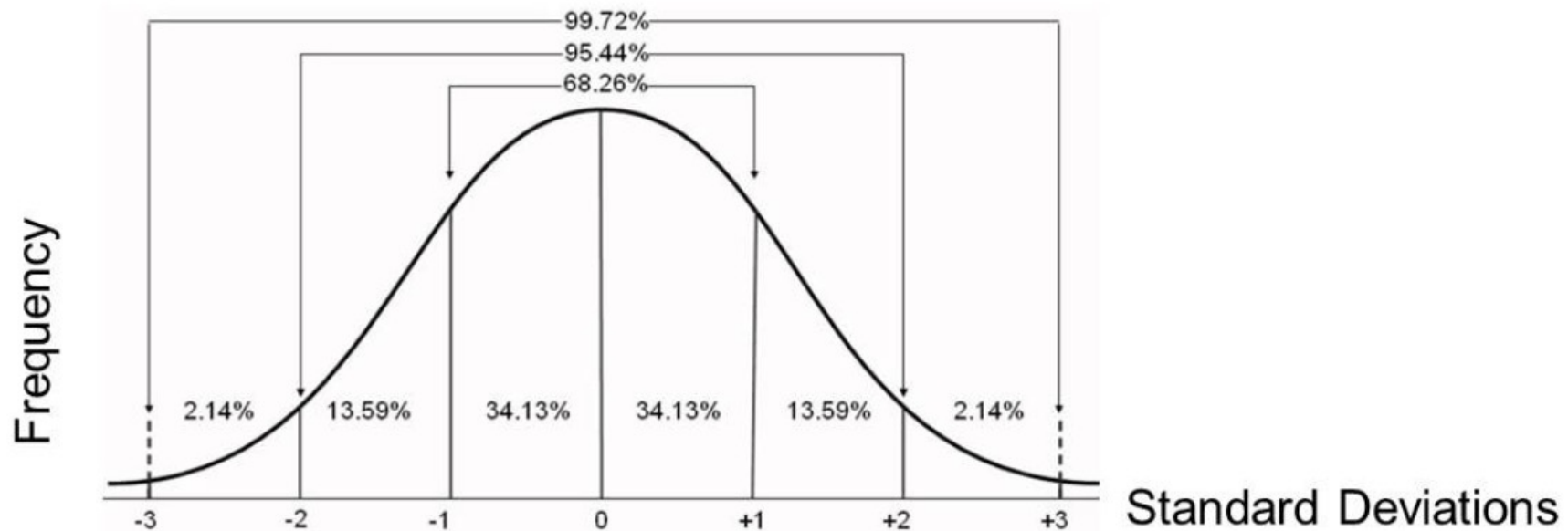
- *As well as Interval and Ratio data that does not meet the assumptions required*

Cleaning of data and tests of normality

- Checking for errors to make sure there is no missing data or mistakes while inputting the data
- Progress to Descriptive Statistics that include:
 - Mean- average
 - Median- middle value of the data set
 - Standard deviation- amount of variation of the data away from the mean
- Assessing normality

Statistical Tests: Normal Distribution

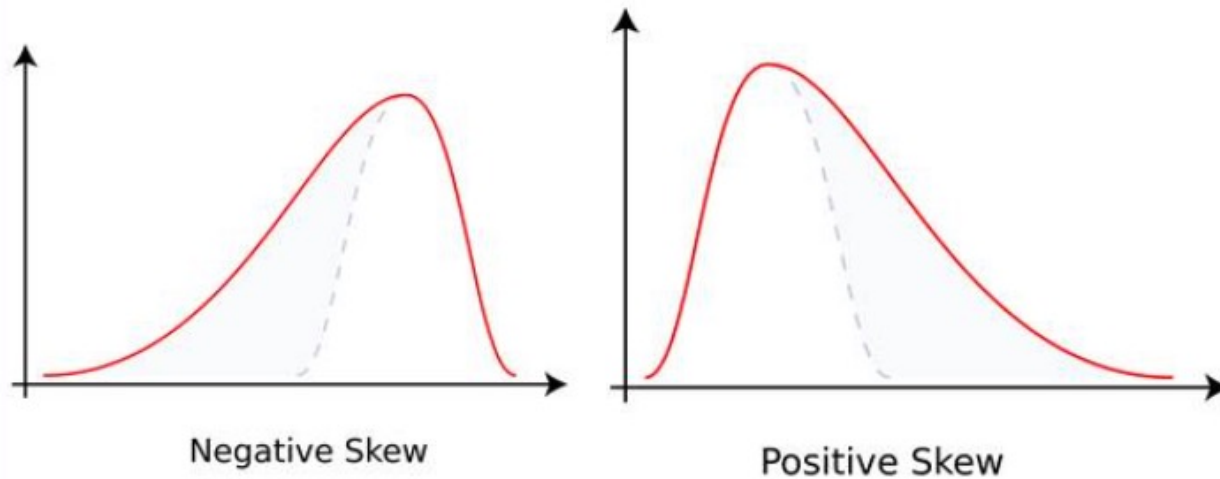
- Bell shaped frequency plot for which the mean, median and mode are coincident and centrally located



Statistical Tests: Normal Distribution

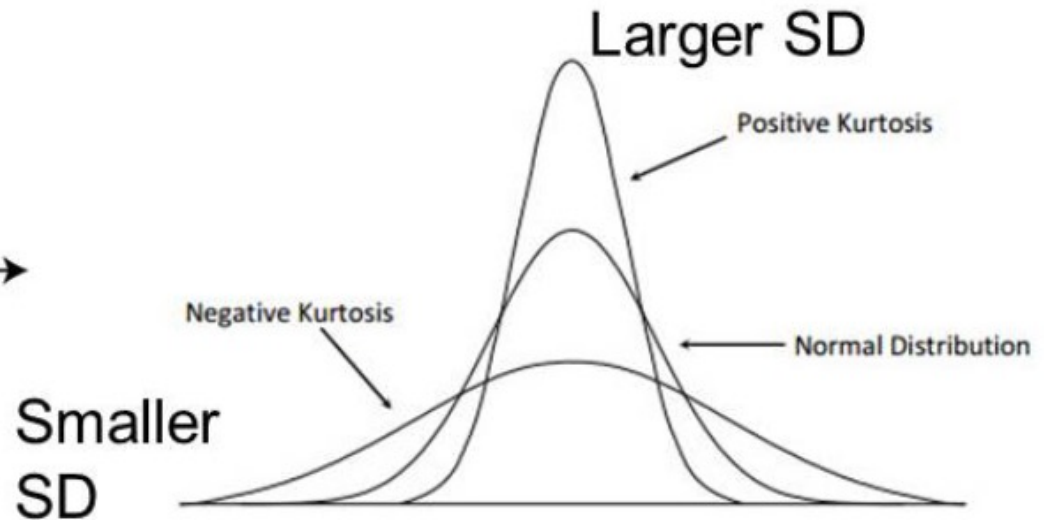
Skewness

- Horizontal shift in a normal curve



Kurtosis

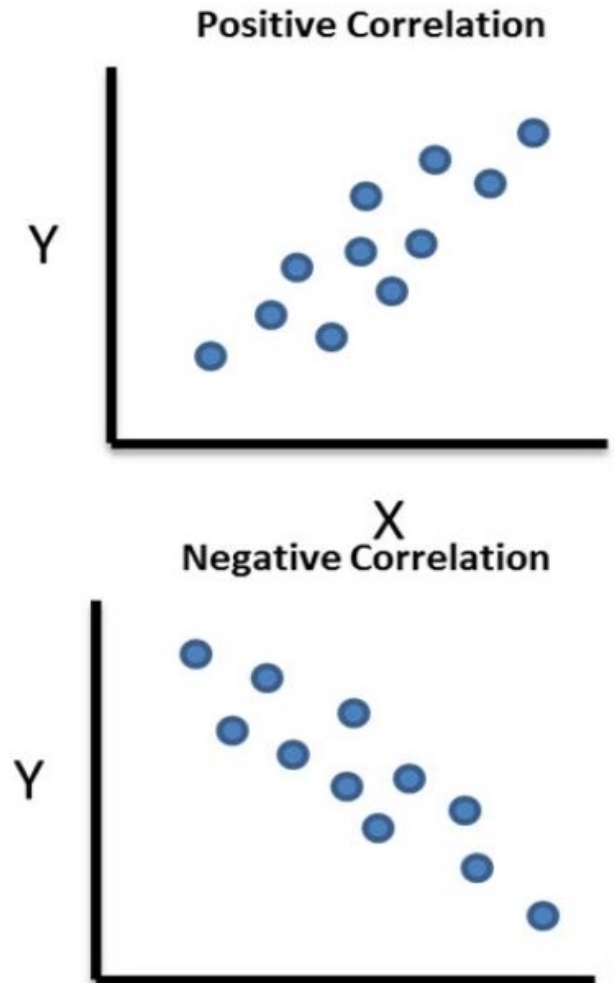
- Vertical shift in a normal curve



Types of Analysis: Relationships

Correlation

- A measure of the relationship among two or more variables
- Do they change together in a predictable fashion
- Strength of correlation
 - -1.0 to +1.0
 - The further away from 0.0 the stronger the correlation
 - Pearson's Product Moment Correlation Coefficient (parametric)
 - Spearman rank-order correlation coefficient (non- parametric)
 - BUT no cause & effect- just because two things correlate does **not** necessarily mean that one **causes** the other



Types of Analysis: Relationships

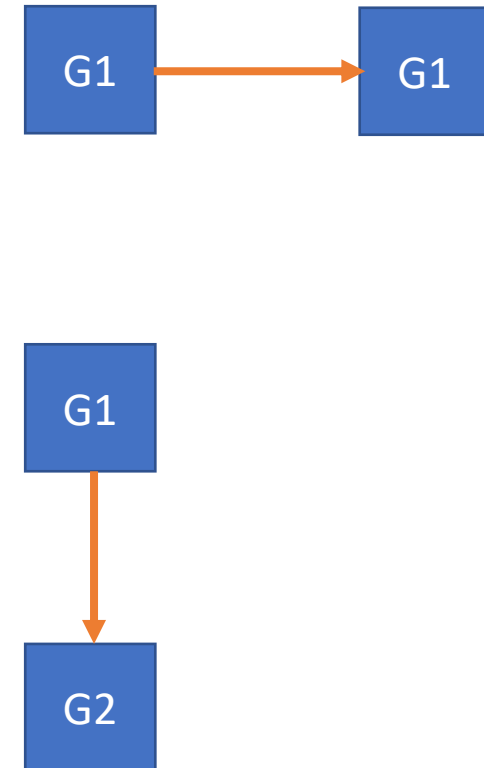
Regression

- A statistical method for predicting one variable based on the value of another variable
- Used when there is a **significant, strong correlation**
- E.g. Motor competence predicts physical activity levels
- Multiple Regressions- can explore the relationship between one continuous dependent variable and a number of independent variables e.g. does motor competence, BMI, perceived motor competence predict MVPA

Types of Analysis: Differences

T- Tests

- If you have a one group pre-test- post-test design i.e. one group tested on two occasions then you would use a Dependent T- Test (also called paired T-test)
- Independent T- Test measure two groups of people you want to compare their scores



Types of Analysis: Differences

ANOVA (Analysis of Variance)

- Finding **differences** among groups
- Test allows evaluation of null hypothesis between two or more groups means
- Avoids repeated T-Tests



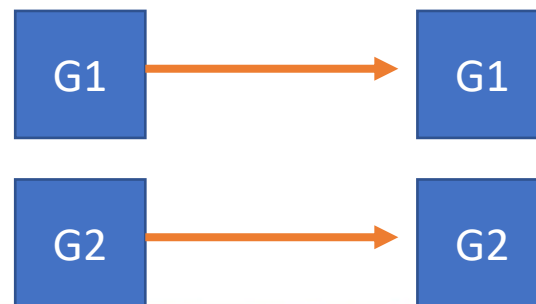
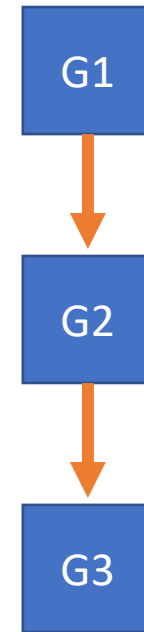
Types of Analysis: Differences

ANOVA (Analysis of Variance) with Repeated Measures

- Testing the same group on more than two occasions

A 2 Group ANOVA with Repeated Measures

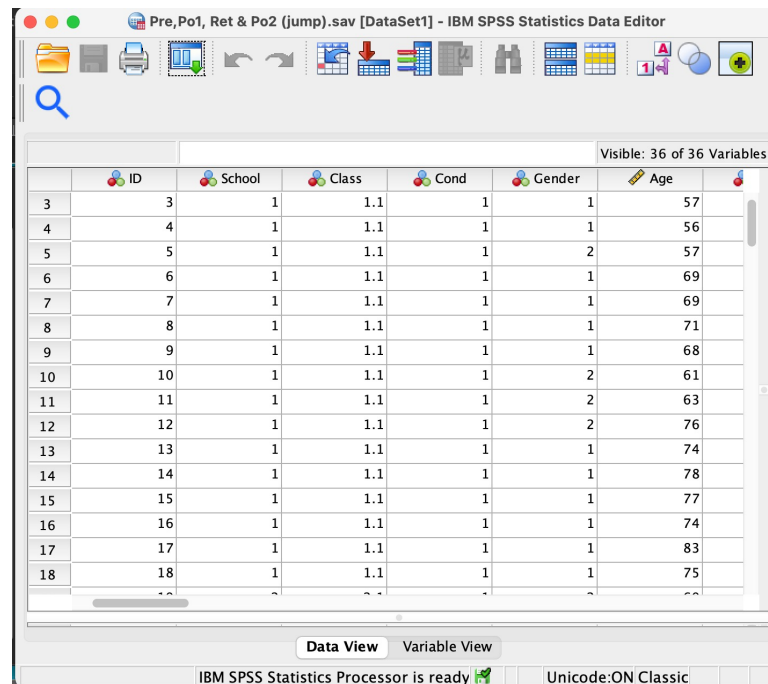
- Testing two or more groups over time



The P Value

- A P value < 0.05 is considered significant- the probability of the result occurring is less than 5%
 - The independent variable has manipulated the dependent variable
- Is this enough? Not really...it only tells you if there is a relationship or difference and **NOT** how **BIG** the relationship or difference is
- Need to examine the EFFECT SIZE- Cohens D

Lets have a go at SPSS



Pre, Po1, Ret & Po2 (jump).sav [DataSet1] - IBM SPSS Statistics Data Editor

Visible: 36 of 36 Variables

	ID	School	Class	Cond	Gender	Age
3	3	1	1.1	1	1	57
4	4	1	1.1	1	1	56
5	5	1	1.1	1	2	57
6	6	1	1.1	1	1	69
7	7	1	1.1	1	1	69
8	8	1	1.1	1	1	71
9	9	1	1.1	1	1	68
10	10	1	1.1	1	2	61
11	11	1	1.1	1	2	63
12	12	1	1.1	1	2	76
13	13	1	1.1	1	1	74
14	14	1	1.1	1	1	78
15	15	1	1.1	1	1	77
16	16	1	1.1	1	1	74
17	17	1	1.1	1	1	83
18	18	1	1.1	1	1	75

Data View Variable View

IBM SPSS Statistics Processor is ready Unicode:ON Classic

