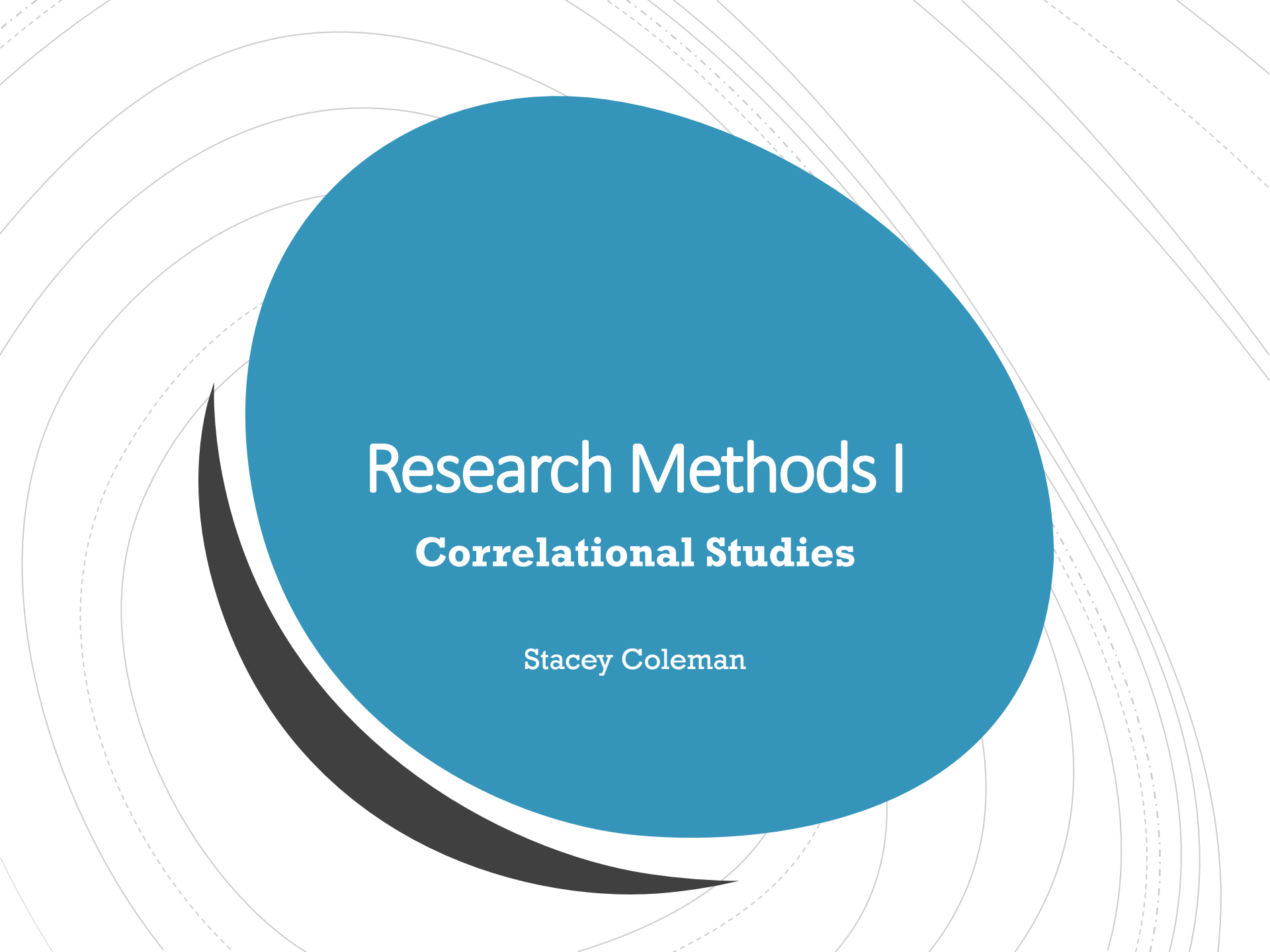


The background features a series of thin, concentric circles in light gray and dashed lines. A large, solid blue circle is centered on the page, containing the main title and author information. A thick, dark gray curved line sweeps across the bottom left of the blue circle.

Research Methods I

Correlational Studies

Stacey Coleman

Recap: 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

Recap: 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



Can identify whether one type of variable affects another

Cause and effect!

Recap: 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 aspect being studied
- Demand characteristics
 - Participants are problem-solvers
 - Will try and act in a way they think is expected of them – may not be their usual behaviour

Recap: 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

- Do people behave in the same way in a laboratory experiment as they would in the real-world?

- 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
Designs

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
 - For example, correlational design

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
 - Instead, researchers measure variables as they naturally occur

Correlation

- Non-experimental method
- With correlational studies, IV is manipulated
 - There are no IV's or DV's
 - Only **co-occurring** variables
 - Requires data at **interval** level

Correlational Research

- ✓ Can establish generalisation outside of the lab
- ✓ Can generate ideas for further lab study
- ✓ Allows the examination of variables that may not be practical or ethical to study in the lab

Correlational Research

- ✓ Variables are **MEASURED**, not manipulated
 - ✓ Correlation measures two variables – binary and continuous
- ✓ A **correlation** analysis allows investigation of any relationship between variables: a shared variance
- ✓ Also provides information relating to the **strength** and **direction** of the relationship

Correlational design

- Important points about correlations:
 - Cause **CANNOT** be inferred from the existence of a strong correlation between variables
 - We cannot say that something has caused something else!
 - **Strength** is a measure of correlation, but **significance** assesses how unlikely such a correlation was to occur under the null hypothesis
 - This assessment depends on the size of N

Correlational Design

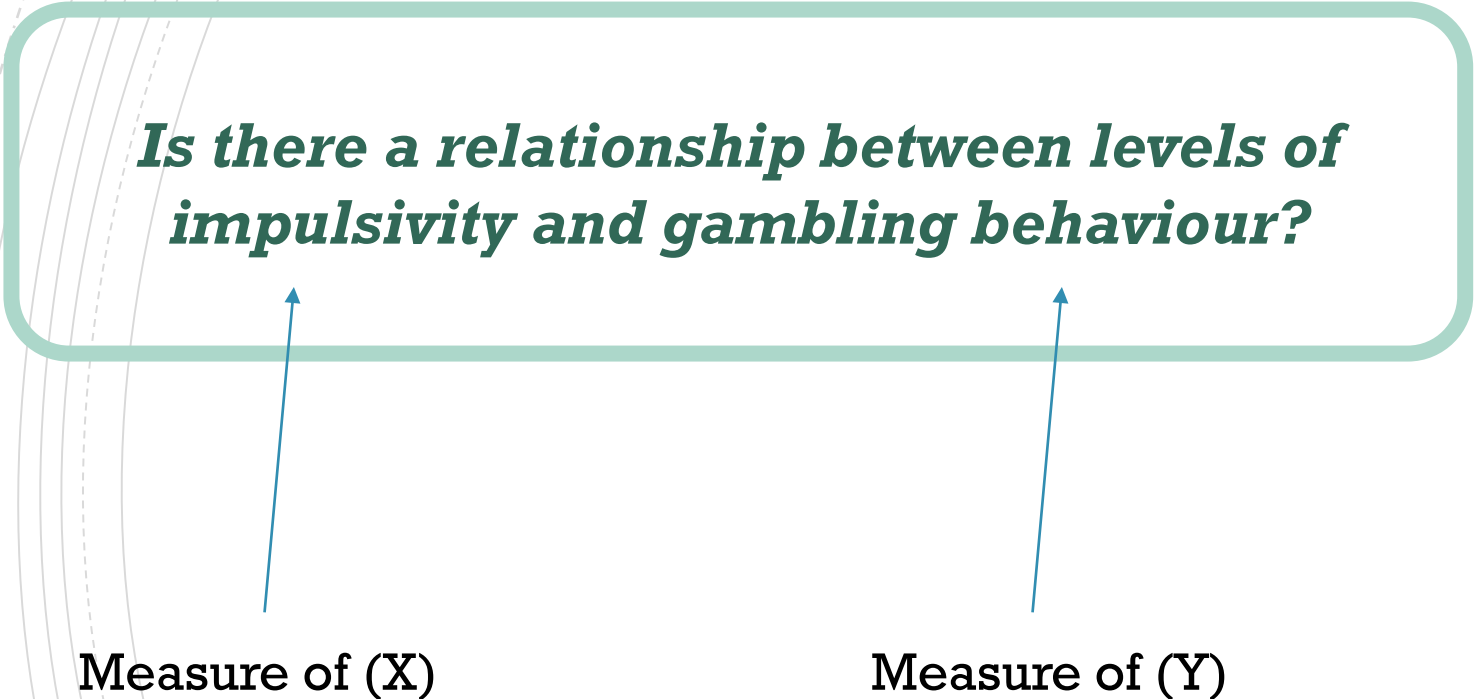
Three components to correlation research:

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

Example

Is there a relationship between levels of impulsivity and gambling behaviour?

Measure of (X)



The diagram illustrates a research question. At the top, the word 'Example' is written in blue. Below it, a green rounded rectangle contains the question 'Is there a relationship between levels of impulsivity and gambling behaviour?' in bold, italicized, dark green text. Two blue arrows point upwards from the labels 'Measure of (X)' and 'Measure of (Y)' towards the words 'impulsivity' and 'gambling behaviour' respectively in the question.

Measure of (Y)

Example

Is there a relationship between levels of impulsivity and gambling behaviour?

Not manipulating anything, simply measuring levels of each variable

***Impulsivity
(X)***



***Gambling
behaviour
(Y)***



- So what can we say about these two variables?

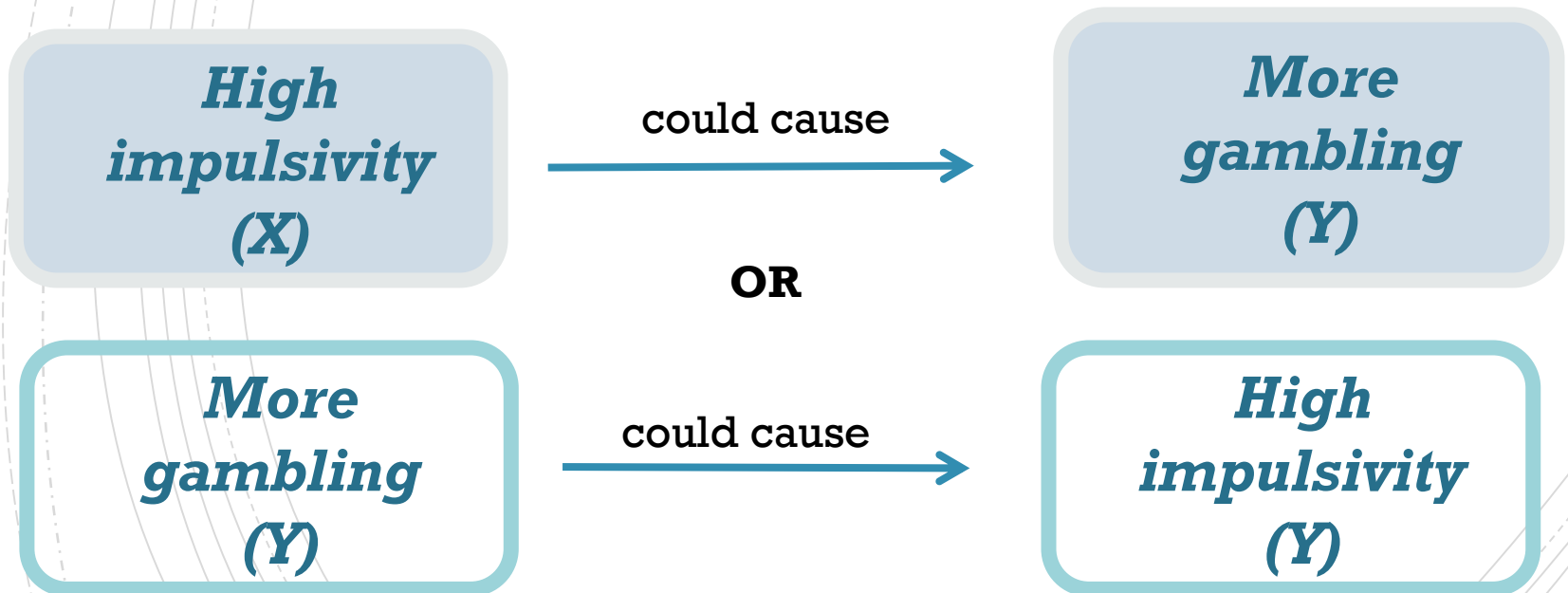
*We can say that levels of
impulsivity and gambling
are related,*

*or that they are **NOT** related*

Example

Example

- What **can't** we say?
- We are not exploring whether one **causes** the other, so we cannot determine causality.

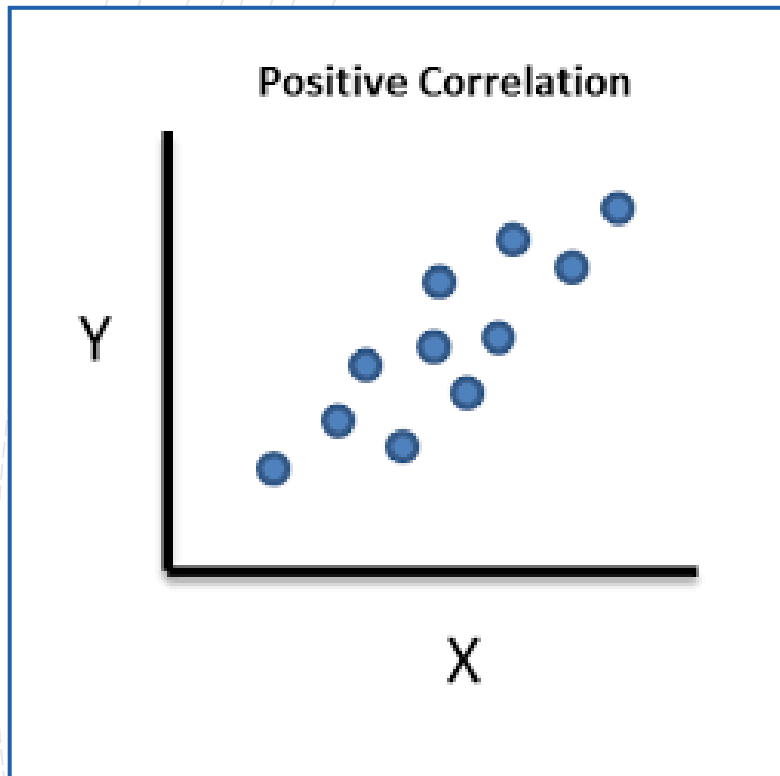


The Scatterplot



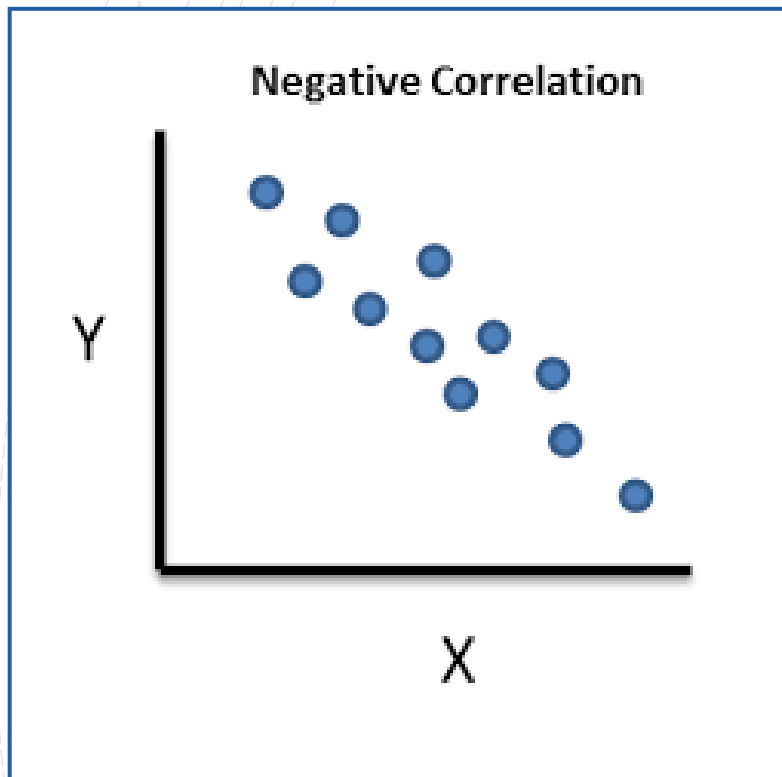
- An essential part of any preliminary analysis when conducting correlational research.
- Scatterplot = graph that plots each participants score on one variable against their score on the other variable.
- The Scatterplot allows you to see whether:
 - There is a relationship between 2 variables
 - What that relationship is
 - What the spread of the data is like (are there outliers)

Types of Correlation / Relationship



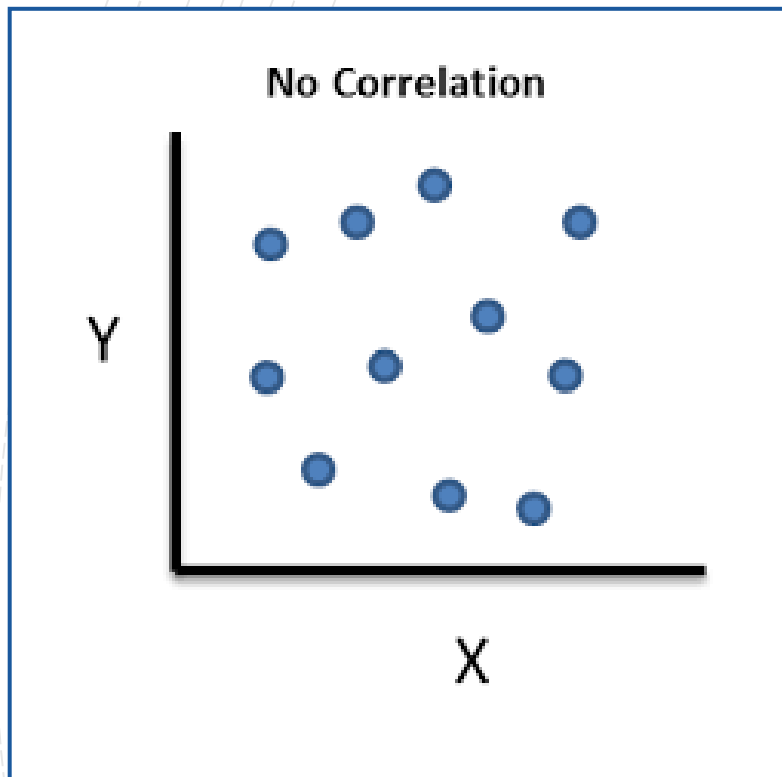
- Higher scores on one variable are associated with higher scores on a second variable

Types of Correlation / Relationship



Higher scores on one variable are associated with lower scores on a second variable

Types of Correlation / Relationship



The two sets of scores are completely unrelated

How do we know if two variables are related or not?

- We carry out a statistical analysis (using SPSS)...

Pearson's Product Moment Correlation **(Pearson's correlation coefficient or Pearson's r)**

This analysis provides us with two vital pieces of information:

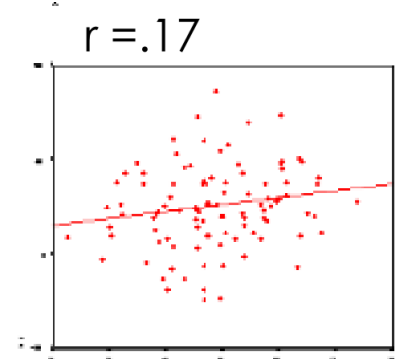
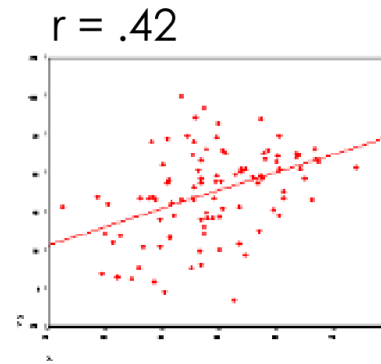
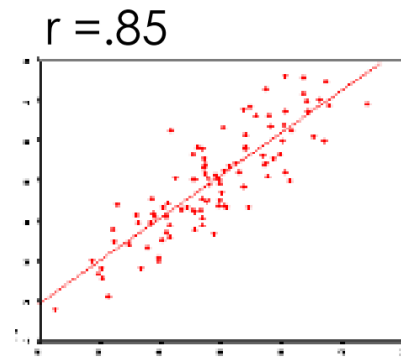
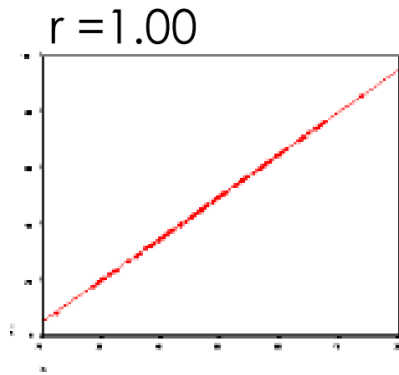
1. A value for the **strength** of the relationship/correlation between the two variables
2. A value for the **significance** (probability) that these two variables are, in fact, related

Measurement of Correlation

- The **strength** of the relationship between two variables is the degree to which one variable does tend to vary with the other
 - If one increases, does the other increase/decrease, too?
- Strength is expressed on a scale ranging from -1 (perfect negative correlation) to +1 (perfect positive correlation)
 - The sign (+/-) indicates direction
 - 0 means there is no correlation
 - The numerical value indicates the strength
- This final number is referred to as a ***correlation coefficient*** and is represented as ***r***

Measurement of Correlation





Strength of the relationship is indicated by its numerical value

Expresses the strength of the linear relationship between the variables.

The line running through the points is called a regression line and represents the "best fit".

Study Example

- After running a correlation analysis on data from a study measuring levels of impulsivity and gambling behaviours, the following values were obtained:

$$r = 0.74$$

$$p = .001$$

1. What is the **DIRECTION** of the relationship?
2. What is the **STRENGTH** of the relationship?
3. Are the two variables **statistically related**?

Study Example

$$r = .74$$
$$p = .001$$

1. What is the **DIRECTION** of the relationship?
 - Positive
2. What is the **STRENGTH** of the relationship?
 - Strong
3. Are the two variables **statistically related**?
 - Yes – $p < .05$



So...

We conclude the following:

- There is a strong positive correlation between levels of impulsivity and gambling behaviour.
 - But what does this MEAN?
- It means that **as levels of impulsivity gets higher, gambling behaviour also increases.**

Study Example 2

- After running a correlation analysis on data from a study measuring temperature and the sale of hot drinks, the following values were obtained:

$$r = - .52$$

$$p = .042$$

1. What is the **DIRECTION** of the relationship?
2. What is the **STRENGTH** of the relationship?
3. Are the two variables **statistically related**?

Study Example

$$r = - .52$$
$$p = .042$$

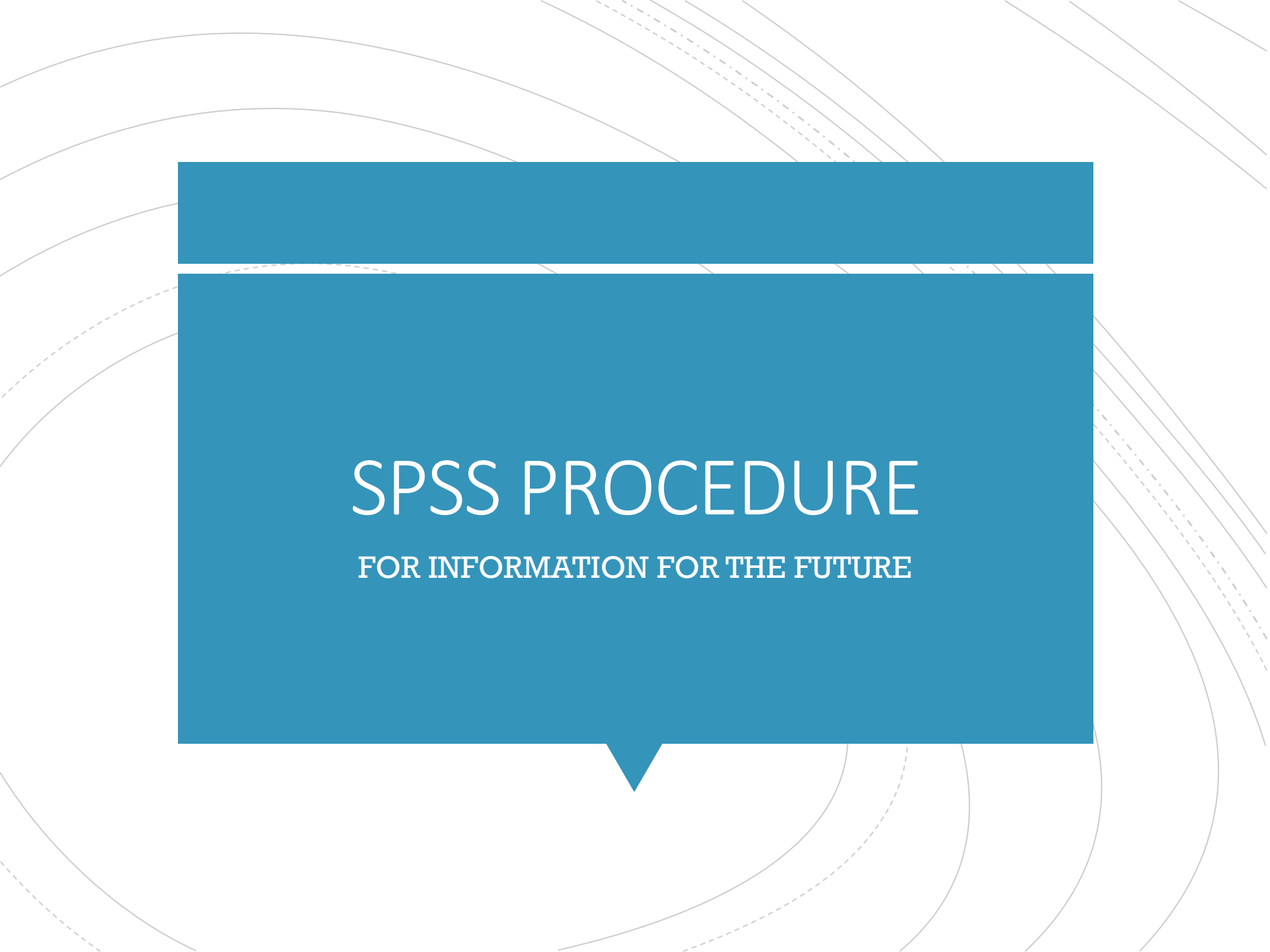
1. What is the **DIRECTION** of the relationship?
 - Negative (NOT NO CORRELATION)
2. What is the **STRENGTH** of the relationship?
 - Moderate
3. Are the two variables **statistically related**?
 - Yes – $p < .05$



So...

We conclude the following:

- There is a moderate negative correlation between temperature and the sale of hot drinks
 - But what does this MEAN?
- It means that **as temperature increases, the sale of hot drinks decreases.**



SPSS PROCEDURE

FOR INFORMATION FOR THE FUTURE

SPSS procedure

1

- **Analyze**

2

- **Correlate**

3

- **Bivariate**

SPSS Output

Correlations

		X	Y
X	Pearson Correlation	1	-.805**
	Sig. (2-tailed)		.005
	N	10	10
		--	

$r = -0.81$

$N = 10$

$p < .05$

OR $p = .005$

Reporting of Correlation Analysis

- When presenting the results of a correlation analysis you need to remember to state the **Pearson's statistic**, the **number of participants**, and the **probability/significance** (less than or more than .05)

Reporting of Correlation Analysis

$r = \underline{\hspace{2cm}}, N = \underline{\hspace{2cm}}, p \leq .05$

OR

$r = \underline{\hspace{2cm}}, N = \underline{\hspace{2cm}}, p = \underline{\hspace{2cm}}$

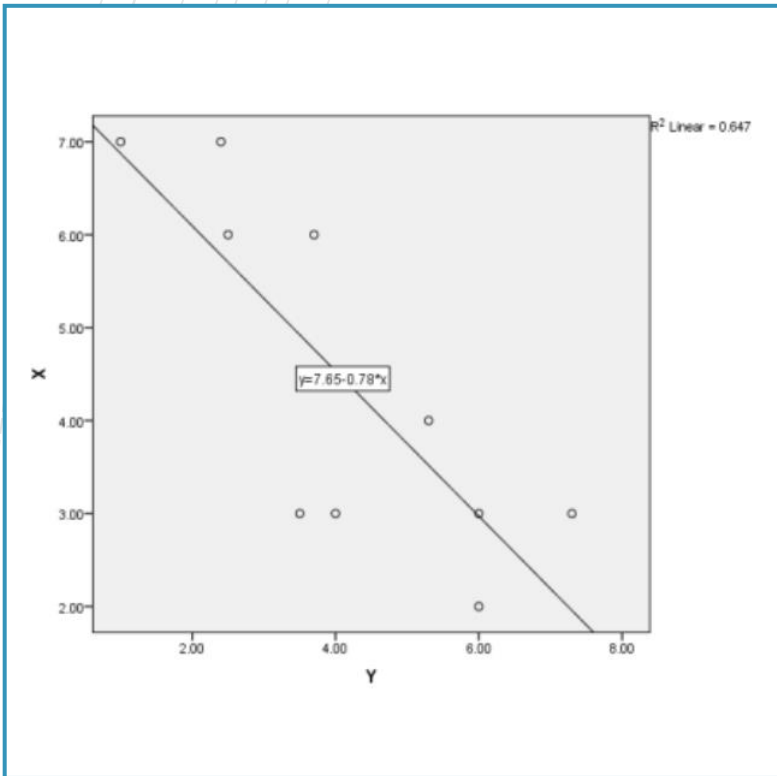
Writing the results section

The relationship between (X) and (Y) was investigated using Pearson product-moment correlation coefficient. There was a strong, negative correlation between the two variables, $r = -.81$, $n = 10$, $p < .01$, with high levels of (X) associated with lower levels of (Y)

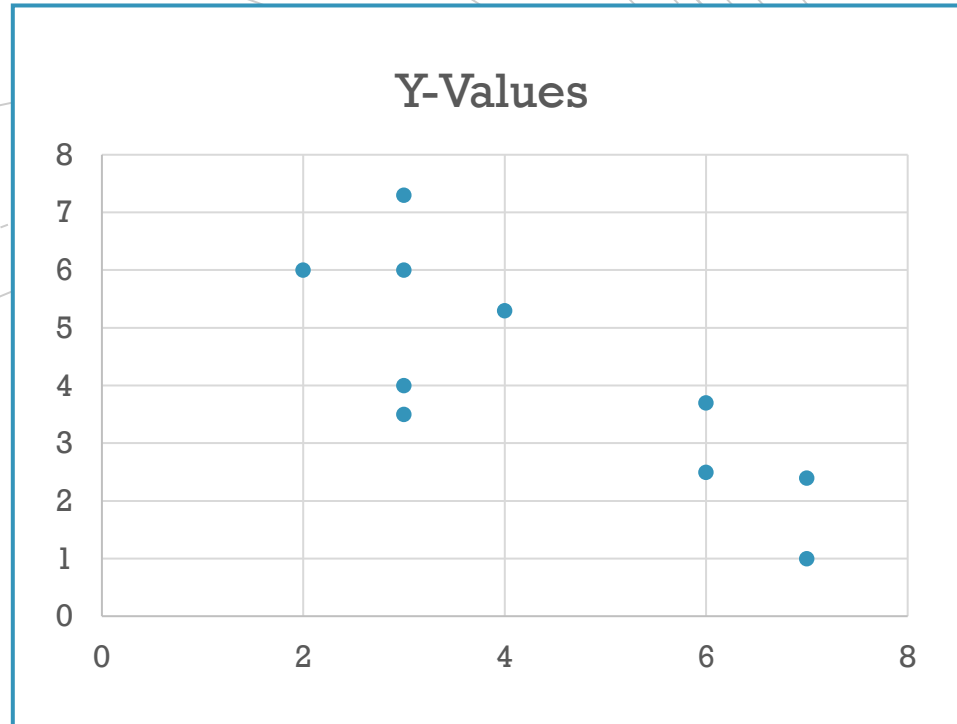
What else is needed?

- Scatterplot
- Powerful graphical technique for demonstrating a correlational relationship
- The extent to which pairs of readings are not scattered randomly on the diagram, but do form a consistent pattern, is a sign of the strength of the relationship
- Shows the spread of data and if there are any outliers

SPSS Scatterplot



- Although SPSS can provide a scatterplot – you must create your own if you intend to include a chart(figure) of the data in the results section of a report



PPT Scatterplot

Scatterplots

1

Remember to label your axis!

- Both X and Y – variables

2

Label correctly according to APA style

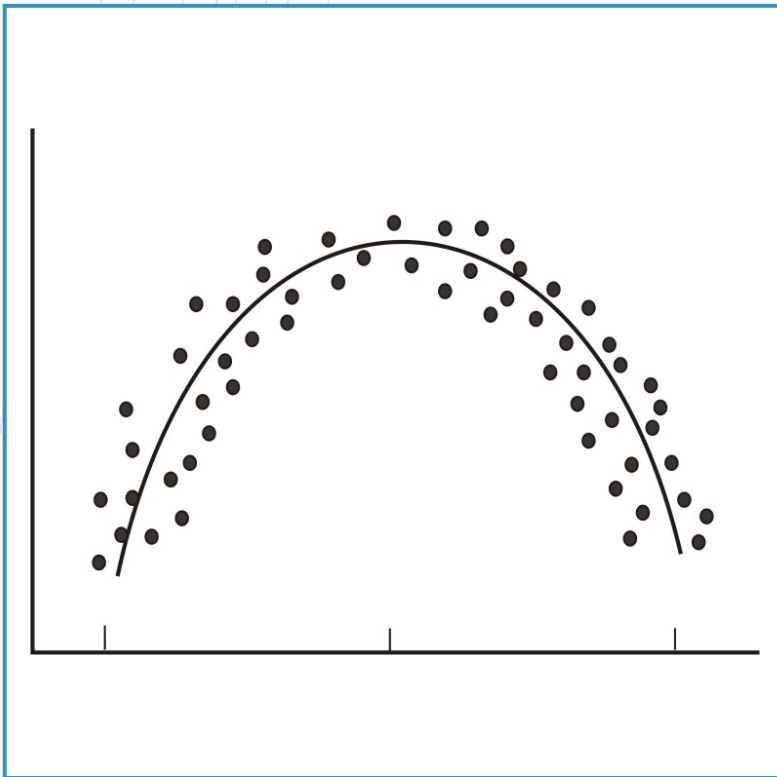
- ***Figure 1.*** Graph showing....

3

Add a 'fit line'

- Can be done easily on SPSS

Curvilinear Relationships



- Pearson's r is a good measure only for linear relationships, in which the points are best approximated by a straight line.
- It is **not** a good measure for nonlinear relationships, in which the points are better approximated by a curved line.
- It is important to make a scatterplot and confirm that a relationship is approximately linear **before** using Pearson's r

Spearman's Rank (Spearman's Rho)

- A Pearson's correlation can not be used if:
 - Data are not parametric, or
 - When variables are not capable of quantitative measurement but can be arranged in serial order, or
 - When you do not get a linear relationship
- Instead the non-parametric Spearman Rank correlation would be used (Spearman's rho).