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Lesson One :What is empirical research?

As a scientific **investigation** or /**inquiry**/,psychological research relies on the empirical method of induction as well as the hypotheticodeductive method. The **empirical method** states that knowledge must be gained through **experience** (i.e.,using our **senses)** and not solely through the powers of reason or logical thinking (i.e., what we believe to be true). This approach to knowledge was developed by British empiricists in the 17th and 18th centuries in opposition to French rationalism. It soon became a method of **observation** and **experimentation** in the natural and social sciences. In **inductive reasoning**, **information** is **gathered** from experience without any preconceived ideas about its order or its meaning.

General patterns or /**laws**/ are then **inferred** from these particular observations. Thus,/**theories**/ can be defined as organized **sets** of **principles** used to explain the observed **phenomena**. This approach is a **bottom-up approach**, moving from the specific to the general.

On the contrary, **deductive reasoning** works from the more general to the more specific.

It is a **top-down approach**. It begins with a /**theory**/, which is narrowed down into specific predictions or hypotheses, which are tested empirically. Theories are then **supported** or **adjusted** according to the data. They are never proven true, because they would then cease to be speculative /**explanations**/. Karl Popper (1963) deemed that the /**criterion**/ for the scientific status of a theory is its /**falsifiability**/, or **refutability**, or **testability**.

His methodology became known as the /**hypothetico-deductive**/ method.

To sum up, **empirical research** is the process of finding empirical **evidence**, also called empirical /**data**/, based on observation or experimentation. It can use inductive or deductive reasoning or a combination of both.

The data which is collected can be /**qualitative**/ (i.e., involving words) or /**quantitative**/ (i.e., involving numbers). Finally, the model for scientific progress is cyclical.

Source :Studying Psychology in English

LESSON TWO :Scientific processes

'The great tragedy of science – the slaying of a beautifulhypothesis by an ugly fact.' Thomas Huxley (1870)

Aims

An **aim** is a precise statement of why a study is taking place/what is being studied, for example to investigate the effect of caffeine on reaction times. An aim should include what is being studied and what the study is trying to achieve.

Hypotheses

A hypothesis is a precise, testable prediction of what is expected to happen. For example, 'caffeine consumption will affect reaction times'.

l **The experimental/alternative hypothesis** – predicts that differences in the DV will be beyond the boundaries of chance (they will occur as a result of manipulation of the IV). Differences beyond the boundaries of chance are significant differences and this can be incorporated into a hypothesis. For example, 'caffeine consumption will significantly affect reaction times'. Statistical tests are used to see if results are significant (see page 304). The term 'experimental hypothesis' is only used with the experimental method. Other research methods use the term 'alternative hypothesis', but the definition is the same.

l **The null hypothesis** – is 'the hypothesis of no differences'. It predicts that the IV will not affect the DV. Any differences in results will be due to chance factors, not the manipulation of the IV, and will therefore be not significant and this can be incorporated into a null hypothesis. For example, 'there will be no significant difference in reaction times as a result of caffeine consumption'.

One of the two **hypotheses**, null or experimental, will be supported by the findings and thus be accepted, with the other one being rejected. There are two types of experimental/alternative hypotheses:

l **Directional ('one-tailed') hypothesis** – predicts the direction of the results. For example, 'there will be a significant reduction in the speed of reaction times as a result of caffeine consumption'. It gets its name from predicting the direction the results will go.

l **Non-directional ('two-tailed')** – predicts that there will be a difference,

but does not predict the direction of the results. For example, 'there will be a significant difference in the speed of reaction times as a result of caffeine consumption'. Reaction times will be either quicker or slower. Directional hypotheses are used when previous research suggests that results will go in one direction, or when replicating a previous study that also used a directional hypothesis.

KEY TERMS

Aim : a precise statement of why a study is taking place.

Hypothesis : precise testable research prediction.

Null hypothesis: a prediction that the results will fail to show any difference (or relationship) that is consistent or systematic.

Alternative (experimental) hypothesis: a prediction of the outcome of a study based on what is expected to happen.

Directional hypothesis: a hypothesis that predicts the direction the results will go in.

Non-directional hypothesis: a hypothesis that predicts that a difference/relationship will be found, but does not specify what the difference/relationship will be.

Experimental hypothesis: the name given to a hypothesis when used in field and laboratory experiments.

Questions :

1. Read the statements below and identify which are aims and which are hypotheses.
   a. Younger people have better memories than older people. [……]
   b. Positive expectations lead to differences in performance. [……..]
   c. Lack of sleep may affect schoolwork. [……..]

   2. For each of the following, decide whether it is a directional or nondirectional hypothesis or a null hypothesis.

a. Boys score differently on aggressiveness tests than girls. [……..]

b. There is no difference in the exam performance of students who have a computer at home compared with those who don't. [……..]

c. People remember the words that are early in a list better than the words that appear later. [……..]

d. Words presented in a written form are recalled differently from those presented in a pictorial form. [……..]

3. Now write your own. Below are research aims for possible experiments. For each one write **three** hypotheses: a directional one, a nondirectional one and a null hypothesis.

a. Do girls score better than boys in Math?

Directional……..

N/ directional……..

Null……..

b. Do teachers give more active students higher marks on essays than students who are less active?

Directional……..

N/ directional……..

Null……..

c. A researcher believes older people sleep more than younger people.

Directional……..

N/ directional……..

Null……..

d. Do people rate food as looking more attractive when they are hungry?

Directional……
……..

N/
directional……..

Null……..

e. A teacher wishes to find out whether one maths test is harder than another maths test.

Directional……
……..

N/
directional……..

Null……..

LESSON THREE :SAMPLING

Populations and samples

The **population** refers to the large group of individuals that a particular researcher may be interested in studying, for example students attending colleges in the North West, children under six with autism, women in their thirties, etc. This is often called the **target population** because it is a subset of the general population.

For practical and economic reasons, it is usually not possible to include all members of a target population in an investigation so a researcher selects a smaller group, known as the **sample**.

Ideally, the sample that is drawn will be **representative** of the target population so that **generalisation** of ndings becomes possible. In practice, however, it is often very dif cult to represent populations within a given sample due to their diverse nature.

Inevitably then, the vast majority of samples contain some degree of **bias**. Samples are selected using a **sampling technique** that aims to produce a representative sample. We will look at the main techniques used by psychologists.

Random sample

A **random sample** is a sophisticated form of sampling in which all members of the target population have an equal chance of being selected.

To select a random sample; rstly, a complete list of all members of the target population is obtained. Secondly, all of the names on the list are assigned a number. Thirdly, the sample is generated through the use of some **lottery method** (a computer-based randomiser or picking numbers from a hat).

Systematic sample

A **systematic sample** is when every nth member of the target population is selected, for example every 3rd house on a street or every 5th pupil on a school register.

A **sampling frame** is produced, which is a list of people in the target population organised into, for instance, alphabetical order. A sampling system is nominated (every 3rd, 6th or 8th person, etc.) or this interval may be determined randomly to reduce bias.

The researcher then works through the sampling frame until the sample is complete.

A **stratified sample** is a sophisticated form of sampling in which the

composition of the sample re- ects the proportions of people in certain sub-groups (strata) within the target population or the wider population. To carry out a strati ed sample the researcher rst identi es the different *strata* that make up the population. Then, the proportions needed for the sample to be representative are worked out. Finally, the participants that make up each stratum are selected using random sampling. For example, let's say in Manchester, 40% of people support Manchester United, 40% support Manchester City, 15% support Bolton and 5% support Leeds. In a stratified sample of 20 participants there would be eight United fans, eight City, three Bolton fans and one solitary Leeds supporter. Each of these would be randomly selected from the larger group of fans of their team.

Opportunity sample

Given that representative samples of the target population are so difficult to obtain, many researchers simply decide to select anyone who happens to be willing and available (an opportunity sample). The researcher simply takes the chance to ask whoever is around at the time of their study, for example in the street (as in the case of market research).

Volunteer sample

A volunteer sample involves participants selecting themselves to be part of the sample;hence, it is also referred to as self-selection.

To select a volunteer sample a researcher may place an advert in a newspaper or on a common room notice board. Alternatively, willing participants may simply raise their hand when the researcher asks.

Sampling method	Advantage, why would you use this method?	Disadvantage
Opportunity sampling How? Recruit those people who are most convenient or most available, for example people walking by you in the street or students at your school.	The easiest method because you just use the fi rst suitable participants you can fi nd, which means it takes less time to locate your sample than if using one of the other techniques.	Inevitably biased because the sample is drawn from a small part of the target population, for example if you selected your sample from people walking around the centre of a town on a Monday morning then it would be unlikely to include professional people (because they are at work) or people from rural areas.
Random sampling How? See 'random	Unbiased, all members of the target population	Need to have a list of all members of the target

techniques' on facing page.	have an equal chance of selection.	population and then contact all of those selected, which may take some time.
Snowball sample How? Current participants recruit further participants from among people they know. Thus the sample group appears to grow like a snowball.	Enables a researcher to locate groups of people who are difficult to access, such as drug addicts.	The sample is not likely to be a good cross-section from the population because it is friends of friends.
Self-selected sampling How? Advertise in a newspaper or on a noticeboard or on the Intrernet.	Gives access to a variety of participants (e.g. all the people who read a particular newspaper) which may make the sample more representative and less biased.	Sample is biased in other ways because participants are likely to be more highly motivated to be helpful, and/or with extra time on their hands. This results in a **volunteer bias**.
Stratified and quota sampling How? Subgroups (or strata) within a target population are identifi ed (e.g. boys and girls, or age groups: 10–12 years, 13–15, etc.). Participants are obtained from each of the strata in proportion to their occurrence in the target population. For a stratifi ed sample selection from the strata is done using a random technique. For a quota sample selection is done using a non-random technique.	Likely to be more representative than other methods because there is a proportional representation of subgroups.	Very time-consuming to identify subgroups, then select participants and contact them.
Systematic sampling How? Use a	Unbiased as participants are selected using an	Not truly unbiased/random unless you select a

predetermined system to select participants, such as selecting every 6th,14th, 20th (or whatever) person from a phonebook. The numerical interval is applied consistently.	objective system.	number using a random method and start with this person, and then select every *n*th person.

Keyterms :

Bias A systematic distortion.
Generalisation Applying the fi ndings of a particular study to the target population.
Opportunity sampling A sample of participants produced by selecting people who are most easily available at the time of the study.
Quota sampling Similar to a stratifi ed sample except participants are not selected from strata using a random sampling technique.
Random sampling A sample of participants produced by using a random technique such that every member of the target population being tested has an equal chance of being selected.
Sampling The selection of participants from the sampling frame with the aim of producing a representative selection of people from that group.
Sampling frame The source material from which a sample is drawn.
Self-selected sampling A sample of participants that relies solely on volunteers to make up the sample. Also called a selfselected sample.
Snowball sample Relies on referrals from initial participants to generate additional participants.
Stratified sampling A sample of participants produced by identifying subgroups according to their frequency in the target population.
Participants are then selected randomly from the subgroups.
Systematic sampling A sample obtained by selecting every *n*th person (where *n* is any number). This can be a random sample if he first person is selected using a random method; you then select every *n*th person after that.
Target population The group of people that the researcher is interested in. The group of people from whom a sample is drawn. The group of people about whom generalisations can be made,,

LESSON FOUR :Correlations

Correlation illustrates the strength and direction of an association between two or more **co-variables** (things that are being measured). Correlations are plotted on a **scattergram** (see examples below). One co-variable forms the x-axis and the other the y-axis. Each point or dot on the graph is the x and y position of each co-variable.

Types of correlation

Let's consider two things that might be correlated. Frequent use of caffeine is correlated with high anxiety. We might get people to work out how many caffeine drinks they consume over a weekly period. We could then get these same peopl to **self-report** their level of anxiety (let's say on a 20-point scale) at the end of the week. We might expect to see a **positive correlation** between the two variablesif we plotted the data on a scattergram – a positive correlation means the morecaffeine people drink, the higher their level of anxiety. Perhaps we could also get these same people to record how many hours sleep they have over the same period. Drinking a lot of caffeine often disrupts sleep patterns, so perhaps the *more* caffeine someone drinks the *less* sleep they have. This would be a **negative correlation** insofar as one variable rises the other one falls.

Finally, we might also persuade our intrepid participants to record the number of dogs they see in the street within the same week. As far as we are aware, there is no relationship between the number of caffeine drinks someone has and the number of dogs they see in the street. For this reason, we might expect to nd something close to a **zero correlation** between these two variables.

The difference between correlations and experiments

In an **experiment** the researcher controls or manipulates the **independent variable (IV)** in order to measure the effect on the **dependent variable (DV).** As

a result of this deliberate change in one variable it is possible to infer that the IV caused any observed changes in the DV.

In contrast, in a correlation, there is no such manipulation of one variable and therefore it is not possible to establish cause and effect between one co-variable and another. Even if we found a strong **positive correlation** between caffeine and anxiety level we cannot assume that caffeine was the cause of the anxiety. People may be anxious for all sorts of reasons (personality type, a stressful job, personal problems, being badgered by a researcher to record their caffeine

levels)
and therefore their in- uence on the other variable cannot be disregarded. These 'other variables' are called **intervening variables**.

Concepts: Correlational hypotheses
Hypotheses written for correlations are not the same as those for experiments. There is no IV or DV in a correlation. The hypothesis still has to clearly state the expected relationship between variables – but co-variables in this case, which must be clearly **operationalised**. Also, as with experimental hypotheses, correlational hypotheses can be **directional** or **non-directional**. A directional hypothesis for the chocolate correlation could be:
There is a positive correlation between the price of a chocolate bar and its tastiness rating (out of 20).
Whereas the equivalent non-directional hypothesis would be:
There is a correlation between the price of a chocolate bar and its tastiness rating (out of 20).

Advantages of correlational analysis

l **Allows predictions to be made** – predictions can be made from correlations, like predicting the number of ice creams that will be sold on hot days.
l **Allows quantification of relationships** – correlations show the strength of relationship between two co-variables. A correlation of +0.9 (90 per cent similarity) means a high positive correlation, while a correlation of –0.1 (10 per cent similarity) indicates a weak negative correlation (see below).
l **No manipulation** – correlations do not require manipulation of variables and so can be used where carrying out an experiment may be unethical.

Weaknesses of correlational analysis

l **Quantification problem** – correlations that appear low (e.g. +0.28) can sometimes be significant (meaningful) if the number of scores is high, while correlations that seem high (e.g. +0.76) are not always statistically significant.
l **Cause and effect** – as they're not done under controlled conditions, correlations do not show causality. Therefore, we cannot say that one covariable has caused the other.

l **Extraneous relationships** – other variables may influence the covariables. For example, many holidays are taken in the summertime and people eat ice creams on holiday; therefore, the variable 'holiday' is related to both temperature and ice cream sales.

l **Only works for linear relationships** – correlations only measure linear (straight-line) relationships. For example, correlations cannot show the relationship between temperature and aggression, as it is curvilinear (not a straight line): as temperature increases, aggression levels increase up to an optimum point: then any further increase in temperature leads to a decline in aggression levels.

Question

1. Write directional and non-directional hypotheses for the caffeine and anxiety level study, and the caffeine and sleep study.

……
……
……

2 ; Design a correlational study that studies the relationship between age and memory ability. What would be your co-variables and how would you measure them?

……
……
……

3. Previous research into whether memory declines with age is contradictory. With this in mind compose a suitable correlational hypothesis. What type of graph would you use to plot the data?

……
……
……

LESSON FIVE :**Self-report techniques**

Psychologists aim to fi nd out about behaviour.One way to do this is to conduct experiments.Another method is by observation – called a nonexperimental method. Another non-experimental method or technique is to ask people questions about their experiences and/or beliefs. These are called **self-report techniques** because the person is reporting their own thoughts/feelings. This includes questionnaires and interviews. A **questionnaire** can be given in a written form or it can be delivered in real-time (face-to- face or on the telephone) in which case it is called an **interview**.

QUESTIONS

In questionnaires and interviews there are two types of question and each collects a specific kind of data.

Closed questions – the range of possible answers is fixed, such as listing fi ve possible answers for respondents to choose from or asking a question with a yes/no/maybe answer. Such closed questions are easier to analyse but respondents may be forced to select answers that don't represent their real thoughts or behaviour.

Closed questions have a limited range of answers and produce **quantitative data**.

Both of these aspects of closed questions make the answers easier to analyse using graphs and measures like the **mean**.

Open questions – there is an infi nite range of possible answers. For example, 'What do you like most about your job?' or 'What makes you feel stressed at work?' you may get 50 different answers from 50 people.

Open questions produce **qualitative data** which are more difficult to summarise because there is likely to be such a wide range of responses. In any research study we are looking for patterns so we can draw conclusions about the behaviour being studied. If you have lots of different answers it is more difficult to summarise the data and detect clear patterns.

QUESTIONNAIRES AND INTERVIEWS

Questionnaires

A questionnaire is a set of written questions. It is designed to collect information about a topic or topics.

Questions permit a researcher to discover what people think and feel, a contrast to observations which rely on 'guessing' what people think and feel on the basis of how they behave. With a questionnaire you can ask people directly; whether

they can and do give you truthful answers is another matter.

Structured and semi-structured interviews

Questionnaires are always predetermined, i.e. structured, whereas an interview can be structured or unstructured.

A **structured interview** has pre-determined questions, in other words it is essentially a questionnaire that is delivered face-to-face (or over the telephone) with no deviation from the original questions. It is conducted in real-time – the interviewer asks questions and the respondent replies.

A **semi-structured interview** has less structure! Basically this 'structure' refers to the pre-determined questions. In an unstructured interview new questions are developed during the course of the interview. The interviewer may begin with general aims and possibly a few pre-determined questions but subsequent questions develop on the basis of the answers that are given.

This is sometimes called a *clinical interview* because it is a bit like the kind of interview you might have with a doctor. He or she starts with some pre-determined questions but further questions are developed as a response to your answers.

Likert scales

A **Likert scale** is one in which the respondent indicates their agreement (or otherwise)with a statement using a scale of usually ve points. The scale ranges from *strongly agree* to *strongly disagree*, for example:

Statement: Sport can have educational value

1	2	3	4	5
strongly agree	agree	neutral	disagree	strongly disagree

Rating scales

A **rating scale** works in a similar way but gets respondents to identify a value that represents their strength of feeling about a particular topic, for example:

Question: How entertaining do you find practising sport?

(circle the number that applies to you)

Very entertaining 1 2 3 4 5 Not at all entertaining

Fixed choice option

A **fixed choice option** item includes a list of possible options and respondents are required to indicate those that apply to them, for example:

Question: For what reasons do you practise sport? (Tick all those that apply)

☐Entertainment ☐ To escape ☐To keep fit

☐Amusement ☐Education ☐ To please others

Designing interviews

Most interviews involve an **interview schedule**, which is the list of questions that the interviewer intends to cover. This should be **standardised** for each participant to reduce the contaminating effect of **interviewer bias**. Typically, the interviewer will take notes throughout the interview, or alternatively, the interview may be recorded and analysed later.

Interviews usually involve an interviewer and a single participant, though **group interviews** may be appropriate especially in **clinical** settings. In the case of a one-to-one interview, the interviewer should conduct the interview in a quiet room, away from other people, as this will increase the likelihood that the interviewee will open up. It is good practice to begin the interview with some neutral questions to make the participants feel relaxed and comfortable, and as a way of establishing rapport. Of course, interviewees should be reminded on several occasions that their answers will be treated in the strictest con dence. This is especially important if the interview includes topics that may be personal or sensitive.

Keywords :

Closed questions Questions that have a pre-determined range of answers from which respondents select one.Produces quantitative data.

Interview A research method or technique that involves a face-to-face, 'real-time' interaction with another individual and results in the collection of data.

Interviewer bias The effect of an interviewer's expectations, communicated unconsciously, on a respondent's behaviour.

Open questions Questions that invite respondents to provide their own answers rather than select one of those provided. Tend to produce qualitative data.

Qualitative data Non-numerical data.

Quantitative data Data in numbers.

Questionnaire Data are collected through the use of written questions.

Semi-structured interview The interview starts out with some general aims and possibly some questions,and lets the respondent's answers guide subsequent questions.

Social desirability bias A distortion in the way people answer questions – they tend to answer questions in such a way that presents themselves in a better light.

Structured interview Any interview in which the questions are decided in

advance.

EVALUATION

Self-report techniques

There are a number of advantages and disadvantages that are common to all methods of self-report. The advantage is the access such techniques allow to what people think and feel, to experiences and attitudes.

One key disadvantage of questionnaires is that people may not supply truthful answers. Observations permit much more direct access to genuine behaviours. It's not a matter that people lie but they may simply answer in a socially desirable way (called a **social desirability bias**). For example, if asked whether you are a leader or a follower,many people would prefer not to class themselves as a follower even if they are.

In addition people sometimes simply don't know what they think or feel, so the answer they supply lacks **validity**.

A fi nal issue relates to the **sample** of people used in any study using self-report. Such a sample may lack **representativeness** and thus the data collected cannot be generalised.

Questionnaire

Many students say that the advantage of a questionnaire is that they are easy – but this overlooks the fact that they actually take quite a lot of time to design. The advantage is that, once you have designed and tested a questionnaire, they can be distributed to large numbers of people relatively cheaply and quickly. This enables a researcher to collect data from a large sample of people.

A further advantage of a questionnaire is that respondents may feel more willing to reveal personal/confi dential information than in an interview. In an interview the respondent is aware that the interviewer is hearing their answer and this may make them feel self-conscious and more cautious.

The impersonal nature of a questionnaire may also reduce social desirability bias as compared to an interview.

On the negative side, a disadvantage of questionnaires as a means of data collection is that they are only fi lled in by people who can read and write and who are also willing to spend time fi lling them in. This means that the sample is likely to be biased.

Structured interview

A structured interview (as well as a questionnaire) can be easily repeated because the questions are **standardised**. This means answers from different people can be compared. This also means that they are easier to analyse than an

unstructured interview because answers are more predictable.
On the other hand, comparability may be a problem in a structured interview (but not a questionnaire) if the same interviewer behaves differently on different occasions or different interviewers behave differently (low **reliability**). One disadvantage of both structured and unstructured interviews is that the interviewer's expectations may infl uence the answers the respondent gives (a form of investigator effect called **interviewer bias**). All interviewers have to be skilled to prevent interviewer bias as far as possible.

Semi-structured interview

In a semi-structured interview, more detailed information can generally be obtained from each respondent than in a structured interview. This is because the interviewer tailors the questions to the specific responses and can get deeper insights into the respondent's feelings and thoughts.
Unstructured interviews require interviewers with more skill than an structured interview because the interviewer has to develop new questions on the spot. Such questions may be more likely to lack objectivity than predetermined ones because of their instantaneous nature, with not time for the interviewer to reflect on what to say.

Questions :

1. Compose three open and three closed questions for a questionnaire examining people's smoking habits and attitudes to smoking.

1 ……

2……

3……

What type of data would:
(i) the open questions generate

……..
(ii) the closed questions generate?

…….

2. Explain how:
(i) social desirability bias could affect the answers given