EXAM NOTES I

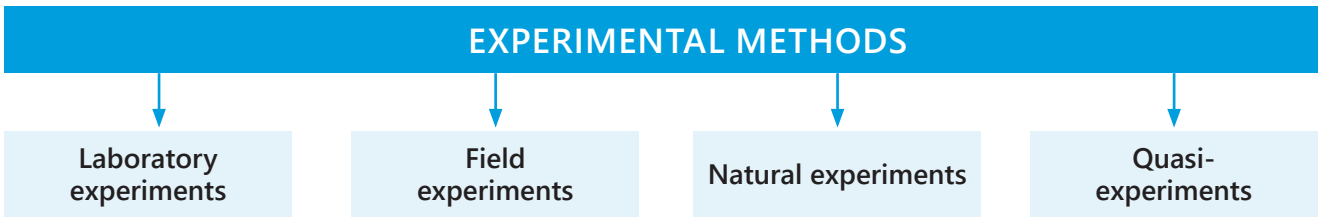
Experimental Methods

AQA specification for Topic 7: Research methods

- Experimental method. Types of experiments, laboratory and field experiments; natural and quasi-experiments.
- Variables: manipulation and control of variables, including independent, dependent, extraneous, confounding. (Note: Operationalisation of variables is covered in Exam Note10.)
- Control: random allocation.

Introduction

There are four different types of experimental methods commonly used in psychological research.



Laboratory experiments

A **laboratory experiment** (or true experiment) is seen as the most scientific psychological method a researcher can use when investigating human behaviour. It is a tightly **controlled** research method conducted in an **artificial environment** to test a hypothesis.

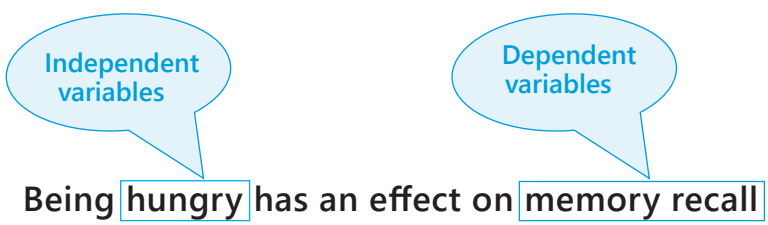
The purpose of conducting a laboratory experiment is to see if one variable called the *independent variable (IV)* has an effect on or changes another variable called the *dependent variable (DV)*, with the aim of discovering a **cause-and-effect relationship** (or causal relationship) between the two variables, that is, the change in the IV has an effect on the DV.

The three main characteristics of a laboratory experiment are:

- **Manipulation of the independent variable** – The experimenter manipulates the first variable (the IV) to observe what effect it has on the second variable (the DV).
- **Experimental control** – The experimenter ensures, as far as possible, that all other unwanted factors (variables) are controlled (held constant or eliminated). These potential unwanted variables are known as extraneous variables.
- **Randomisation** – A laboratory experiment allows the researcher to randomly allocate the participants to the different experimental conditions.

Independent and dependent variables

An important feature of experimental research is what we call **variables**. In a simple psychology experiment, there are usually two variables, the **independent variable (IV)** and the **dependent variable (DV)**. To understand the difference, let us take this hypothesis:



- **Independent variable (IV)** – This is the variable that is **manipulated** by the experimenter to see what effect it has on the *dependent* variable. In the example above, *hunger* would be our independent variable. In a research experiment, a group of participants went without food for a day (i.e. the *hungry* lot = the experimental group). The other group of participants had eaten (i.e. the *not-hungry* lot = control group). The two groups can be compared to see what effect hunger has on memory recall (e.g. remembering words). This is what is meant by manipulating the independent variable (i.e. anything that can be varied such as behaviour, items, events, sizes or amounts).
- **Dependent variable (DV)** – This is the variable that is **measured** (a result or score) by the experimenter. We measure the effects that the *independent* variable may have on the dependent variable. In our example above, memory recall would be our DV because we are measuring how good memory recall is (e.g. the number of words remembered), when someone is hungry or not hungry.

Experimental control

In order to establish a cause-and-effect relationship between hunger and memory, the experimenter must control – or eliminate – other 'interfering variables' known as **extraneous variables (EV)**, that may influence the participant's memory recall.

Extraneous variables can be defined as any *unwanted* variable (other than the IV) that may potentially affect the results (DV) of the study. If an extraneous variable does affect the results, then we say it has confounded (confused) the results. This is known as a **confounding variable (CV)** and it describes a factor in the experiment that was *not* controlled and that affected the research findings. If this occurs, it reduces the validity of the results, which means we can't trust the research findings. Note that some CVs are easier to identify than others!

Two main types of extraneous variables that can affect the validity of an experiment are:

- **Participant variables** – These refer to individual differences and behaviours of the participants themselves that could influence the results of the experiment, such as age, intelligence, gender, ethnicity, social class, experiences, skills, tiredness, mood, and motivation. They can all (unintentionally) influence the outcome of the results. This is only an issue if the experimental design is an *independent group design*. *(See Exam Notes 2)*
- **Situational variables** – These relate to the situational setting of the research, which may affect the participants' behaviour. There might be *environmental factors*, such as the instructions given, the material used, noise levels or temperature, light level and time of day, and even weather conditions! Situational variables could also be features of the experiment that lead participants to behave in a particular way called *demand characteristics* and *investigator effects (See Exam Notes 13)*. There are also *order effects*, whereby the type of *experimental design* can affect the results of the research *(See Exam Notes 13)*.

Example of a study with extraneous variables

In the above example of hunger and memory, the potential situational and participant EVs could be the number of hours they slept the night before the test, their intelligence, and the time of day the test was taken. Let's say we tested the participants at different times of the day, perhaps one group in the morning and the other in the afternoon; the results would then be confounded (i.e. confused). We cannot be sure if the IV (hunger) or the time of day (EV) was the cause of any difference in memory scores among the participants. The time of day would be a confounding variable.

Experimental groups and the control group

In order to see if the IV has an effect on the DV, an experiment must have at least *two groups* (conditions) – one group receives the IV and the other group does not. Then we can compare the results.

- The **experimental group** is exposed to the IV.
- The **control group** is not exposed to the IV.

If the results differ between the two groups, and we have assured ourselves that we have controlled any EVs, then we can conclude that any difference in the participants was due to the IV. For example, a study on Revising for an exam while listening to music affects memory recall might have two groups:

- The participants in the *experimental group* attempt to learn a psychological theory while listening to music.
- The participants in the *control group* learn a psychological theory without listening to music.

The control group is really important because without them it would be impossible to tell whether the music had any effect on learning. With a control group as a comparison, and if the average score of the experimental group is higher than the average score of the control group, we can conclude that music improves learning. If there were no differences between the groups, then we can conclude that that the IV (listening to music) made no difference.

Randomisation

In the above example, participant EVs would relate to *individual differences*, that is personal characteristics of the participants. It is possible, for example, to assign more participants with higher intelligence to one group than the other. If this occurs, their individual differences will confound the results.

- A way to reduce the effect of personal differences is to use **random assignment** (or randomisation). This is based on the laws of chance. This means that the participants have an equal chance of being selected *either* in the experimental group or in the control group.
- The process of *random sampling* (e.g. tossing a coin or running a computer program to generate random numbers) for each participant will determine which group they go into. This means that any personal differences of the participants would be to some extent equally balanced out between the two groups, and this will increase the internal validity of the study.

Evaluation

Strengths

✔ **High levels of control.** A strength of laboratory experiments is they allow a high level of control over the research environment. This is done by controlling EVs, which means that the researcher can be confident about establishing a causal relationship between the IV and the DV, increasing the validity of the study.

✔ **Easy to replicate.** Laboratory experiments are easier to replicate than many other research methods, which is a strength. This means that the original experiment can be repeated by other researchers, under the same conditions and following the same procedures, to see whether they obtain similar results. The ability to be replicated is important for checking other researchers' work. If the findings are similar, we can be confident that the original results have internal validity and reliability.

Weaknesses

✘ **Artificiality.** A weakness of laboratory experiments is that they have been criticised for being highly artificial, that is they lack mundane realism (because the setting is unlike real life). This means that the results obtained in a laboratory experiment may not be valid because they bear little resemblance to the real world. Therefore, research findings from laboratory experiments are difficult to generalise to the real world.

✘ **Demand characteristics**. Another weakness of a laboratory experiment is that the participants may show demand characteristics because they know they are taking part in the experiment. Participants naturally will be curious and try to guess what the study is about. Any features of the experiment (e.g. tasks, resources, equipment, video clips), and the experimenter themselves, may act as a clue to what the study may be about. The participants may unconsciously respond to such cues and will then change their behaviour. This will affect the validity of the findings because the participants are not behaving as they normally would.

◆ Field experiments

Sometimes experiments are not carried out in an artificial laboratory setting, but in a **real-life environment** where people are engaged in everyday normal behaviour. Experiments might be conducted in schools or shopping malls, on the streets or in a workplace. Often, the participants do not know they are taking part in a study. Such experiments are called **field experiments**. In field experiments, the researcher is still able to manipulate the IV in a natural setting, to see the effect it has on the DV.

Example of a field experiment

Sissons (1979) investigated the effect that social class can have on 'helping behaviour' from strangers (helping others out). The confederate (an actor) stood outside Paddington rail station in London and asked people for directions to Hyde Park. In the first part of the experiment, the actor was dressed professionally, in a suit and wearing a bowler hat, and he spoke with a middle-class accent. In the other half of the experiment, the actor changed his clothes into those of a working-class labourer and spoke in a working-class accent. He asked passers-by the same question as before. The findings indicated that people were more helpful towards the man who was smartly dressed, with a middle-class accent, than the labourer, implying that people's perception of each other can alter responses. In this case, it influenced how helpful they were.

Evaluation

Strength

✔ **High external validity.** The strength of field experiments is that they are conducted in the real world, where the participants are often not aware they are taking part in a study, so there is no influence of the investigator effect or demand characteristics. This means that findings of field experiments are often more realistic and true to life than laboratory experiments, and therefore they are high in external validity. Therefore findings from field experiments can be generalised to the real world – something laboratory experiments cannot.

Weaknesses

✘ **More difficult to control unwanted variables.** A problem with field experiments is that the researcher has less control over the natural environment. This means changes to the DV may not be due to the IV, but to other unwanted variables (CV). This makes it more difficult to establish a cause-and-effect relationship, which reduces the validity of the research findings.

✘ **Not easy to replicate.** Field experiments are less reliable than laboratory experiments because they are carried out in a natural environment, where it is difficult to replicate the study under conditions that are the same as the original. This makes the findings from different field experiments difficult to compare.

✘ **Ethical issues.** Field experiments have ethical weaknesses. If the participants are unaware they are taking part in a study, this means they have not agreed to take part (lack of informed consent). In such instances, the researchers should, if possible, attempt to debrief the participant. This means telling the participants the purpose of the experiment at the end of the study, to reassure them that the information collected will be kept confidential and that they have the right to withdraw the data collected on them (if they were not happy being part of the research!).

◆ Natural experiments

A **natural experiment** is a type of research that collects data from a situation where the researcher does not manipulate the IV. This is because the IV would have changed/occurred naturally by itself.

The DV may be measured in a laboratory or in the field. The key feature of a natural experiment is not *where* it is conducted but *the way* the independent variable is manipulated.

Examples of a natural experiment

Charlton et al. (2002) investigated whether increased exposure to media such as television increases antisocial behaviours like aggression. He studied a small island called St Helena (a remote island in the South Atlantic Ocean), where television had been introduced only recently – in 1995 – to see whether levels of aggression had increased. After five years of television viewing, there was no increase in the children's physical or verbal aggression.

Another example of a natural experiment is that by Hodges and Tizard, who studied the effects of privation on children. They wanted to see how privation affects a child's development. To do this, they compared a group of children in institutionalised care with a group of children who were living at home with their families and assessed each child's development.

Another example is a study that compares football players to rugby players (IV varies 'naturally). The DV could be an IQ test in a controlled laboratory setting.

Evaluation

Strengths

✔ **Greater external validity.** A strength of natural experiments is that they often involve real-life issues such as the effects of institutionalisation on children. This means the findings are more relevant to real-life situations.

✔ **Avoid investigator effects and demand characteristics.** Another strength is that, like field experiments, the participants are unaware that they are taking part in a natural experiment study. This means that their behaviour will be more normal and not subject to investigator effects and demand characteristics. Again, this increases the ecological validity of the study, which means that the findings can be generalised to the real world.

✔ **Only possible method.** Natural experiments are also good because they allow psychologists to investigate phenomena that would be unethical to manipulate the IV. For example, researcher investigating the effects of teenage smoking cannot randomly assign people to groups of smokers and non-smokers to see whether they develop cancer. This means a natural experiment may be the only way to research some topics.

Weaknesses

✘ **Participants are not randomly assigned.** A weakness of this design is that the researcher has no control over which participants are placed in which conditions as the IV is pre-existing. This may result in uncontrolled variables that affect the IV (confounding variables). For example, the Romanian orphans that were adopted early may have also been the friendlier ones. This reduces the validity of the findings.

✘ **Difficult to replicate.** Another weakness of these studies is that natural experiments tend to investigate a phenomenon that is unique, a one-off situation. This makes it difficult to verify the research findings because it is extremely unlikely that a researcher can replicate the study using the same setting and conditions. Therefore, it is difficult to check the reliability and validity of the results.

◆ Quasi-experiments

There are some studies that resemble a true experiment, because the IV seems to be manipulated in a controlled setting in which the extraneous variables are held constant. However, they may share similar characteristics of a true experiment design, without being truly experimental. These are known as **quasi-experiments.** Some differences between true experiments and quasi-experiments are:

- In a true experiment, the IV is manipulated in a controlled way and participants have an equal chance of being randomly assigned to either group; whereas in a quasi-experiment, the participants are *not assigned randomly into the different groups*. The experimenter does manipulate the IV.
- The reason why participants cannot be randomly allocated to the experimental/control group is because, in a quasi-experiment, the IV is already established and cannot be manipulated. If the IV is gender, age or ethnicity, this obviously cannot be changed by the experimenter for the purpose of the experiment. Usually this happens when the independent variable in question is something that is an innate characteristic of the participants involved. This also means that natural experiments are deemed as quasi-experiments.

Examples

An experimenter wants to see the difference in the reliability of memory recall of female and male participants after watching a crime scene. (The IV will be the sex of the participants and the DV will be the reliability of information recalled.) The researcher cannot manipulate the sex of the participants and randomly allocate them to be either male or female. So instead, the researcher assigns the participants to one group or the other, depending on whether they are male or female (this is the pre-existing variable).

A psychologist wants to see if personality traits 'extrovert' and 'introvert' have an effect on intelligence. The personality factors are the independent variable. Personality traits are inherent to each person, so random assignment cannot be used. Participants would initially be assigned to one of the groups based on their personality assessment scores.

Evaluation

Strength

✔ **Comparison can be made.** Quasi-experiments are good because they allow psychologists to study the differences in people (gender, developmental disorders such as autism, ethnicity, etc.). This means that a comparison between different types of people or behaviours can be made.

✘ **Cause-effect relationship cannot be inferred.** A weakness of these studies is that because in a quasi-experiment there is no random allocation, there is no control over the participants. This means that individual differences (social background, IQ, education, experience, etc.) might explain the difference in the results between the experimental groups, therefore we cannot be confident in inferring a cause-and-effect relationship.

Practice exam questions

1. Explain what is meant by the term 'laboratory experiment'. **[2 marks]**
2. Give one advantage of using laboratory experiments in psychological research. **[2 marks]**
3. Give two weaknesses of using laboratory experiments in psychological research. **[2+2 marks]**
4. Explain what is meant by the term 'field experiment'. **[2marks]**
5. Give one advantage of using field experiments in psychological research. **[2 marks]**
6. Give two weaknesses of using field experiments in psychological research. **[2+2 marks]**
7. Explain what is meant by the term 'natural experiment'. **[2 marks]**
8. Give two weaknesses of using natural experiments in psychological research. **[2+2 marks]**