PYSC 224
Introduction to Experimental Psychology

Session 4–Variables and terms in Experimentation
Part 1 & 2

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Session Overview

- In experimentation, certain variables that have to be identified, before the experiment can be conducted- the independent, dependent and extraneous variables

- Also, terminologies such as population, sample, randomization etc. are often used, it is therefore important for you to familiarize yourselves with these terminologies which will be referred to throughout this course

Session Goals and Objectives

At the end of this session, you should be able to

- Explain the role of variables in experimentation

- Describe the types and categories of variables

- Distinguish the three variables in experiments

- List and explain the various terminologies used in experimentation

Session Outline

The key topics to be covered in the session are as follows:

- Types of variables in experimentation

- The three variables in experimentation

- Terms used in experimentation

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Reading List

- Christensen, B.L. (2007). *Experimental Methodology* (10th ed.). Boston: Allyn & Bacon. (p. 182-188)

- Kantowitz, B. H., Roediger III, H. L., Elmes, D. G. (2015). *Experimental Psychology*. Stamford: Cengage Learning (p. 63-72)

- Martin, D. W. (2008). *Doing Psychology Experiments*. Belmont, CA: Thomson Higher Education (p. 25-31, 131-147)

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Topic One

TYPES OF VARIABLES IN EXPERIMENTATION

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Types of Variables

- Variables are the gears that make experiments run (Kantowitz, Roediger III & Elmes, 1988)

- In every experiment the independent, dependent and extraneous variables have to be identified

- A variable is any event, situation, behaviour, or individual characteristic that can be varied to have at least two values (Cozby, 2001)

Types of Variables

- Example:

  ❑ Behaviour can be varied as good or bad

  ❑ Emotions can be varied to be sad, happy, anger etc.

- An experimenter can also vary each of these varied variables again

  ❑ Example: 'good behaviour' can be varied as good, very good or 'anger' can be varied as angry or very angry

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Types of Variables

- Effective selection and manipulation of variables makes the difference between a good experiment and a poor one (Kantowitz, Roediger III & Elmes, 2015)

- One way to distinguish between variables is to categorize them as discrete or continuous

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Types of Variables

1.   <u>Discrete variables</u>

- Variables that come in whole units or categories

- Example- race, (black, white or mixed race) , or sex (male or female), or state of wellbeing (sick or well)

- One can only belong to one of these categories

Types of Variables

2. Continuous variables

- Variables that form a continuum and can be represented by both whole and fractional units

- Example- attitude towards work could be extremely positive, positive or extremely negative

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Types of Variables

- Variables could also be qualitative or quantitative

    1. Qualitative variables

- Qualitative variables vary in kind

- Manipulating a quality or attribute of the situation that participants are exposed to

- Example- the quality of room lighting system (dim, bright)

Types of Variables

2.   <u>Quantitative variables</u>

- Quantitative variables vary in amount

- Manipulating the amount of variable that participants are exposed to

- Example- loudness is measured in decibels or time could be measured in hours minutes or seconds

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Topic Two

THE THREE VARIABLES IN EXPERIMENTATION

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Three Variables in Experimentation

- Independent variable

- Dependent Variable

- Extraneous Variable

1. Independent variable

- The variable systematically manipulated by the experimenter

- Its values are chosen and set by the experimenter (called the levels)

- The variable hypothesized to be one of the causes of the presumed effect

- Example- increasing the amount of practice time should increase performance on a task

1. Independent variable

- Should be one that can be manipulated, there should be variations in this variable such as:

  ❑1. Presence versus absence technique- research participants are exposed to two levels i.e. treatment condition or no treatment condition

  ❑Example- A drug, alcohol, feedback, motivation, learning strategy, breakfast, etc,

1. Independent variable

❑ 2. **Administering different amounts** of the independent variable to each of the several groups

❑Example- 5 bottles, 2 bottles, 1 bottle and 0 bottle beer to four groups

❑3. administering different types of independent variables

❑Example- positive or negative feedback, type of psychological illness, IQ and anxiety

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1. Independent variable

- Identify the independent variables- how can they be varied

- Effect of type of information given to participants on the amount of information remembered

- Alcohol drinking will decrease people's reaction time to a task

- Effect of office plan on level of productivity

- Type of learning and recall of words

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2. Dependent Variable

- The variable whose value is observed and recorded

- It measures the influence or effect of the independent variable

- It is expected to change as a result of manipulation of the independent variable

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2. Dependent variable

- Identify the dependent variables and how they will be measured

- Effect of type of information given to participants on the amount of information remembered

- Alcohol drinking will decrease people's reaction time to a task

- Effect of office plan on level of productivity

- Type of learning and recall of words

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3. Extraneous variable

- Any variable other than the independent variable that can influence the dependent variable but is not of interest to the experimenter

- A potential independent variable that is held constant during an experiment

- If not controlled, a causal relationship cannot be established

- E.g.- The effects of instructional strategies on student's performance

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3. Extraneous variable

- Identify possible extraneous variables

- Effect of type of information given to participants on the amount of information remembered

- Alcohol drinking will decrease people's reaction time to a task

- Effect of office plan on level of productivity

- Type of learning and recall of words

Topic Three

TERMS USED IN EXPERIMENTATION

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Terms used in Experimentation

1. Population

- The entire collection or group of people or animals belonging to a particular category (Coon 2001), that a researcher selects his participants from

- The target population is made up of all of the individuals of interest to the researcher

- The researcher selects some of them based on a particular criteria to serve as the sample

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Terms used in Experimentation

2. Sample

- People selected from a population to be tested as research participants

- May be drawn from the population using probability sampling or non-probability sampling techniques

- The method used to select participants (i.e. sampling technique) has implications for generalising the research results

Terms used in Experimentation

- The sample size to be tested should be specified

- The type of research design has implications for the sample size

  ❑ Quantitative/ descriptive research studies needs hundreds of participants

  ❑ Experiments generally need a lot less

  ❑ Qualitative research design may need even lesser participants

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Terms used in Experimentation

3. Participant

- People who collaborate in an experiment for the purpose of allowing their behaviour to be studied

- The phenomenon under study will determine the type of participants to be studied

- Psychotherapy experiment- a group of phobias or depressives or diabetes patients etc.

Terms used in Experimentation

4. Experimental Group

- A group of participants in an experiment that receives the treatment condition or some amount of independent variable

- Also known as the treatment group

Terms used in Experimentation

5. Control Group

- A group of participants in an experiment that do not receive any treatment or independent variable

- They serve as a standard of comparison to determine if the treatment conditions produced any effect

- It is necessary that subjects are similar to those in the experimental group

Terms used in Experimentation

6. Confederate

- A person in an experiment who has been instructed to behave in ways that could affect the responses of participants

- Confederates help administer the independent variable

- Merely act as if they are participants to create a situation to deceive the research participants

- Pseudo-subjects

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Terms used in Experimentation

7. <u>Randomization</u>

- A control technique that equates groups of participants by ensuring every member has an equal chance of being assigned to any group

- Participants are randomly selected from a population to make the sample representative of the total population

Terms used in Experimentation

- Randomly selected participants should be randomly assigned to the various groups in an experiment

- Procedures such as tossing coins or using a table of random numbers can be employed

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Terms used in Experimentation

8. Internal Validity

- The ability of an experiment to adequately test hypotheses is known as its internal validity (Campbell & Stanley, 1963)

- It is the extent to which a cause-effect relationship can be established between an independent and dependent variable

- An experiment lacks internal validity if confounding variables are not controlled

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Terms used in Experimentation

9. External Validity

- The extent to which the findings of a research can be generalized to other situations or populations, other than the population of study

END OF SESSION 4

References

- Campbell, D. T. & Stanley, J. C. (1963). *Experimental and Quasi-Experimental Designs for Research.* London. Houghton Mifflin Company.

- Christensen, B.L. (2007). *Experimental Methodology* (10th ed.). Boston: Allyn & Bacon.

- Heiman, G. A. (1995). Research methods in psychology. Boston: Houghton Mifflin.

- Kantowitz, B. H., Roediger III, H. L., Elmes, D. G. (2015). *Experimental Psychology*. Stamford: Cengage Learning