Advanced Research Methods

Introduction to Advanced Research Methods in Psychology:

Course Presentation

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Course Overview

- This course is designed for doctoral students in psychology who aspire to become **proficient researchers**.

- The course delves into the intricacies of **research design**, **data collection**, **statistical analysis**, and **the ethical considerations** necessary for conducting robust research in psychology.

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Course Overview

Course Content

- Various research paradigms, from experimental to qualitative approaches,
- hands-on experience in designing, executing, and critically evaluating research studies

Course Design

- lectures, discussions, videos, forums, online activities, tutorials and practical exercises

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Course Objectives

- Develop a deeper understanding of the fundamental research methods and techniques in psychology.
- Identify the strength and limitations of various research designs
- Design and conduct empirical studies using the appropriate research methods
- Develop research questions and hypotheses
- Understand ethical considerations in research
- Collect and analyze data
- Evaluate and interpret research findings
- Communicate research findings
- Conduct literature searches and reviews

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Course Structure

1st Week	Introduction to Advanced Research Methods in Psychology
2nd Week	Ethical Guidelines in Psychological Research
3rd Week	Experimental Design and Control
4th Week	Formulating Research Questions and Hypotheses.
5th Week	Measurement in Research
6th Week	Sampling Methods
7th Week	Quantitative Research

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Course Structure

8th Week	Qualitative Research
9th Week	Mix Methods Design
10th Week	Statistical Analysis Techniques, Interpretation of Results
11th Week	Searching and Reviewing Relevant Literature.
12th Week	Writing and Communicating Research Findings
13th Week	Course Review and Summary/ Final Project Presentation

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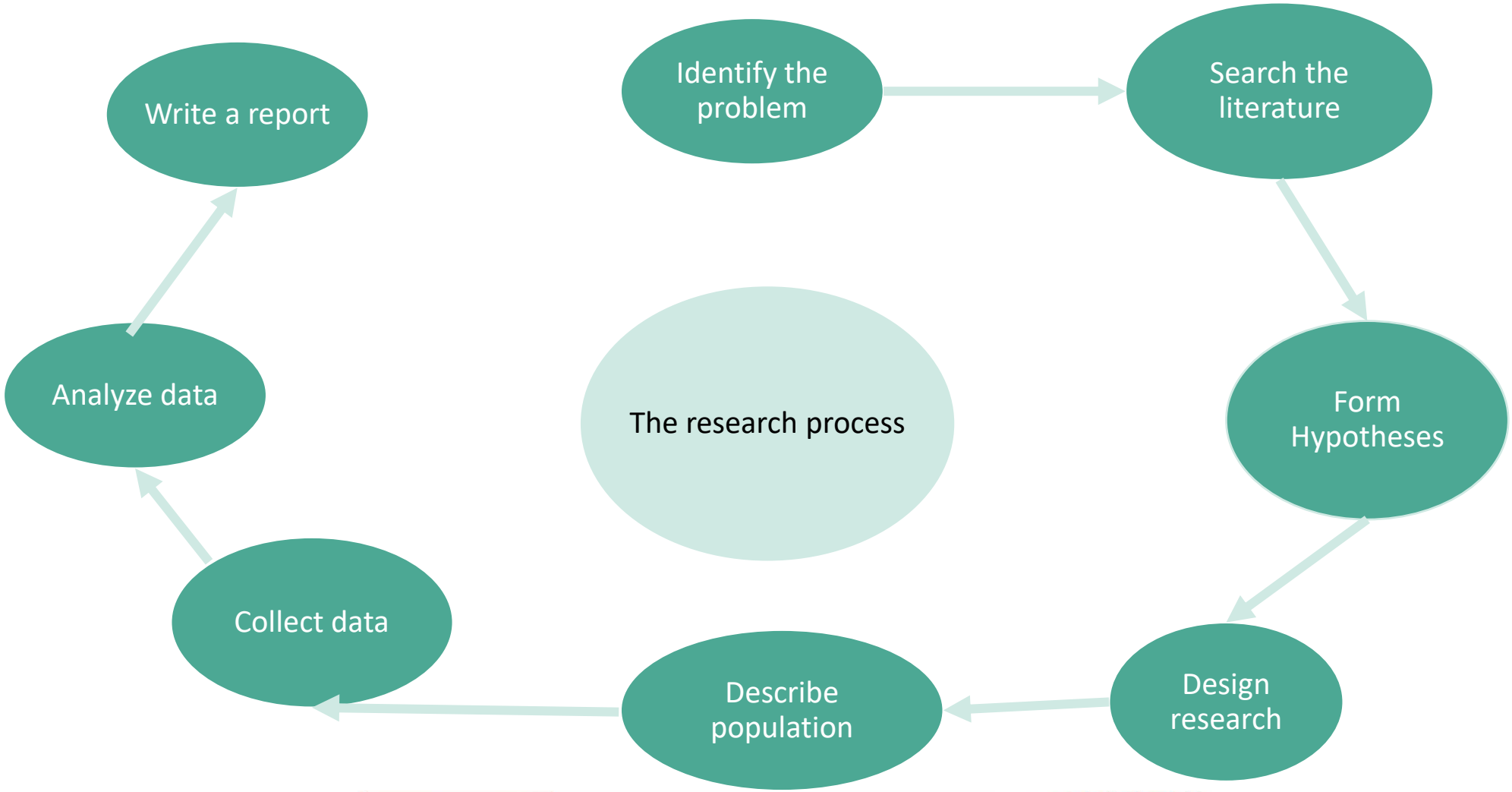
Overview of the Research Process



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The role of research methods

- Research methods provide the **systematic** and **structured** framework necessary for conducting rigorous and valid research.

- They guide researchers **through each stage of the research process**, from problem identification to the generation of new knowledge, while also ensuring ethical and responsible conduct.

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Research Design

*"**Research design** refers to the overall strategy that you choose to integrate the different components of the study in a coherent and logical way, thereby ensuring you will effectively address the research problem."*

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Why is it REALY IMPORTANT to choose the right research design?

- **Impact on Research Outcomes:** different research designs are suited for different research questions and objectives.
- **Validity and Reliability:** using the wrong design can compromise the quality of results.
- **Resource Utilization:** Choosing an inappropriate design may result in wasted resources.
- **Ethical Considerations:** The wrong design can raise ethical issues, such as unnecessary exposure of participants to risks or inadequate informed consent.
- **Relevance to Research Questions:** Different research questions may require different designs, such as experimental, correlational, or qualitative.

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Activity

- Make a list of famous psychological studies, including both successful and controversial ones.
    - What was the research question or objective of the study?
    - What research design was chosen, and why?
    - What were the key findings or outcomes?
    - Did the research design contribute to the study's success or challenges?

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Types of Research Designs

- ✓Experimental Design
- ✓Correlational Design
- ✓Longitudinal Design
- ✓Cross-Sectional Design
- ✓Case Study Design
- ✓Quasi-Experimental Design
- ✓Cross-Sequential Design
- ✓Survey
- ✓Meta-Analysis

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Research Questions

- Research questions are pivotal in the research process
  - Study's direction,
  - Study’s design,
  - data collection,
  - Interpretation of results

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Good Research Questions Usually Are…

- ✓Specific
- ✓Clear
- ✓Relevant
- ✓Feasible
- ✓Testable
- ✓Non-Biased

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Hypotheses

- A hypothesis is a testable statement or educated guess that suggests a relationship between two or more variables.
- Good hypotheses are:
  - *Testable*
  - *Specific*
  - *Falsifiable*
  - *Based on Research Questions*

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Formulating Hypotheses Based on Research Questions

- **Start with a Research Question**
- **Identify Variables**
- **State the Relationship**
- **Specify Direction**

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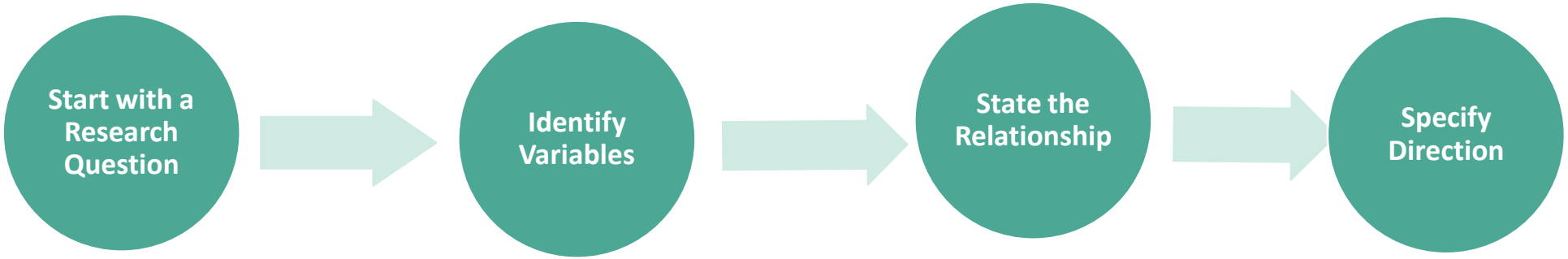
Formulating Hypotheses Based on Research Questions



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The Role of Hypotheses in Research

- ✓**Guide Research**
- ✓**Testable Predictions**
- ✓**Empirical Verification**
- ✓**Structure for Analysis**
- ✓**Interpretation of Results**
- ✓**Communication of Findings**

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Variables

- A variable is any attribute, phenomenon, or quantity that can vary or take on different values
- Types of variables:
  - **Independent:** intentionally manipulated or changed by the researcher, not influenced by the other variables in the study
  - **Dependent:** It is expected to change as a result of the independent variable
  - **Control:** Control variables are factors that researchers keep constant or control
  - **Categorical (Nominal or Ordinal):** Represent categories or groups
  - **Continuous (Interval or Ratio):** Are numeric and represent measurements
  - **Discrete:** Are numeric but represent whole numbers or distinct values
  - **Moderator:** is a variable that influences the strength or direction of the relationship between the independent and dependent variables
  - **Examples?**

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Data Collection

- The quality and accuracy of data collection greatly impact the validity and reliability of research findings.
- Researchers employ various methods and techniques to collect data:
  - Surveys
  - Observations
  - Interviews
  - Experimental Methods
  - Content Analysis
  - Secondary Data Analysis

  - Do ethics matter?

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Sampling

- Sampling techniques are crucial for making inferences and generalizations from a manageable subset to a larger group.

Types of Sampling:

- **Random Sampling**
- **Stratified Sampling**
- **Convenience Sampling**

Sampling Techniques:

- **Simple Random Sampling:**
- **Systematic Sampling:**
- **Cluster Sampling:**
- **Purposive Sampling:**
- **Quota Sampling:**

- Can you think of strengths and limitations?

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Data Analysis

- Data analysis → involves organizing, cleaning, interpreting, and summarizing data to answer research questions, test hypotheses, and draw valid conclusions
  - **Quantitative analysis** deals with numeric data, statistical tests, and quantifiable measurements. It focuses on numerical relationships, statistical significance, and the quantification of patterns and relationships within data.
  - **Qualitative analysis techniques** may include content analysis, thematic analysis, grounded theory, narrative analysis, and others. The goal is to extract meaningful information, identify patterns or themes, and provide rich descriptions of phenomena.

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Validity

- Validity in research refers to the extent to which a study measures what it intends to measure and the degree to which the findings accurately represent the target construct or phenomenon.

- It is a critical aspect of research quality, ensuring that the conclusions drawn from data are trustworthy and meaningful.

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Types of Validity

- **Internal Validity**
- **External Validity**
- **Construct Validity**

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Ways to ensure validity

- ✓Use Established Measures
- ✓Pilot Testing
- ✓Random Sampling
- ✓Control Extraneous Variables
- ✓Replication
- ✓Expert Review
- ✓Triangulation
- ✓Transparent Reporting
- ✓Cautious Generalization
- ✓Consistency with Theory

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Reliability

- Reliability in research refers to the degree of consistency, stability, and accuracy in measurements or observations.
- It assesses whether a research instrument or measurement tool consistently produces similar results when used repeatedly or with different samples under similar conditions.
- High reliability indicates that the measurements are dependable and free from random error.
- **Types of Reliability:**
  - **Internal Consistency Reliability**
  - **Test-Retest Reliability**

Strategies for Improving Reliability

- ✓Standardization
- ✓Clear Operational Definitions
- ✓Training and Calibration
- ✓Use of Established Measures
- ✓Pilot Testing
- ✓Randomization
- ✓Replication
- ✓Multiple Measurements
- ✓Longer Testing Periods
- ✓Item Analysis
- ✓Statistical Techniques

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Literature Review

- A literature review is a critical component of the research process:
  - *It provides context for the research by summarizing existing knowledge and research on the topic,*
  - *It helps identify gaps, unanswered questions, or areas where further research is needed,*
  - *It assists in building a theoretical framework by highlighting key theories, models, and concepts related to the research topic.*
  - *It informs researchers about various research methods and approaches used in previous studies, helping them make informed choices about their own methodology.*
  - *It prevents duplication of research efforts by showing what has already been done and published, saving time and resources.*
  - *It provides evidence and prior research findings that support the rationale for the study, enhancing the credibility of research claims.*

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Steps in Conducting a Literature Review

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Ethical Guidelines in Psychological Research

Protecting Participants and Ensuring Research Integrity

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Introduction to Ethical Guidelines

- Ethical considerations are foundational to responsible and socially accountable research in psychology.
- Adhering to ethical guidelines ensures that research is conducted with integrity, transparency, and respect for the well-being and rights of all individuals involved.
- It is an essential aspect of conducting research that is both scientifically valid and ethically sound.

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The Significance of Ethical Considerations in Research

- Protection of Participants/ avoiding harm
- Maintaining Trust in Science and Scientists/ Credibility and reputation of the field
- Respect for Autonomy
- Privacy and Confidentiality
- Beneficence
- Scientific Integrity
- Inclusivity and Equity
- Legal and Regulatory Compliance
- Human Rights

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Historical Context

- Throughout history, there have been instances of unethical research practices that have had profound consequences.
    - Any notable examples?

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The Development of Modern Ethical Guidelines

- The recognition of unethical practices led to the development of modern ethical guidelines and principles in research
- Modern ethical guidelines prioritize the protection of participants, the transparency of research practices, and adherence to ethical principles.
- Violations of ethical principles can have severe consequences, including damage to reputations, loss of research funding, legal consequences, and harm to participants.

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Key Ethical Principles

- **Informed Consent:** Explanation of the concept and its importance.
- **Privacy and Confidentiality:** Ensuring the protection of participants' personal information.
- **Protection from Harm:** Discussing how researchers should minimize potential harm.
- **Beneficence:** Highlighting the obligation to maximize benefits and minimize harm.
- **Research Integrity:** Emphasizing honesty, accuracy, and transparency in research.

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Key Ethical Principles

- Informed Consent
- Privacy and Confidentiality
- Protection from Harm
- Beneficence
- Research Integrity
- Cultural Sensitivity
- Non-Discrimination

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Activity

- Case studies
- How to navigate and resolve ethical dilemmas.

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Ethical Committees

- **Ethics Review:** Ethics committees review research proposals involving human participants to ensure ethical standards are met.

- **The Research Ethics Committee (REC-UOWM),** established at the University of Western Macedonia by decision of the Research Committee, is composed of 5 members and their deputies.

- *"Key responsibilities of the Committee include overseeing research projects carried out at the University of Western Macedonia to ensure they do not contravene relevant legislations, but conform to generally accepted codes of ethics in research in terms of content and procedures."*

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Debriefing

- Debriefing refers to the process of providing participants with information and clarification about a research study after their involvement has concluded.

- Debriefing is a fundamental ethical practice that ensures participants' well-being, rights, and dignity are upheld throughout the research process

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Debriefing

- Informing Participants
- Addressing Questions
- Minimizing Harm
- Ensuring Consent Was Informed
- Maintaining Trust

How Debriefing Helps Participants after Their Involvement in Research?

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Vulnerable Populations

- Vulnerable populations are groups of individuals who may be at increased risk of harm or exploitation due to their characteristics or circumstances.
  - Some examples:
    - Children
    - Elderly Individuals
    - Individuals with Cognitive or Developmental Disabilities
    - Individuals with Serious Mental Illness

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Research Misconduct

- Research misconduct refers to unethical or fraudulent practices in the design, conduct, or reporting of research.
  - Fabrication
  - Falsification
  - Plagiarism
  - Etc...

- Any consequences?

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Ethical Guidelines in Action

- Case studies!

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The Ethical Decision-Making Process

- The ethical decision-making process is a systematic approach to addressing ethical dilemmas and making morally sound choices.

- It involves several steps

however

- The ethical decision-making process is not always linear, and it may require revisiting earlier steps as new information becomes available or as your understanding of the situation evolves.

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The Ethical Decision-Making Process

1. *Recognize the Ethical Dilemma*
2. *Gather Information*
3. *Identify Options*
4. *Evaluate Options*
5. *Make a Decision*
6. *Implement the Decision*
7. *Monitor and Reflect*
8. *Seek Feedback*
9. *Learn and Adapt*
10. *Document the Process*

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Balancing Research Goals with Ethical Considerations

- *Scientific Rigor vs. Participant Welfare*
- *Publication Goals vs. Data Accuracy*
- *Exploration vs. Informed Consent*
- *Confidentiality vs. Data Sharing*
- *Financial Interests vs. Objectivity*

- Other examples?

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Experimental Deign and Control in Psychological Research
Establishing Causal Relationships and Minimizing Bias

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Overview

- Introduction to Experimental Design
- Key Concepts in Experimental Design
- Random Assignment
- Manipulation of Variables
- Internal Validity
- External Validity
- Confounding Variables
- Counterbalancing
- Quasi-experimental design
- Between - subjects design
- Within – subjects design

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Introduction to Experimental Design

- Experimental design refers to **the systematic and structured plan for conducting experiments** to investigate causal relationships between variables.

- It refers to the procedures, the manipulations and controls necessary to test hypotheses.

- Experimental design plays a pivotal role in psychological research for several reasons. Can you name some?

The Significance of Experimental Design in Establishing Causal Relationships

- Some of the reasons are:
  - Causality
  - Internal Validity
  - Replicability
  - Generalizability
  - Precision
  - Hypothesis Testing
  - Ethical Considerations

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Key Concepts in Experimental Design

- **Independent Variable:** The independent variable is crucial in establishing cause-and-effect relationships. By manipulating this variable and observing its impact on the dependent variable, researchers can infer whether changes in the independent variable lead to changes in the outcome.

- **Dependent Variable:** The dependent variable is the key measure that allows researchers to assess the impact of the independent variable.

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Key Concepts in Experimental Design

- **Control Group:** A control group is a subset of participants or subjects in an experiment **who do not receive** the experimental treatment or intervention.

- The control group serves as a comparison or reference point against which the experimental group is compared.

- The primary purpose of a control group is to provide a baseline for evaluating the impact of the independent variable.

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Random Assignment

- Random Assignment → to allocate participants to different experimental conditions or groups in an entirely random or chance-based manner.
- It ensures that each participant **has an equal opportunity of being assigned to any condition**, and the assignment is not influenced by any systematic factors or bias.
  - Role in Reducing Bias:
    - Equal Distribution of Participant Characteristics
    - Minimization of Selection Bias
    - Enhanced Internal Validity

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Manipulation of Variables

- How do researchers manipulate independent variables?
  - Controlled Conditions
  - Experimental Treatments
  - Presentation of Stimuli
  - Time Manipulation
  - Random Assignment

- Can you give examples of variable manipulation in experiments?

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Internal Validity

- **Internal validity** assesses whether the observed changes in the dependent variable can be attributed to the manipulation of the independent variable and not to other factors

- Internal validity allows researchers to confidently assert that changes in the independent variable caused the observed changes in the dependent variable
- High internal validity ensures that an experiment is conducted rigorously and systematically
- Internally valid experiments are more likely to produce results that can be generalized to broader populations or contexts

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Strategies for enhancing internal validity in experimental design

- Random Assignment
- Control Groups
- Counterbalancing
- Standardized Procedures
- Blinding
- Pilot Testing
- Careful Measurement
- Random Sampling
- Etc.

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External Validity

- **External validity** refers to the extent to which the results of a research study can be generalized or applied to settings, populations, times, and situations beyond the specific conditions of the study.
- In this case results could
  - be applicable to real-world situations
  - inform policy decisions and practical interventions
  - be integrated into existing theories and models, advancing the field

- **Balancing internal and external validity can be challenging because they sometimes compete with each other**

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Confounding Variables

- **Confounding variables** are variables that are not the main focus of the study but can influence the dependent variable and lead to erroneous conclusions about the relationship between the independent and dependent variables.
- Identifying and controlling confounding variables is essential for ensuring the internal validity of a study:
  - Before conducting a study, plan and consider potential confounding variables that might affect the results
  - Random assignment can help distribute potential confounding variables evenly across experimental groups, reducing their impact on the dependent variable
  - Use statistical techniques to control for the influence of confounding variables statistically.
  - Keep experimental conditions consistent
  - Use standardized procedures
  - Include additional measures to assess the influence of potential confounding variables

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Impact of Confounding Variables on Research Outcomes

- Misattribution of Effects
- Reduced Internal Validity
- Inconsistent Findings
- Decreased Generalizability
- Invalid Conclusions

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Counterbalancing

- **Counterbalancing** is a technique used in experimental design to control for and avoid order effects or sequence effects.

- **Order effects** occur when the order in which participants experience different experimental conditions or treatments systematically influences the results – repeated measures

- Counterbalancing involves varying the order of presentation of conditions across participants to ensure that the potential impact of order effects is evenly distributed.

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Counterbalancing

- To avoid order effects in repeated measures designs, researchers can employ different counterbalancing techniques:

  - **Complete Counterbalancing**
  - **Partial Counterbalancing**
  - **Randomly assigning the order of conditions for each participant**
  - **Blocked Designs**

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Quasi-Experimental Design

- **Quasi-experimental design** is a research approach that lies between experimental design and non-experimental or observational research

- In quasi-experiments, researchers lack full control over the manipulation of the independent variable, making it challenging to establish causality definitively

- quasi-experimental designs are valuable in situations where true experiments are not feasible or ethical

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Differences between experimental and quasi-experimental design

Experimental design

- Random assignment
- Full manipulation of the independent variable
- Better suited for establishing causality
- Enhance generalizability when properly designed.

Quasi-experimental design

- Non-random assignment
- Cannot manipulate the independent variable fully
- May have limitations in making causal claims
- May have limitations in terms of generalizability

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Between-Subjects Design

- **Between-subjects design** → different groups of participants are exposed to different levels of the independent variable

- Pros

- **Minimizes Order Effects**
- **Prevents Practice Effects**
- **Easier to Implement**
- **Avoids Participant Fatigue**

- Cons

- **Larger Sample Sizes**
- **Individual Differences**
- **Reduced Statistical Power**
- **Cannot assess individual change**

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Within-Subjects Design

- Within-subjects design → the same group of participants is exposed to all levels of the independent variable allowing for a direct comparison of different conditions within the same individuals

- Pros

- **Increased Statistical Power**
- **Control Over Individual Differences**
- **Can assess individual change**
- **Smaller sample size**

- Cons

- **Order Effects**
- **Fatigue and Boredom**
- **Cohort effect**

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Experimental Design in Action

- Case studies illustrating how experimental design principles are applied in real research scenarios.
- Group discussion on experimental design challenges.

Challenges When Choosing Experimental Design

- Some of the key challenges:
- Practical limitations, such as time, budget, and availability of participants or equipment
- Ethical guidelines
- Researchers may balance the need for internal validity with external
- Different designs offer varying levels of control over extraneous variables
- Sample Size
- Availability of Equipment and Technology
- Researcher Bias, confirmation bias?

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QUANTITATIVE RESEARCH

The process of conducting a quantitative social survey follows two distinct stages.

1) The research design stage, the objectives of the research are formulated and the requirements are determined based on job cases, then the method of its implementation is chosen and its step-by-step implementation is planned.

2) The implementation stage, the necessary data are collected, followed by the processing and analysis of the resulting data and their composition and formulation of the relevant conclusions

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1. Research Design

- Basic working assumptions
- • 1.1. Preparation of Questionnaires
- In quantitative research, the filling in of questionnaires is widely used, in which the content of the personal interviews conducted on the subject is captured.
- Compilation of a questionnaire by the researcher, who undertakes:
- • a) To transform the purposes pursued by the research into individual questions.
- • b) To adapt the questionnaire to the persons with whom the interview will take place.
- • c) To inform the interviewers about them so that they can clearly state the questions to the persons to be interviewed and to predispose the person interviewed to spontaneously transmit the information they expect from him

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The interview formats used in quantitative research are divided into two main categories, which are:

- • The structured interview.
- By this term we mean the interview where the interviewee is prompted to answer a series of questions whose number, order and content are predetermined by the interview form. Responses are recorded either verbatim or coded.
- • The focused interview (FOCUSED INTERVIEW),
- The interviewer sets the general framework and identifies the points of particular interest, so that the development of the topic can be focused there (semi-directed interview). This technique is mainly used on key informants, whom we consider in advance to have special knowledge on the subject under investigation.
- After the construction of the appropriate questionnaire, a "pilot survey" (pre-survey) is carried out to determine the functionality of the questionnaire and to finalize its structure. In this process, to a certain extent, the techniques of the qualitative approach are used.
- Then follows the selection of a sample from the entire population, in which the on-site research will be carried out by conducting interviews through questionnaires.

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Sampling

- • Systematic Sampling
- • Stratified sampling
- • (the geographic location (region)
- • the type of settlement (urban, semi-urban, rural)
- • gender
- • the age groups
- • the employment status (employed or unemployed)

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2. Implementation of the Research

- • 2.1. Conducting Field Research
- In empirical research, the presentation of the demographic structure of the researched population is a basic principle, because the demographic characteristics are the main independent variables with which, by correlating the respondents' attitudes and reactions to the researched object, demonstrate the existence or non-existence of some dependence on them .

• Basic demographic characteristics are:

• Gender

• Age

• Education level

• Employment (profession, branch of household activities, position in the profession)

• Marital status

• Number of children

• Number of household members and relationship to the respondent.

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2. Implementation of the Research

- 2.2. Data processing
- The processing phase consists of the following distinct stages:
- control
- coding
- computer processing
-

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Control

• Of course, the control must be exercised throughout the research, for each activity: control of the correct wording of the research objectives in the questionnaire, control of the correct printing of the forms, control of the selection of interviewers.

• The main control, however, concerns the correct completion and compliance with the sampling rules.

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• Coding

• By the term coding we mean the conversion of answers into numbers or symbols, that is, the qualitative element (whole sentences, a name, an affirmation or denial, etc.) into a quantitative or qualitative-symbolic one.

- Of course the answer may already have a number, so no conversion is needed.

• Coding therefore converts the answers into a form suitable for computer processing.

- Coding can be prepared (to a greater or lesser extent) in the design phase, by coding anticipated responses.
- By coding we mean the prediction of possible answer categories for each question.
- In this case, the answers are pre-coded and the questions are characterized as "closed", while in contrast to the "open" questions there is no answer prediction (they are not pre-coded). Then, after the fact, the responses are grouped into categories, the response groups are coded and coded.

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- Entering Data into the PC
- Statistical Data Processing

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Statistical Data Processing

- Frequencies
- In the frequencies we see at a first glance how our data is distributed. They are suitable for certain type of items. Mainly when the items are grouped into a few large categories e.g. for the gender of the teachers (so many men, so many women), for the Age Group. They are not suitable for elements that have a continuous series eg. the year of birth of each teacher.
- Tabulation
- The simplest intersections between two or more variables are usually presented in the form of tables, where one variable is on the horizontal axis and the other is on the vertical axis. And in this case the intersection makes sense when the variables are grouped into a few categories.

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Statistical Data Processing

- Regression
- • This procedure estimates the relationship between two variables. If we associate e.g. the variable "salary" with the variable "years of service" of a teacher we are very likely to find that there is a very strong positive relationship between the two variables (ie salary increases with years of service). We may want to apply this process to check whether a student's performance is related to the educational level of his parents, etc.
- Graphs and Charts
- • A picture speaks a thousand words and one of the most essential functions of Statistical Packages is the creation of graphics. Plotting the data is a helpful means of drawing general conclusions from tables that can be very complex. The most common graphics we use are the chart, bars and pies.
- The line chart is usually used for ungrouped data, the column chart for data grouped into several categories, and the pie chart for data grouped into very few categories.

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Research approaches

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1.Action research

- An on-the-spot procedure, designed to negotiate a specific issue that exists in an immediate situation
- It is suitable for any object when specific knowledge is required for a special problem in a special situation, or when a new approach is introduced to an existing system.

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2.Case study

- It gives the opportunity to study in depth one side of a problem in a limited amount of time.
- A whole family of research methods that have in common the focus of attention on gathering information about a phenomenon or event.
- Advantage: the dedication to a particular incident or situation.
- Problem of representativeness.

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3.Ethnographic form

- For the in-depth study of a society, or an aspect of society, culture or a group.
- Participant observation: enables researchers to share as much as possible the same experiences with the subjects in order to better understand their way of acting.
- Problem of representativeness.

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4. Surveys

- Objective: to gather information, which can be analyzed, lead to the derivation of patterns and draw conclusions.
- The representativeness of the sample must be ensured
- Same questions under same conditions.
- They rarely find causal relationships

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5. The experimental research method

- Experimental group-treatment
- Control group-no treatment
- Any difference between the two groups should be due to the difference in treatment.
- Inferences about causes and effects if the design of the experiment is correct.

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Types of variables

- Categorical variables
- Ordered or gradable variables
- Quantitative variables

–Discrete variables

–Continuous variables

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Categorical variables

- Categorical or nominal variables are the variables which do not correspond to measurable quantities, but simply categorize the elements of a population into groups that are clearly differentiated from each other. In categorical variables, the subcategories (or groups) defined do not involve the concept of array. The simplest case of categorical variables are those that include only two categories, e.g. gender (male, female). These variables are called binary or dichotomous.

- The use of numeric coding in categorical variables, e.g. 1=married, 2=single, 3=divorced, 4=widowed, it can only be used to identify their categories (as a kind of label, that is). Under no circumstances can arithmetic operations be defined on these values.

- An exception is the coding 0 and 1 for binary variables. In such a case, the sum of the numerical values of the variable defines the number of observations that have been categorized with the number 1, while the numerical mean gives the proportion of observations that have the value 1 in the total number of observations.

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Ordered or gradable variables

- Ordered (ordinal variables) are the categorical variables, whose categories are defined based on an order relationship that exists between them. E.g. in a market survey, the satisfaction expressed by a consumer in relation to a fishery product, can be given with a series of answers of the type: 'very satisfied', 'satisfied', 'neutral', 'dissatisfied', 'very dissatisfied'. This way of differentiating the answers essentially categorizes people into five groups, arranged according to their degree of satisfaction.

- The arrangement that exists in the previous example, only determines if the satisfaction expressed by the people of one group is greater or less than the satisfaction of the people of another. The difference (or distance) of the degree of satisfaction from one group to another cannot be assumed to be the same between all groups.

- E.g., the difference in satisfaction between people who declare 'satisfied' and 'very satisfied', is not necessarily the same as that which exists between people who declare 'neutral' or 'satisfied'.

- Due to the different distances that exist between the ranks of an ordered variable, the use of numerical coding on them (e.g. in the previous example the coding from 0 = very dissatisfied to 4 = very satisfied) does not, as a rule, allow the definition of numerical operations on of these.

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Quantitative variables

- Quantitative variables are the variables that correspond to quantities that can be measured, such as weight, length, income, the density of a substance in the blood, etc. Quantitative variables according to the possible values they can take , are divided into two categories. In discrete variables or discontinuous variables and in continuous variables.

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Discrete variables

- Discrete variables take on a finite number of values, usually integers, without having the possibility of taking any intermediate values between these values. The numerical expression of these variables follows directly from the value of the quantity to which they refer. The most common case of discrete variables are those that enumerate the elements of a set.
- In discrete variables, the relation of the arrangement of their individual values applies, while in addition the differences between these values are numerically comparable. For example the size difference of two families with three and four members is equal to the size difference of two families with five and six members.
- Due to the possibility of comparing the differences of the individual values of a discrete variable, any arithmetic operation makes sense to be defined on them.

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Continuous variables

- Continuous variables can take any value in the entire range of real numbers, while the difference between two possible values can be infinitely small. Examples of continuous variables are time, temperature, concentration of a pollutant in the atmosphere, density of a substance in blood serum, etc.
- The only limiting factor for the possible values of a continuous variable is the precision of the measurement. In theory, the more precise the instrument with which a continuous variable is measured, the more values it can take. Usually, manipulating a continuous variable results in computing its values in an approximate way
- In continuous variables, an ordering relationship is defined between their individual values, while the distances between these values are comparable from a numerical point of view. Therefore all known arithmetic operations are defined on them.

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Ratio variables and interval variables

- A second scheme of classification of variables maintains in its categorization the first two types, while in place of quantitative variables it defines ratio variables and interval variables.
- Categorical variables
- Ordered variables
- Quantitative variables

Ratio variables

Interval variables

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Ratio scale variables

- Ratio scale variables are defined based on a value scale that satisfies the following criteria:
- Scale values can be ordered.
- The interval between two consecutive scale values is of fixed size.
- There is a zero point on the scale and from a physical point of view it is completely interpretable and not conventionally defined. The existence and numerical interpretation of the zero point makes it possible to define numerically the ratio between two values of the scale.
- Examples of ratio variables are weight, height, income, density of a substance in blood, number of members of a family, etc. That is, based on the previous classification scheme, quantitative variables both discrete and continuous.
- E.g. the difference between two people 175 and 176 cm tall is equal to the difference between two people 163 and 164 cm tall, while the height of a person 180 cm (or 70.8 inches) is twice that of a person 90 cm tall (or 35.4 inch). That is, for the height, all the three conditions we mentioned are met: • (i) the arrangement of its values, (ii) the stability of the difference between two successive values of it and (iii) the numerical interpretation of the ratio of any two values of

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Interval scale variables

- Interval scale variables differ from ratio variables only in terms of the third criterion mentioned.
- That is, they satisfy criteria (i) and (ii), but the zero point in their scale is conventionally defined and, therefore, the ratios defined by their individual values are not numerically interpretable. The most representative example of such a variable is temperature.
- Two temperatures e.g. measured simultaneously in degrees Celsius and Fahrenheit take values of 20oC (68oF) and 25oC (77oF), that is, they differ by 5oC or 9oF, just as the temperatures of 5oC (41oF) and 10oC (50oF) differ from each other. But we cannot claim that the temperature of 40oC (104oF) is twice as hot as the temperature of 20oC (68oF), because as is obvious the ratio of temperatures 40oC / 20oC = 2 is reversed when the same temperatures are expressed in degrees Fahrenheit 104oF / 68oF = 1.53.
- The reason is that the zero point on both scales is conventionally defined. In other words, point 0, on both scales (oC and oF), does not define the complete absence of heat, but the heat corresponding to a specific natural phenomenon (the freezing of water).
- The two schemes of classification of the variables mentioned differ essentially only in the way each of them defines the quantitative variables. The definition of categorical and ordinal variables is essentially the same in both schemes.
- However, from the point of view of handling the data during their analysis, the general distinction between categorical, ordered and quantitative variables is of greater interest.

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Statistics

Descriptive statistics

- • The subject of Statistics consists of two different thematic fields: descriptive statistics and inductive statistics.
- • Descriptive statistics aims at the summary and thorough description of numerical data, with the ultimate goal of their simpler presentation and easier understanding. These data can come either from the complete set of elements of a population or from a sample of it.

Inductive Statistics

- • If the data comes from a sample of the population, the validity of the conclusions of the descriptive statistics is limited only to the elements of the sample, and it always remains to be investigated whether they can be generalized to the whole population.
- • This second process, that is, the induction of conclusions about the sample, from the sample to the population, is the subject of inductive statistics.

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Techniques for summarizing and describing numerical data

- The summary and description of numerical data in Descriptive Statistics is done with the help of:
- The frequency tables
- Diagrams
- Descriptive statistical measures

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Types of statistical analyses

-Descriptive statistics

- Univariate analyses

- -Inductive statistics
- Bivariate analyzes (eg T-test, ANOVA, Correlation)
- Multivariate analyzes (e.g. Regression Analysis)

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Quantitative Research Laboratory with examples of analyzes and interpretation of results

- • https://www.youtube.com/@psychologyresearchhub5961

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Topic selection

1. Draw a short list of topics

- Consult library catalogs, colleagues and students

2. Choose a topic for research

- Discuss possible outcomes with your supervisor and decide what the point of view of your study will be.

3. Identify the precise central objective of the study

• Draw up a list of "first priority" questions and subject each one to rigorous scrutiny.

4. Decide on the objectives of the study and formulate a hypothesis

- Think carefully about what is and isn't worth investigating

5. Structure an initial, general description of your research design.

- List the aims or objectives of the research, your suggestions for exploring possible research methods, and the literature to be consulted. Consult your supervisor.

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Stages of scientific research

- Selection and formulation of the research problem
- Planning the research process to secure the empirical material
- Execution of the research plan: Collection of the data
- Analysis and interpretation of data
- Writing the scientific study
- The stages of the research process are mutually determining

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Notes/References

- Make a note of everything you read
- Strictly follow the ARA system
- Separate a list of “first thoughts” categories
- Make an accurate note of all references as you read them

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Literature review

- Topic selection
- Decide exactly what information you need before the literature search
- Define terminology
- Define the parameters (time, place)
- Selection of sources (books, libraries, journals, theses, internet)
- Take notes throughout

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Formulation of research hypotheses/questions

- At the end of the literature review
- As a result of the review
- Clarity and precision
- Remember that based on the research hypotheses or questions, the results of the research will also be presented.

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Selection of research subjects/participants: concepts

- Population
- Sample
- Sampling
- Representative sample

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Sampling forms

- Simple "random" sampling (e.g. lottery)
- "Stratified" random sampling: categorize the population and get the proportional number of cases in the sample
- "Straight" random sampling: selection of individuals at stages already predetermined
- "Cluster" random sampling: we reach the group of individual cases, not random to the end

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Selection of research participants/subjects: what can be done in practice

- Striving for greater impartiality
- The tolerance for sampling deviations is not the same for all types of research
- "Convenience" samples are not researched
- Continuous control of the representativeness of the survey

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The sample size

- The 'random error' of sampling and sample size: natural expected
- The 'error of bias' of sampling and sample size: biased way of selecting subjects
- The bigger the sample the better

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Design and administration of questionnaires (1)

- What information you need
- Why you need this information
- Is the questionnaire the appropriate instrument?
- If yes, proceed to structure the questions
- Check the vocabulary of the questions
- Decide on the type of your questions
- Write the instructions to be included in the questionnaire
- Consider the content and appearance of the questionnaire

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Design and administration of questionnaires (2)

- Decide on your sample
- Design a pilot questionnaire
- Test the analysis methods
- Make modifications based on feedback from pilot study subjects
- Decide at the outset how the questionnaires will be distributed
- Set a time for returning questionnaires
- Decide what to do with non-respondents before you distribute the questionnaires
- Is approval needed to conduct the research?
- Begin recording information as soon as completed questionnaires are returned
- Don't get involved with difficult statistical studies unless you know what you're doing

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Planning and conducting interviews (1)

- What information you need
- Why you need this information
- Is the interview the appropriate medium?
- If yes, proceed to structure the questions
- Decide on the type of interview
- Clarify the questions
- Think about how the questions will be analyzed
- Prepare an interview schedule or guide
- Pilot your design
- Revise the design if necessary

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Planning and conducting interviews (2)

- Avoid bias
- Select respondents
- Arrange a meeting place and time
- Have official bodies approved your work?
- Introduce yourself, explain the purpose of the research
- Specify how long the interview will last
- Integrity and honesty
- Common sense and good manners
- Be consistent, show that taking part in research is not always an unpleasant experience

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Quantitative research: advantages and disadvantages

Advantages

- Fixed and specific format.
- Distinguished by greater reliability and validity due to a large researched sample.
- Highlights general or more overall trends due to a large sample.
- Quick and easy data collection
- Not much money is required if the survey is conducted online or in person
- Allows research on a large (representative) population sample.
- Generalization of results
- You can analyze data relatively quickly and easily, especially if you use software packages such as Excel, STATA, SPSS, etc.
- Ability to find correlations and predictions between variables

Disadvantages

- Closed answers
- Reduced possibility of deepening the understanding of the phenomena. The answers are not explanatory.
- Greater scope for possible misinterpretation by the reader
- Risk of poor performance / completion if surveys are not completed face-to-face

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Qualitative Analysis

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Is the distinction between qualitative & quantitative useful?

Rationale

Heuristic

Mixed methods?

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Qualitative aiming at

- Sense making
- Understanding
- Interpretation
- Interaction
- Experience

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Central premises

Context

Meaning production

Construction

Dynamic

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Partnership Agreement
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Epistemologies

Social constructionist

Phenomenological

Interpretivist

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Key features

AIM & RESEARCH QUESTIONS / OBJECTIVES

FIELD / POPULATION / PARTICIPANTS

RECRUITMENT

SETTINGS

ANALYSIS

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Sample Topics

- Experiences
- Everyday life
- Identities
- Interactions
- Communication
- Narratives

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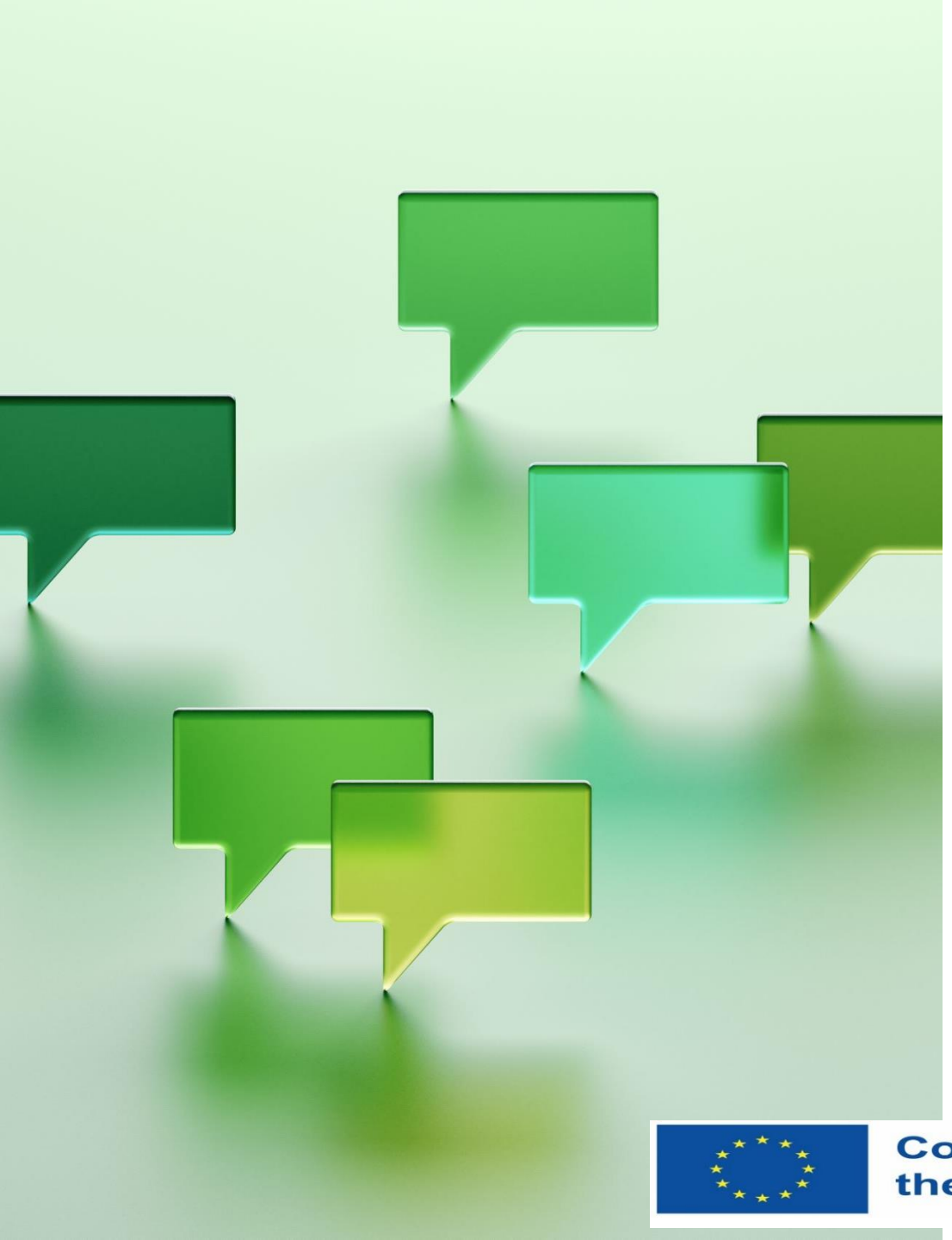

Methods

- Texts (offline & online, audio-visual and written)
- Interviews
- Group interviews & focus groups
- Observations
- Conversations

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Some issues to consider

- Entrance to the field
- Recruitment
- Rapport
- Ethics, subjects & data use
- Co-construction
- Interpretation

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Q & A

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Additional Resources

- Please find activities, readings, video and websites on e-class!

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UNIVERSITY OF WESTERN MACEDONIA

Psychology Department
Doctoral Studies Program

Thank you!

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