UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Psychometrics and Quantitative Methods

2526-1-F5109P003

Learning area

2**:** Research methods in experimental psychological sciences

Learning objectives

Knowledge and Understanding
The course provides students with foundational and advanced knowledge in psychometrics and statistical methods in psychology, including measurement properties, hypothesis testing, regression, ANOVA, and factor analysis. Students also gain theoretical insights into data dimensionality and psychometric principles, as well as basic knowledge of a Bayesian vs. a Frequentist statistical approach.

Applying Knowledge and Understanding
Students learn to apply statistical methods using real and simulated psychological data, including the selection and implementation of techniques appropriate to various research designs. Through laboratory sessions, students gain hands-on experience with R, whereas during lectures, they will be assigned exercises using Jamovi, allowing them to analyze data and interpret empirical results.

Making Judgements
Students develop critical thinking skills necessary to evaluate the adequacy of psychological measures, assess statistical assumptions, and select suitable analytic methods. They also learn to interpret findings in the context of psychological theories and empirical evidence.

Communication
The course fosters the ability to clearly report and discuss statistical findings through open-ended assessment questions and laboratory reporting. Emphasis is placed on explaining complex analyses and results in understandable terms.

Learning Skills
By engaging with practical data analysis tasks, basic literature, and interactive lectures, students enhance their capacity for autonomous learning. The course supports the development of skills necessary for an independent application of statistical methods and software in future research or professional contexts.

Contents

The course is about psychometrics and quantitative methods. Fundamental concepts related to measurement in psychology and the logic of hypothesis testing will be presented. Concerning data analyses, the course will focus on statistical techniques for prediction (e.g., multiple regression), for comparing means (e.g., ANOVA), and for uncovering data dimensionality (e.g., Factor Analysis). Emphasis will be given on choosing the adequate statistical analysis and on interpreting the results using the statstical software Jamovi. During the lectures there will be exercises with Jamovi, whereas the associated laboratory will provide hands-on experience on the statistical software R.

Detailed program

- Introduction to psychological measurement
- Direct and indirect measures
- Reliability and validity
- Statistical models and inferential statistics
- Multiple Regression
- ANOVA and General Linear Model
- Principal Component Analysis

Laboratory

- Basics of R statistical software and hands-on exercises with data.

Prerequisites

Basic descriptive statistics (measures of central tendency and dispersion); Basic inferential statistics; Correlation; t-test. Students lacking such basic knowledge are encouraged to read again their books of statistics and statistical method studied in their BSc program, search and consult dedicated resources widely avaibale on the web, or start to read Navarro & Foxcroft (2025, e.g., chapters 4 and 5).

Teaching methods

The course will be held in presence. Teaching will consist of 42 hours of lecture-based lessons. There will also be 16 hours of laboratory sessions using R in the computer labs with analyses of research data and discussion.

Assessment methods

The exam will verify the level of mastery of the course contents with special attention to:

- Understanding the logic of the statistical analyses discussed in the course;

- The ability to choose between different techniques based on the research design and aims;

- Ability to execute the analyses with suggested software;

- Ability to interpret and report the results of the statistical analyses discussed in the course.

The exam will consist of multiple-choice questions and open-ended questions on the course topics.

The multiple-choice questions aim to ascertain the student's preparation and knowledge of the topics. The open questions aim to evaluate the ability to think critically, create links between the acquired knowledge, and apply them concretely to analyze empirical data and discuss the results

Textbooks and Reading Materials

Navarro DJ and Foxcroft DR (2025). Learning statistics with Jamovi: a tutorial for beginners in statistical analysis. https://www.openbookpublishers.com/books/10.11647/obp.0333; https://www.learnstatswithjamovi.com/.

Additional readings and materials will be indicated during the lectures and in the laboratory sessions.

Sustainable Development Goals

QUALITY EDUCATION