PSYCHOMETRICS APPLIED TO HEALTHCARE PROFESSIONS EDUCATION

COURSE PROGRAMME

Psychometric properties such as reliability and validity are essential components in the utility of assessment in medical education. Many teachers from the healthcare professions are interested in knowing more about psychometrics and how they can apply psychometric analysis in their institutions. At the same time, it might be difficult for them to find the opportunity of having a course where they can learn not only the theoretical concepts of Psychometrics, but also their strengths and limitations, in a manner that they can understand. Furthermore, learning how to do the psychometric analyses might be a challenging task for non-psychometricians. For those reasons, the European Board of Medical Assessors (EBMA) now offers the new course on “Psychometrics Applied to Healthcare Professions Education”, destined to persons in the introductory and intermediate who wish to learn the theory and the practice of Psychometrics.

During this course several practical exercises will be done by participants. Each one of the participants is expected to bring their own device (BYOD) with the latest versions of R (https://cran.r-project.org/), RStudio (https://www.rstudio.com/products/rstudio/download/) and Exametrika (http://www.rd.dnc.ac.jp/~shojima/exmk/exmk53.zip) installed. Nevertheless, participants are not expected to have previous experience with any of this software.

Participants are invited to also bring their own datasets and use their free time to apply the techniques learned during the course. In the last day of the course, participants who would like to make a short presentation of their work and get feedback will have that option.
Course instructors:

**Cees van der Vleuten,** PhD, is a Professor of Education of the Department of Educational Development and Research of the Faculty of Health, Medicine and Life Sciences. Since 2005 he has been the Scientific Director of the School of Health Professions Education. His primary expertise lies in evaluation and assessment. He has published widely in this domain, holds numerous academic awards, including several career awards. In 2005 he received John P. Hubbard Award for significant contribution to research and development of assessment of medical competence from the National Board of Medical Examiners in the US. In 2010 he received a Dutch royal decoration for the societal impact of his work and in 2012 the Karolinska Prize for Research in Medical Education. He serves frequently as a consultant internationally. He holds honorary academic appointments in the School of Medicine, Flinders University, Adelaide in Australia, Western Sydney University, Sydney in Australia, the University of the Witwatersrand, Johannesburg in South-Africa, and the Uniformed Services University of the Health Sciences, Bethesda, United States of America.

![Cees van der Vleuten](image1)

**Carlos Collares,** MD, MSc, PhD, FACMT, is Assistant Professor of Medical Education in the Department of Educational Development and Research of the Faculty of Health, Medicine and Life Sciences as well as Assessment Specialist for the European Board of Medical Assessors. He moved from Brazil to the Netherlands after applying techniques used on the validity and reliability studies of neurobehavioral test batteries to the analysis of assessment tools used in medical education, particularly progress testing. He has implemented the International Progress Test to institutions in the Netherlands, Finland, Mexico and Saudi Arabia, and collaborates with progress testing programmes in Australia and Mozambique. He has also assisted on the implementation of a computerized adaptive version of the International Progress Test, which, by dynamically adjusting the difficulty of the test according to the test takers' performance, shortens the test, reduces testing time and increases the reliability of scores, especially for students in the early academic years.

![Carlos Collares](image2)
Day 1 – July 3rd - Introduction to psychometrics – Carlos Collares

09.00 Welcome and overview of the day
09.10 Interactive lecture: What is Psychometrics?
10.30 Coffee/tea break
10.45 Interactive lecture: What is Validity and Reliability?
12.00 Lunch
13.00 Small-group exercise: Simulated Post-Test Review Committee.
14.30 Coffee/tea break
14.45 Practical exercise: making your own classical test theory analysis
16.00 Plenary discussion and Take-home messages
16.30 Closing
18.30 Social program: to be announced

This module focuses on
- The scope of Psychometrics and an overview of the main psychometric theories;
- The concepts of validity and reliability;
- The contributions of psychometrics to the quality assurance of testing;
- Classical test theory analyses.

Activities and working formats
- Interactive lectures;
- Small-group exercises.

Objectives
- Comprehension of fundamental psychometric concepts;
- Enabling participants to perform and interpret their own classical test theory analysis.

Preparatory and/or further reading
Day 2 – July 4th - Generalizability theory – Cees van der Vleuten

09.00 Welcome and overview of the day
09.10 Interactive lecture: The nuts and bolts of generalizability theory?
10.30 Coffee/tea break
10.45 Making sense out of published papers using generalizability theory.
12.00 Lunch
13.00 Practical exercise: making your own generalizability theory analysis.
14.30 Coffee/tea break
14.45 Practical exercise: making your own generalizability theory analysis.
16.00 Plenary discussion and Take-home messages.
16.30 Closing

This module focuses on
- Why and when is generalizability theory useful?
- What is a generalizability study?
- What is a decision study?

Activities and working formats
- Interactive lectures;
- Small-group exercises.

Objectives
- Comprehension of fundamental concepts of generalizability theory;
- Enabling participants to perform and interpret their generalizability theory analysis.

Preparatory reading

Further reading
Day 3 – July 5th - Exploratory methods – Carlos Collares

09.00 Welcome and overview of the day

09.10 Interactive lecture: How can we find the internal structure of an assessment tool? An overview of the available methods (Part I – Exploratory factor analysis/Principal component analysis/Principal axis factoring)

10.30 Coffee/tea break

10.45 Interactive lecture: How can we find the internal structure of an assessment tool? An overview of the available methods (Part II – New methods: Exploratory Structural Equation Modelling, Lasso Regularization and Exploratory Graph Analysis)

12.00 Lunch

13.00 Practical exercise: comparing different exploratory methods

14.30 Coffee/tea break

14.45 Practical exercise: comparing different exploratory methods (continuation)

16.00 Plenary discussion and Take-home messages

16.30 Closing

This module focuses on
- The available exploratory methods to find the internal structure of an assessment tool;
- Exploratory analyses in practice.

Activities and working formats
- Interactive lectures;
- Practical exercises.

Objectives
- Comprehension of the different exploratory methods;
- Enabling participants to perform and interpret their exploratory analyses.

Preparatory and/or further reading
Day 4 – July 6th - Confirmatory methods and Item response theory – Carlos Collares

09.00 Welcome and overview of the day

09.10 Interactive lecture: Understanding confirmatory factor analysis

10.30 Coffee/tea break

10.45 Interactive lecture: Understanding item response theory

12.00 Lunch

13.00 Practical exercise: making confirmatory factor analyses

14.30 Coffee/tea break

14.45 Practical exercise: making item response theory analyses

16.00 Plenary discussion and Take-home messages

16.30 Closing

This module focuses on
- Unidimensional and Multidimensional Item Response Theory (UIRT/MIRT);
- Confirmatory factor analysis (CFA);
- The comparison between the UIRT/MIRT and CFA approaches.

Activities and working formats
- Interactive lectures;
- Practical exercises.

Objectives
- Comprehension of CFA and UIRT/MIRT;
- Enabling participants to perform and interpret their own CFA and UIRT/MIRT analyses.

Preparatory and/or further reading
Day 5 – July 7th - Developments in psychometrics – Carlos Collares

09.00 Welcome and overview of the day
09.10 Interactive lecture: Computerized adaptive testing
10.00 Coffee/tea break
10.15 Interactive lecture: Many-Facets Rasch Model
11.00 Coffee/tea break
11.15 Interactive lecture: Measurement invariance
12.00 Lunch
13.00 Interactive lecture: Network psychometrics
14.00 Coffee/tea break
14.15 Presentations by the participants (optional)
16.15 Plenary discussion and Take-home messages
16.30 Closing

This module focuses on
- Emerging topics and techniques on Psychometrics.

Activities and working formats
- Interactive lectures;
- Demonstrations.

Objectives
- Introduce the participants to the emerging topics on Psychometrics;
- Demonstrate applications for these techniques.

Preparatory and/or further reading