

# **REVIEW OF MEASUREMENT IN MEDICINE: A PRACTICAL GUIDE. HENRICA C. W. DE VET, CAROLINE B. TERWEE, LIDWINE B. MOKKINK, DIRK L. KNOL. CAMBRIDGE UNIVERSITY PRESS, 2011.**

**Elzbieta Gos**

World Hearing Center, Institute of Physiology and Pathology of Hearing, Kajetany/Warsaw

Clinical investigators, epidemiologists, biostatisticians, and other biomedical researchers need reliable sources of information on measurements in the medical and health sciences and their properties. However, this knowledge needs to have not only a theoretical, but also a practical aspect, allowing researchers to evaluate the properties of available measurement instruments and choose the most appropriate one – or develop a better, custom-designed instrument that will meet their specific goals. *Measurement in medicine: A practical guide* achieves these requirements.

The authors are outstanding specialists in epidemiology and biostatistics from VU University Medical Center in Amsterdam. They have a deep understanding of the problems that researchers encounter when measuring clinical phenomena and they offer well-tested solutions, based on deep theoretical knowledge and practical experience. The authors are members of the COSMIN Group (COsensus-based Standards for the selection of health Measurement INstruments) and in the book they use the terminology and definitions proposed by this organisation.

The book consists of nine chapters. It is complete with extensive references and a practical index. In the introduction (Chapter 1), the main goals, application, and structure of the book are presented.

Chapter 2 offers a theoretical background. It contains definitions of the most important concepts, a conceptual framework, distinctions between reflective and formative models, and the essentials of classical test theory (CTT) and item response theory (IRT). The authors present the implications of these theories for the use of multi-purpose instruments, which is framed in terms of measuring unobservable constructs. This part of the book is written in a clear and well-articulated, but rather superficial way.

Chapter 3 is very practical. In it one can learn how to develop a new measurement instrument. The authors propose a six-step procedure, from defining the construct to be measured to the pilot-testing of a new instrument. The procedure is extensively described and provides very useful guidelines ready to be implemented.

Chapters 4–8 focus on measurement properties such as reliability, validity, responsiveness, and interpretability. In Chapter 4 the authors show how to examine the

structure of a measurement instrument using various complementary techniques, ranging from the relatively simple (e.g. inspecting the distribution of item scores) to more complicated ones such as exploratory factor analysis (EFA). For assessing internal consistency Cronbach's alpha is proposed, but it is regrettable that other parameters, well-designed by psychometricians, are never mentioned.

Reliability and validity are basic properties of measurement and these concepts are discussed in detail in Chapters 5–6. The advantage of Chapter 5 is the presentation of a wide range of indicators of reliability, with recommendations on which parameter to use in what situation. In a straightforward way the relationship between reliability and a standard error of measurement (SEM) is shown, as well as the relationship between SEM and limits of agreement as proposed by Bland and Altman. In this chapter, the reader can learn how many patients are needed in a reliability study.

Validity is conceptualised by the authors as the “degree to which an instrument truly measures the construct it purports to measure”, and they distinguish three types of validity: content validity, criterion validity, and construct validity. Thanks to well chosen examples it is easy to understand this distinction. What is especially valuable is a clear presentation of confirmatory factor analysis (CFA), a method seldom used by researchers even though it is an excellent way of checking for structural validity (one aspect of validity).

Chapter 7 should be of most interest to clinicians, as it focuses on responsiveness, i.e. the ability of a measurement instrument to detect changes over time. The authors discuss such measures of responsiveness as effect size, paired *t*-test, and Guyat's responsiveness ratio. In Chapter 8 they propose an approach based on the concept of the smallest detectable change (SDC). SDC is based on measurement error and the minimal important change (MIC) and they present methods to determine both.

Chapter 9 may be especially useful to those researchers who intend to make a professional systematic review of measurement properties, for example to find the best instrument available for a particular purpose.

Each chapter ends with assignments concerning the issues discussed. The reader may solve the tasks and compare

their results with solutions given on an associated website. Data sets and syntaxes are also available online. This makes the book especially handy for unassisted study.

The advantages of the book are indisputable. It meets all the goals set by the authors, it is very useful, and is based on real clinical practice. In the preface the authors write: “we appreciate feedback on this first edition and welcome suggestion for improvement”. Undoubtedly the book would have been even more useful had the authors shown how to mark out norm values for a measurement instrument, since it is important, especially in clinical

practice, to be able to assign qualitative meanings to quantitative scores. There are many types of norms proposed in psychometry, but unfortunately they are not described in this book.

Nevertheless, this slight drawback does not overshadow the great advantages of this book. It is well grounded in current knowledge and professional practice. It offers a lucid presentation of scientific knowledge as well as a practical guide. It is an obligatory purchase for every researcher and practitioner dealing with measurement problems in any medical or health domain.