

# UCLA

## UCLA Previously Published Works

### Title

INTRODUCTION TO MEASUREMENT THEORY - ALLEN,MJ, YEN,WM

### Permalink

<https://escholarship.org/uc/item/7nc7d8pr>

### Journal

CONTEMPORARY PSYCHOLOGY, 25(5)

### ISSN

0010-7549

### Author

COOPER, LG

### Publication Date

1980

### Copyright Information

This work is made available under the terms of a Creative Commons Attribution-ShareAlike License, available at <https://creativecommons.org/licenses/by-sa/4.0/>

Peer reviewed

## PsycCRITIQUES

### The Measure of All Things

LEE G. COOPER

PsycCRITIQUES v. 25, n. 5 (May 1980) : 368-369

DOI: [10.1037/018311](https://doi.org/10.1037/018311)Portico Content Set: ISSN\_00107549, (American Psychological Association)ISSN: 15540138, 00107549Portico Item ID: ark:/27927/phzrk1dhd

### Abstract

Reviews the book, *Introduction to Measurement Theory* by Mary J. Allen and Wendy M. Yen (1979). Measurement theory provides an evolving set of guidelines that are supposed to insure that the transformation maintains, or does not distort, the meaning inherent in the quality. Allen and Yen define measurement as "the assigning of numbers to individuals in a systematic way as a means of representing properties of the individuals". Allen and Yen intend to and succeed in writing a text that is in between the "extremely difficult, mathematically rigorous volumes" and the texts that discuss the statistical properties of psychological measurement in only a "cookbook" fashion. Allen and Yen present excellent introductory discussions of the complex issues facing the field which are usually reserved for more advanced study. Authors have taken a risk trying to cover a broader domain than usually addressed in an undergraduate course on this topic. With some careful explanation from instructors, the students should greatly benefit from the brave efforts of Allen and Yen. (PsycINFO Database Record (c) 2017 APA, all rights reserved)

### Keywords

measurement theory; undergraduate course; measures

Measurement is a transformation of information about qualities into quantitative form. Length, mass, color, intelligence, satisfaction, and achievement are qualities. One may pose classificatory questions, frequency questions, and extensivity questions (e.g., which? how many? and how much?) and use the resulting measures to gain knowledge about the qualities. Measurement theory provides an evolving set of guidelines that are supposed to insure that the transformation maintains, or does not distort, the meaning inherent in the quality. Measurement theory overlaps the theory of analysis. This latter domain deals with how measures can be summarized, distilled, aggregated, or otherwise transformed while preserving, and not distorting, the relation of the meaning of the result to the meaning of the original quality. Psychological measurement encompasses these arenas as they apply to human qualities or their comparative equivalents.

Allen and Yen define *measurement* as "the assigning of numbers to individuals in a systematic way as a means of representing properties of the individuals" (p. 2). They define *measurement theory* as "a branch of applied statistics" (p. 2). Both definitions

presume measurement and psychological measurement are synonymous and they tend to divorce psychological measurement from its central and important role in a philosophy of science for psychology.

While establishing a proper foundation is very important for any text, the full value of a book is rarely determined by the second page. Read to the end and I believe one will discover a very good text for an undergraduate course in the theory and practice of psychological testing. Allen and Yen intend to and succeed in writing a text that is in between the "extremely difficult, mathematically rigorous volumes" and the texts that discuss the statistical properties of psychological measurement in only a "cookbook" fashion.

After a bit of historical perspective on psychological testing and an excellent, brief review of all the statistics and mathematics needed to understand the developments in the text, the authors offer a very clear presentation of classical true-score theory, the conclusions from that theory and the derivations of those conclusions. These developments greatly facilitate the presentation of the basics of reliability, validity, and item analysis while they set the stage for later discussion of strong true-score theories and latent trait models. In many places in the book, but particularly in the final three chapters, Allen and Yen present excellent introductory discussions of the complex issues facing the field which are usually reserved for more advanced study (e.g., suppressor and moderator variables, measuring change, generalizability theory, Bayesian methods, tailored testing, binomial error models, Poisson models, normal ogive and logistic models, and information functions). One can hope that these issues will intrigue students enough to draw them into graduate study of the topics. One can worry that the text will leave the impression that students are prepared to deal with some issues when they are not.

A microcosm of this concern can be illustrated from the chapter on scaling. Students may erroneously gain the impression they can do a Q-sort when they cannot. Enough information is provided to perform a simple scalogram analysis, but not enough to do an unfolding. Students could do direct estimation scaling and could run the experiment for the method of bisection, but would not know how to assign scale values. They could estimate case V values for the law of comparative judgments, but would not know that other cases exist with different underlying assumptions. The text also leaves the impressions that test-retest correlations are more useful' as measures of reliability than they are in practice and contains no discussion of stability coefficients; that criterion measures are easily chosen and obtained (e.g., "The first step in predicting a criterion is to secure a representative sample of examinees and obtain a predictor score,  $X$ , and a criterion score,  $Y$ , for each examinee," p. 99); and that the students are prepared to deal with factorial validity, test bias, and the measurement of change. By use of the excellent

study questions and attention to the computational problems, the instructor can help clarify where the student should have developed analytical skills and where there should be conceptual understanding.

It was interesting for me to note that the analytical skills provided in this text are sufficient to answer a question I had on my doctoral qualifying examinations over 10 years ago. It was an open book examination and we had 30 minutes to respond to an item from Prof. L. R. Tucker, referring to [Table 1](#) shown below:

Test X has been given to a large, random sample of individuals and used to select a subsample to which parallel forms of test Y are administered. A formula is desired by which the reliability (parallel forms) may be estimated for the random sample. Develop this formula being sure to give the assumptions you make as well as the steps in the derivation. Demonstrate the use of this formula with the following data.

TABLE 1  
DATA TO ACCOMPANY EXAMINATION QUESTION

	Random sample	Selected subsample
Mean for Test X	50	60
Standard deviation for Test X	10	5
Mean for Test Y (each form)	—	25
Standard deviation of Test Y (each form)	—	4
Correlation Test X with Test Y (each form)	—	.50
Correlation between forms of Test Y	—	.65

The answer I will leave for those curious enough to attempt it. Perhaps if I had a copy of Allen and Yen at the time I would not have missed it.

The authors have taken a risk trying to cover a broader domain than usually addressed in an undergraduate course on this topic. With some careful explanation from instructors, the students should greatly benefit from the brave efforts of Allen and Yen.