

Generalizability Theory

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ABSTRACT: *Generalizability Theory (GT) provides a flexible, practical framework for examining the dependability of behavioral measurements. GT extends classical theory by (a) estimating the magnitude of multiple sources of measurement error, (b) modeling the use of a measurement for both norm-referenced and domain-referenced decisions, (c) providing reliability (generalizability) coefficients tailored to the proposed uses of the measurement, and (d) isolating major sources of error so that a cost-efficient measurement design can be built. Unfortunately, GT has not been readily accessible to psychological researchers, perhaps because its development and presentation have been largely technical. G theory's inaccessibility may explain why classical theory remains the preferred method for estimating reliability. The purpose of this article is to present GT and its wide applicability to a broad audience. Our intent is to demystify GT and provide a useful tool to psychological researchers and test developers.*

Generalizability theory (Cronbach, Gleser, Nanda, & Rajaratnam, 1972) provides a framework for examining the dependability of behavioral measurements. Generalizability theory (GT) extends classical reliability theory most notably by recognizing and estimating the magnitude of the multiple sources of measurement error. In this article, we describe GT for an audience of psychologists, not psychometricians. To this end, we develop the theory's central concepts concretely and simply, linking the new theory to the classical theory (CT). We then describe some recent advances and conclude with a concrete application.

Motivation for Generalizability Theory

CT partitions observed-score variance into two parts: that which is thought to be systematic (called true-score variance) and that which is thought to be random (called error variance). The results of this partition are elegant and satisfying.

CT's usefulness, however, depends on the researcher's ability to estimate true-score and error variances from data. With practical application of CT, we find that error variance is not a monolithic construct; error arises from multiple sources. Consequently, error estimates and estimates of reliability (the ratio of true- to observed-score variance) vary according to the data-collection design.

Test-retest reliability counts day-to-day variation in performance as error, but not variation due to item sampling. An internal-consistency coefficient counts variation due to item sampling as error, but not day-to-day variation. Alternate-forms reliability counts both sources as error. CT, then, sits precariously on shifting definitions of true- and error-scores.

GT, in contrast, recognizes that there may be multiple definitions of true- and error-scores. Multiple sources of error define the universe of generalization, a fundamental notion in GT. A measurement taken on a person records a sample of behavior. A score

is only one of many scores that might serve the same purpose. The decision maker is almost never interested in the response given to the particular stimulus objects or questions, to the particular tester, at the particular moment of testing. Some, at least, of these conditions of measurement could be altered without making the score any less acceptable to the decision maker. (Cronbach et al., 1972, p. 15)

A score's usefulness, then, largely depends on the extent to which it allows us to generalize accurately to behavior in some wider set of situations, a *universe of generalization*.

That is to say, there is a universe of observations, any of which would have yielded a usable basis for the decision. The ideal datum on which to base the decision would be something like the person's mean score over all acceptable observations, which we shall call his "universe score." The investigator uses the observed score or some function of it as if it were the universe score. That is, he generalizes from sample to universe. (Cronbach et al., 1972, p. 15)

The concept of *reliability*, so fundamental to CT, is replaced by the broader and more flexible notion of *generalizability*. Instead of asking how accurately observed scores reflect their corresponding true scores, GT asks how accurately observed scores permit us to generalize about persons' behavior in a defined universe of situations. "*The question of 'reliability' thus resolves into a question of accuracy of generalization, or generalizability*" (Cronbach et al., 1972, p. 15).

A Framework for Estimating Error and Generalizability

GT can be described and illustrated within the analysis of variance (ANOVA) framework. GT is to measurement

Generalizability Theory

Robert L. Brennan



Generalizability Theory:

Generalizability Theory Robert L. Brennan, 2001-08-09 Generalizability theory offers an extensive conceptual framework and a powerful set of statistical procedures for characterizing and quantifying the fallibility of measurements Robert Brennan the author has written the most comprehensive and up to date treatment of generalizability theory The book provides a synthesis of those parts of the statistical literature that are directly applicable to generalizability theory The principal intended audience is measurement practitioners and graduate students in the behavioral and social sciences although a few examples and references are provided from other fields Readers will benefit from some familiarity with classical test theory and analysis of variance but the treatment of most topics does not presume specific background

Generalizability Theory Richard J. Shavelson, Noreen M. Webb, 1991-07-23 In this volume Shavelson and Webb offer an intuitive development of generalizability theory and cover a wide variety of topics such as generalizability studies with nested facets and with fixed facets measurement error and generalizability coefficients and decision studies with same and with different designs Detailed illustrations examples and exercises all serve to clearly describe the logic underlying major concepts in generalizability theory and assist readers in applying these methods when investigating the consistency of their own measurements Generalizability Theory Leslie J. Fyans, 1983 Generalizability Theory Robert L.

Brennan, 2013-11-11 In 1972 a monograph by Cronbach Gleser Nanda and Rajaratnam was published entitled The Dependability of Behavioral Measurements That book incorporated systematized and extended their previous research into what came to be called generalizability theory which liberalizes classical test theory in part through the application of analysis of variance procedures that focus on variance components Generalizability theory is perhaps the most broadly defined measurement model currently in existence and the Cronbach et al 1972 treatment of the theory represents a major contribution to psychometrics However as Cronbach et al 1972 p 3 state their book is complexly organized and by no means simple to follow and of course it is nearly 30 years old In 1983 ACT Inc published my monograph entitled Elements of Generalizability Theory with a slightly revised version appearing in 1992 That treatment is considerably less comprehensive than Cronbach et al 1972 but still detailed enough to convey much of the richness of the theory and to facilitate its application However the 1983 1992 monograph is essentially two decades old it does not cover multivariate generalizability theory in depth and it does not incorporate recent developments in statistics that bear upon the estimation of variance components Also of course there have been numerous developments in generalizability theory in the last 20 years **Generalizability**

Theory Richard J. Shavelson, Noreen M. Webb, 1991-07-23 In this volume Shavelson and Webb offer an intuitive development of generalizability theory and cover a wide variety of topics such as generalizability studies with nested facets and with fixed facets measurement error and generalizability coefficients and decision studies with same and with different designs Detailed illustrations examples and exercises all serve to clearly describe the logic underlying major concepts in

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Intended to help improve measurement and data collection methods in the behavioral social and medical sciences this book demonstrates an expanded and accessible use of Generalizability Theory G theory G theory conceptually models the way in which the reliability of measurement is ascertained Sources of score variation are identified as potential contributors to measurement error and taken into account accordingly The authors demonstrate the powerful potential of G theory by showing how to improve the quality of any kind of measurement regardless of the discipline Readers will appreciate the conversational style used to present a comprehensive review of G theory and its application using the freeware EduG To maximize understanding the authors illustrate all fundamental principles with concrete examples from different fields and contexts Annotated applications lead students through the main concepts of G theory while illustrating both the use of EduG and interpretation of its output Formulas are avoided wherever possible Exercises with data sets available on the Psychology Press website allow readers to carry out their own analyses to reinforce understanding Brief overviews of analysis of variance estimation and the statistical error model are provided for review The procedures involved in carrying out a generalizability study using EduG follow as well as guidance in the interpretation of results Real world applications of G theory to the assessment of depression managerial ability attitudes and writing and mathematical skills are then presented Next annotated exercises provide an opportunity for readers to use EduG and interpret its results The book concludes with a review of the development of G theory and possible new directions of application Finally for those with a strong statistical background the appendixes provide the formulas used by EduG Ideal as a supplement for courses on measurement theory and or generalizability theory taught in departments of psychology education medicine and the social sciences this text will also appeal to researchers from a variety of fields interested in learning how to apply G theory to their studies Applying Generalizability Theory using EduG Jean Cardinet, Sandra Johnson, Gianreto Pini, 2011-03-04

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Psychometrics C.R. Rao,Sandip Sinharay,2007 This volume representing a compilation of authoritative reviews on a multitude of uses of statistics in epidemiology and medical statistics written by internationally renowned experts is addressed to statisticians working in biomedical and epidemiological fields who use statistical and quantitative methods in their work While the use of statistics in these fields has a long and rich history explosive growth of science in general and clinical and epidemiological sciences in particular have gone through a sea of change spawning the development of new methods and innovative adaptations of standard methods Since the literature is highly scattered the Editors have undertaken this humble exercise to document a representative collection of topics of broad interest to diverse users The volume spans a cross section of standard topics oriented toward users in the current evolving field as well as special topics in much need which have more recent origins This volume was prepared especially keeping the applied statisticians in mind emphasizing applications oriented methods and techniques including references to appropriate software when relevant The contributors are internationally renowned experts in their respective areas This volume addresses emerging statistical challenges in epidemiological biomedical and pharmaceutical research It features methods for assessing Biomarkers analysis of competing risks clinical trials including sequential and group sequential crossover designs cluster randomized and adaptive designs and structural equations modelling and longitudinal data analysis

Handbook of Research Methods in Social and Personality Psychology Harry T. Reis,Charles M. Judd,2000-03-13 This volume first published in 2000 provides an overview of research methods in contemporary social psychology

Psychometrics R. Michael Furr,Verne R. Bacharach,2008 Focusing on the conceptual understanding of psychometric issues such as validity and reliability this textbook introduces psychometric principles at a level that goes into more detail than introductory undergraduate texts yet also more intuitive than more technical publications intended for postgraduate level By emphasizing conceptual development and practical significance over mathematical proofs this book assists students in appreciating how measurement problems can be addressed and why it is important to address them

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Zhu,2006 Provides readers with an understanding of the basics of measurement techniques in physical activity by focusing on understanding the concept behind techniques Looking at measurement issues in the physical domain this book is useful for post graduate students researchers and professionals in sport and exercise science **The History of Educational Measurement**

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Bruno,2012-12-06 Assessment has long been recognized as a key feature in learning efficacy especially through formative evaluation Item banking the storage and classification of test items is an essential part of systematic assessment This volume is based on a NATO Advanced Research Workshop held as part of the Special Programme on Advanced Educational Technology The workshop brought together scholars from around the world to discuss and critically analyze the issues and problems associated with Subjective Probability Measurement SPM or the more generic research area called self assessment Recent advances in computer technology expert systems interactive video disks and hypermedia along with the developing sophistication of self assessment scoring systems based on SPM made this conference particularly important and timely The book is divided into three main parts The input item banking and hypermedia The process subjective probabilities The output teaching and learning feedbacks In summary although SPM is a difficult theoretical concept for most educators to comprehend the sophisticated nature of modern computer systems coupled with comprehensive formative and summative evaluation and self assessment systems make SPM transparent to the user *The ECPH Encyclopedia of Psychology*

,2025-01-11 This encyclopedia volume comprehensively reflects the basic knowledge and the latest research results in the field of psychology In this reference book the knowledge system basic concepts basic theories as well as important figures representative works and institutions of psychology are well organized in encyclopedic entries The whole work includes more than 1 300 entries and about 570 figures making it a full and detailed introduction to the origin and development of psychology

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Achievement Assessment Huisheng Tian,Zhichang Sun,2018-06-07 This book consists of introduction to academic achievement assessment international comparison of academic achievement assessment and reference as well as theoretical system and practice strategy of academic achievement assessment The study indicates that the development trends of foreign academic achievement assessment are establishing a complete education quality monitoring system paying more attention to the function and value of independent education quality monitoring institution and intermediary organization the orientation based on the integrated development of students growing more apparent marching from evaluation of study to evaluation for study and placing educational equity in a prominent position This book is easy to understand and readable for professionals like teachers educational researchers and particularly those engaged in academic achievement

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