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Please improve this article if you can April A hypothetical, perfect Guttman scale consists of a unidimensional set of items that are ranked in order of difficulty from least extreme to most extreme position. For example, a person scoring a "7" on a ten item Guttman scale, will agree with items and disagree with items 8,9, Deterministic model Edit An important objective in Guttman scaling is to maximize the reproducibility of response patterns from a single score. A good Guttman scale should have a coefficient of reproducibility the percentage of original responses that could be reproduced by knowing the scale scores used to summarize them above. In order to maximize unidimensionality, misfitting items are re-written or discarded. The Rasch model requires a probabilistic Guttman structure when items have dichotomous responses e. In the Rasch model, the Guttman response pattern is the most probable response pattern for a person when items are ordered from least difficult to most difficult Andrich, In addition, the Polytomous Rasch model is premised on a deterministic latent Guttman response subspace, and this is the basis for integer scoring in the model Andrich, , Analysis of data using item response theory requires comparatively longer instruments and larger datasets, though, in order to scale item and person locations and evaluate fit of data to the model. Several probabilistic models of Guttman implicatory scales were developed by Krus and Krus and Bart Applications The Guttman scale is used mostly when researchers want to design short questionnaires with good discriminating ability. The Guttman model works best for constructs that are hierarchical and highly structured such as social distance, organizational hierarchies, and evolutionary stages. These models also assume unidimensionality but posit that the probability of endorsing an item is proportional to the distance between the items standing on the unidimensional trait and the standing of the respondent. For example, items like "I think immigration should be reduced" on a scale measuring attitude towards immigration would be unlikely to be endorsed both by those favoring open policies and also by those favoring no immigration at all. Such an item might be endorsed by someone in the middle of the continuum. Some researchers feel that many attitude items fit this unfolding model while most psychometric techniques are based on correlation or factor analysis, and thus implicitly assume a linear relationship between the trait and the response probability. The effect of using these techniques would be to only include the most extreme items, leaving attitude instruments with little precision to measure the trait standing of individuals in the middle of the continuum. Least extreme Are you willing to permit immigrants to live in your country? Are you willing to permit immigrants to live in your community? Are you willing to permit immigrants to live in your neighbourhood? Are you willing to permit immigrants to live next door to you? Would you permit your child to marry an immigrant? References Edit Andrich, D. A rating formulation for ordered response categories. The Rasch model explained. A book of exemplars. An elaboration of Guttman scaling with Rasch models for measurement. A theory of consistency of ordering generalizable to tailored testing. The basis for scalogram analysis. In Stouffer et al. The American Soldier Vol. Estimating chance reproducibility in Guttman scaling. Social Science Research, 6, Educational and Psychological Measurement, 37, Educational and Psychological Measurement, 34, Test reliability and homogeneity from perspective of the ordinal test theory. Applied Measurement in Education, 1, Request reprint. The technic of homogeneous tests compared with some aspects of scale analysis and factor analysis. Psychological Bulletin, 45, Public Opinion Quarterly, Vol. Summer, , pp. American Journal of Sociology, Vol.

Unidimensional Scaling Of Social Variables Latent class analysis frequently asked questions (faq), what is latent class analysis? latent class analysis (lca) is a statistical method for finding subtypes of related cases.

Why not just create text statements or questions and use response formats to collect the answers? First, sometimes we do scaling to test a hypothesis. We might want to know whether the construct or concept is a single dimensional or multidimensional one more about dimensionality later. Sometimes, we do scaling as part of exploratory research. We want to know what dimensions underlie a set of ratings. For instance, if you create a set of questions, you can use scaling to determine how well they "hang together" and whether they measure one concept or multiple concepts. But probably the most common reason for doing scaling is for scoring purposes. Dimensionality A scale can have any number of dimensions in it. Most scales that we develop have only a few dimensions. Think of a dimension as a number line. If we want to measure a construct, we have to decide whether the construct can be measured well with one number line or whether it may need more. For instance, height is a concept that is unidimensional or one-dimensional. We can measure the concept of height very well with only a single number line e. Weight is also unidimensional -- we can measure it with a scale. Thirst might also bee considered a unidimensional concept -- you are either more or less thirsty at any given time. But what about a concept like self esteem? What would a two-dimensional concept be? Many models of intelligence or achievement postulate two major dimensions -- mathematical and verbal ability. In this type of two-dimensional model, a person can be said to possess two types of achievement. Some people will be high in verbal skills and lower in math. For others, it will be the reverse. In other words, in order to describe achievement you would need to locate a person as a point in two dimensional x,y space. Psychologists who study the idea of meaning theorized that the meaning of a term could be well described in three dimensions. Put in other terms, any objects can be distinguished or differentiated from each other along three dimensions. They labeled these three dimensions activity, evaluation, and potency. They called this general theory of meaning the semantic differential. Their theory essentially states that you can rate any object along those three dimensions. For instance, think of the idea of "ballet. On the other hand, think about the concept of a "book" like a novel. Now, think of the idea of "going to the dentist. The theorists who came up with the idea of the semantic differential thought that the meaning of any concepts could be described well by rating the concept on these three dimensions. In other words, in order to describe the meaning of an object you have to locate it as a dot somewhere within the cube three-dimensional space. What are the advantages of using a unidimensional model? Unidimensional concepts are generally easier to understand. But the best reason to use unidimensional scaling is because you believe the concept you are measuring really is unidimensional in reality. If you try to measure academic achievement on a single dimension, you would place every person on a single line ranging from low to high achievers. But how do you score someone who is a high math achiever and terrible verbally, or vice versa? They are similar in that they each measure the concept of interest on a number line. But they differ considerably in how they arrive at scale values for different items.

3: Unidimensional Scaling - John McIver, Edward G. Carmines - Google Books

Theoretical developments in software quality could be greatly enhanced if a theoretical definition of software quality existed. Content analysis is used here to objectively identify the dimensions of software quality.

Theoretical developments in software quality could be greatly enhanced if a theoretical definition of software quality existed. Content analysis is used here to objectively identify the dimensions of software quality. The dimensions are derived from the perspectives of both producers and consumers. Results show that the most important software quality dimensions include accuracy, capability, communication, completeness, conformance, features, flexibility, serviceability, simplicity, stability, and structuredness. Consumer and producer attitudes about software quality differ only slightly. Further analysis suggests some possible meta-dimensions of software quality: Consumers appear to be primarily interested in what the software can do for them now, whereas producers appear to be primarily interested in what the software can do for them in the future. We shall detail the steps involved in the identification of significant dimensions, and discuss implications to practice and further research. The quantitative and qualitative analysis also suggested several avenues for further research. Discovery, calibration, and verification of ordinal scales for a subset of the constructs would facilitate the use of more power Dooley, Usrey Dooley " Dooley This paper is concerned with the development of an instrument aimed at the measurement of consumer attitudes concerning software quality. The operationalization of the construct software quality includes the dimensions of communication, completeness, features, flexibility, independence, simpl The operationalization of the construct software quality includes the dimensions of communication, completeness, features, flexibility, independence, simplicity, stability, and maturity. Ordinal scale development methods are used to develop objective, operational measures of these dimensions. An on-line, Internet-based survey tool was developed to facilitate the large number of responses required for survey validation. The instrument will help solve important problems of software development productivity, software engineering research and survey research. Results show that relevant software consumer attitudes Show Context Citation Context In most other frequently used techniques, only subjects are scaled. Preparation of unidimensional scale item requires three steps: Four heuristics to discover unidimensional items are sympathetic introspection, participant observation, reading, and interviewing [ibid]. Labaw [] warns that introspection and other attempts t Wealth ranking in given field sites can be problematic for a number of reasons. This article explores the usefulness of Guttman Scaling and AnthroPac software in such contexts, using a small fishing community on the northern coast of Ecuador as an example. The author provides a step-by-step descript The author provides a step-by-step description of procedures for imple-menting and analyzing Guttman Scale methodology and discusses the issue of con-struct validity. The complementary relationship between qualitative and quantita-tive data is highlighted throughout. AnthroPac Borgatti is a suite of programs for collecting and analyz-ing a variety of field data. In this article, I show 1 how to use the routine in AnthroPac to build a Guttman scale for assessing household wealth and 2 how a Guttman scale, informed by qualitative data, can provide insights and generate interesting questions for further study. Finally, I discuss some of the potential problems and questions that arise when using the technique. Household wealth is a widely used variable in social science research, but for researchers working in developing countries, where income is not docu-mented or wage labor is uncommon, assessing wealth can be a daunting task. One potential solution is wealth ranking: Individuals or households are ranked relative to each other according to given criteria and subsequently given an ordinal value. Grandin had local participants rank families The Short Takes section of Field Methods is for brief research articles and how-to articles like the one by Greg Guest in this issue. My gratitude also goes to the Show Context Citation Context Using the data management routines in AnthroPac, variables can be deleted in any combination and a new analysis done in seconds. One can continue to organize data to discover

Face validity or logical validity Unidimensional--a composite measure should represent only one dimension of a concept. General or Specific--the nature of the items you include will determine specifically or generally the variable that is measured. Variance--to guarantee variance you can a select several items the responses to which divide people about equally in terms of the variable b select items differing in variance Examination of Empirical Relationships Bivariate relationship: Index Scoring Determine the desirable range of index scores Determine whether to give each item in the index equal or different weights Make sure to standardize the weights--items should be weighted equally unless there are reasons not to. Handling Missing Data You may decide to exclude them from the construction of the index and analyses Treat missing data as one of the available responses Analyze missing data and interpret their meaning Assign missing data a middle value or mean value Assign values to the proportion of the variables scored. Index Validation Item analysis an assessment of whether each of the items included in the measure makes an independent contribution or merely duplicates the contribution of other items in the measure External validation tests the validity by examining its relationship to other presumed indicators of the same variable. A scale is a measure of the intensity of an attitude or emotion. Specifically, scales exist in the ordinal level of data. Usually scales are constructed using the ordinal level of measurement, which organizes items in an order in order to determine degrees of favor or disfavor, but does not provide any meaning of distance between degrees. The Likert scale is one of the most commonly used scales in the research community. The scale consists of assigning a numerical value to intensity or neutrality of emotion about a specific topic, and then attempts to standardize these response categories to provide an interpretation of the relative intensity of items on the scale. The semantic differential scale is similar to Likert scaling, however, rather than allowing varying degrees of response, it asks the respondent to rate something in terms of only two completely opposite adjectives. An example of a scale used in real-life situations is the Bogardus Social Distance Scale. Thurstone scaling is quite unlike Bogardus or Likert scaling. Developed by Louis Thurstone, this scale is a format that seeks to use respondents both to answer survey questions, and to determine the importance of the questions. Guttman scaling, like the Thurstone scale, recognizes that different questions provide different intensities of indication of preferences. It is based upon the assumption that the agreement with the strongest indicators also signifies agreement with weaker indicators. There are two misconceptions of scaling, one of which is the combination of data into a scale is influenced by the observation of the sample of the study. Thus the data of one scale from a sample may not comply with another scale. Therefore that combination of data can be scaled multiple times because it was originally was able to earlier in the study. A second misconception pertains to specific scales. By this, given items or data may aid in determine what constitutes as a scale opposed to a scale itself. Scales versus Indices In general, scales are considered to function better than indexes, due to the fact that scales usually consider intensity of the questions they ask and feelings they measure, despite the fact that both are ordinal measures. When computing this index, the goods are weighted according to how many of them are purchased in the general population relative to other goods , so that items purchased with greater frequency will have a greater impact on the value of the index. In most cases, studying the entire population may not be possible Sampling allows researchers to gather information from a smaller, more manageable subset of the population. That information can be used to represent the greater population. To sample researchers must first designate a target population about which generalizations will be made The target population is the pool of cases that a researcher wants to study. Target populations are turned into practical lists of potential subjects using a sampling frame Nonprobability Sampling any technique in which samples are selected in some way not suggested by probability theory. Nonprobability sampling is usually the only method that is practical for field research and comparative historical research Types of nonprobability sampling include: Probability theory permits researchers to estimate the accuracy or representativeness of a sample EPSEM Equal probability of

selection method samples are samples where every member of the population has an equal chance of selection for the sample. Sampling Bias Sampling bias occurs when the sample is not classic or representative of the larger population. Sampling Designs Simple random sampling: Sampling is Important Poor sampling reduces the validity of using study results to make population inferences. Recording and Analyzing Samples To preface, Probability theory is a branch of mathematics that provides the tools need to do accurate research--mathematical sampling methods, statistical analysis, and methods of finding parameters of populations. Probability theory uses sample distributions to accomplish this. Results of research are typically graphed as dots, with the mean each sample taken being represented as one dot on the x-axis. As research is repeated, means of samples often are duplicated, so their dots are simply placed on top of their duplicates. The number of samples with certain means is represented on the y axis. As more and more people are surveyed, the graphs get taller and taller, until usually one true mean is left standing alone in the middle. Parameters are usually determined by sample surveys. A sampling error--known in statistics as the standard deviation--can be calculated by taking the square root of: This is an important number to know because it gives the researcher an idea of how far around the population parameter the numbers are going to be distributed. A confidence interval is the range of values within which a population parameter is estimated to lie. A confidence level is the probability that a population parameter is within a certain confidence interval. Throughout all of this, the size of the population is barely relevant. This is represented by the square root of: Populations and Sampling Frames A sample frame is a list of elements composing a population from which a sample is selected ex. All elements should have equal representation in the sample frame. Findings based on a sample can be interpreted as a representation of the elements of the sampling frame. The researcher usually acquires a sampling frame, then randomly selects numbers. This is done by computer if possible. A list of potential subjects is acquired, and every kth element in the total list is chosen for inclusion. The first subject should be randomly chosen. It turns out to be about the same as random sampling, but more tedious to do and therefore less commonly used. Modification to sampling that involves dividing the population into homogenoous strata before forming samples to increase representativeness within groups. It presents the advantage of reducing the sampling error with its homogenity, but also presents the disadvantage of increasing sampling error with its smaller sample sizes. It enhances the presentation of whatever variable is being used to divide the groups. Stratification works with simple random, systematic, or cluster sampling. One accomplishes this by simpling whichever methods they had planned on using, but within the startified groups. Involves the steps of listing, then sampling. Cluster sampling is accomplished when one takes advantage of different subpopulations in order to achieve a sample. For instance, subjects are pulled from one specific neighborhood to answer questions about city government. Elements are selected from their location, then analyzed for characteristics that would make them good subjects for specific research. Appropriate subjects are then selected according to the data. Sometimes, such as in medical research, this is desired. Normally, elements are homogenized more in these cases. Weighting Samples By default, most members of a population were not selected completely by random. Weighting is the act of assigning different "weights" to different members of a sample that had different chances of being slected. Often, that can mean skewing how many people are selected from a certain area to ensure that the appropriate ratios of characteristics are maintained. Often, individuals may seek to put variables into an organized format. This is where typologies come into play. Typologies consist of the sets of categories created by the intersection of multiple variables. An empirical relationship two variables such that 1. Correlation in and of itself does not constitute a casual relationship between the two variables, but it is one creation of causality. A coincidental statistical correlation between two variables, shown to be caused by some third variable. The what or whom being studied. In social science research, the most typical units of analysis are individual people. Any product of social beings or their behavior. Can be a unit of analysis. Erroneously drawing conclusions about individuals solely from the observation of groups. A fault of some researches: A paradigm based in the view that social behavior can be explained solely in terms of genetic characteristics and behavior Cross-sectional Study: A study based on observation representing a single point in time. A study design involving the collection of data at different points in time. A type of longitudinal study in which a given characteristic of some population is monitored over time. A study in which some specific subpopulation,

or cohort, is studied over time, although data may be collected from different members in each set of observations. For example, a study of the questionnaires were sent every five years would be a cohort study. A type of longitudinal study, in which data are collected from the same set of people the sample or panel at several points in time.

"Unidimensionality" is used to describe a specific type of measurement scale. A unidimensional measurement scale has only one ("uni") dimension. In other words, it can be represented by a single number line.

With comparative scaling , the items are directly compared with each other example: Do you prefer Pepsi or Coke? In noncomparative scaling each item is scaled independently of the others example: How do you feel about Coke? Composite measures Edit Composite measures of variables are created by combining two or more separate empirical indicators into a single measure. Composite measures measure complex concepts more adequately than single indicators, extend the range of scores available and are more efficient at handling multiplie items. In addition to scales, there are two other types of composite measures. Indexes are similar to scales except multiple indicators of a variable are combined into a single measure. The index of consumer confidence, for example, is a combination of several measures of consumer attitudes. A typology is similar to an index except the variable is measured at the nominal level. Indexes are constructed by accumulating scores assigned to individual attributes, while scales are constructed through the assignment of scores to patterns of attributes. While indexes and scales provide measures of a single dimension, typologies are often employed to examine the intersection of two or more dimensions. Typologies are very useful analytical tools and can be easily used as independent variables , although since they are not unidimensional it is difficult to use them as a dependent variable. Data types Edit The type of information collected can influence scale construction. Different types of information are measured in different ways. See in particular level of measurement. Some data are measured at the nominal level. That is, any numbers used are mere labels: See Nominal scale Some data are measured at the ordinal level. Numbers indicate the relative position of items, but not the magnitude of difference. An example is a preference ranking. See Ordinal scale Some data are measured at the interval level. Numbers indicate the magnitude of difference between items, but there is no absolute zero point. Examples are attitude scales and opinion scales. See Interval scale Some data are measured at the ratio level. Numbers indicate magnitude of difference and there is a fixed zero point. Ratios can be calculated. See Ratio scale Scale construction decisions What level of data is involved nominal, ordinal, interval, or ratio? What will the results be used for? Should you use a scale, index, or typology? What types of statistical analysis would be useful? Should you use a comparative scale or a noncomparative scale? Should there be an odd or even number of divisions? Odd gives neutral center value; even forces respondents to take a non-neutral position. What should the nature and descriptiveness of the scale labels be? What should the physical form or layout of the scale be? Comparative scaling techniques Edit Pairwise comparison scale - a respondent is presented with two items at a time and asked to select one example: This is an ordinal level technique when a measurment model is not applied. Krus and Kennedy elaborated the paired comparison scaling within their domain-referenced model. The Bradley-Terry-Luce BTL model Bradley and Terry, ; Luce, can be applied in order to derive measurments provided the data derived from paired comparisons possess an appropriate structure. Rasch model scaling - respondents interact with items and comparisons are inferred between items from the responses to obtain scale values. Respondents are subsequently also scaled based on their responses to items given the item scale values. The Rasch model has a close relation to the BTL model. Rank-order scale - a respondent is presented with several items simultaneously and asked to rank them example: Rate the following advertisements from 1 to This is an ordinal level technique. Constant sum scale - a respondent is given a constant sum of money, script, credits, or points and asked to allocate these to various items example: If you had Yen to spend on food products, how much would you spend on product A, on product B, on product C, etc. Bogardus social distance scale - measures the degree to which a person is willing to associate with a class or type of people. It asks how willing the respondent is to make various associations. The results are reduced to a single score on a scale. There are also non-comparative versions of this scale. Q-Sort scale - Up to items are sorted into groups based a rank-order procedure. Guttman scale - This is a procedure to determine whether a set of items can be rank-ordered on an unidimensional scale. It utilizes the intensity structure among several indicators of a given variable. Statements are listed in order of importance. The rating

is scaled by summing all responses until the first negative response in the list. The Guttman scale is related to Rasch measurement; specifically, Rasch models bring the Guttman approach within a probabilistic framework. Non-comparative scaling techniques Borg scale Continuous rating scale also called the graphic rating scale - respondents rate items by placing a mark on a line. The line is usually labeled at each end. There are sometimes a series of numbers, called scale points, say, from zero to under the line. Scoring and codification is difficult. Likert scale - Respondents are asked to indicate the amount of agreement or disagreement from strongly agree to strongly disagree on a five- or seven-point scale. The same format is used for multiple questions. Phrase completion scales - Respondents are asked to complete a phrase on an point response scale in which 0 represents the absence of the theoretical construct and 10 represents the theorized maximum amount of the construct being measured. The same basic format is used for multiple questions. Semantic differential scale - Respondents are asked to rate on a 7 point scale an item on various attributes. Each attribute requires a scale with bipolar terminal labels. Stapel scale - This is a unipolar ten-point rating scale. Thurstone scale - This is a scaling technique that incorporates the intensity structure among indicators.

In the social sciences, scaling is the process of measuring or ordering entities with respect to quantitative attributes or traits. For example, a scaling technique might involve estimating individuals' levels of extraversion, or the perceived quality of products.

Thornton Find articles by Everard W. Shaw Find articles by Pamela J. Young Find articles by Carolyn A. Abstract Objective Social withdrawal is described as the condition in which an individual experiences a desire to make social contact, but is unable to satisfy that desire. It is an important issue for patients with motor neurone disease who are likely to experience severe physical impairment. Model fit, category threshold analysis, differential item functioning DIF , dimensionality and local dependency were evaluated. Results Factor analysis confirmed the suitability of the four-factor solution suggested by the original authors. Mokken scale analysis suggested the removal of item five. Rasch analysis removed a further three items; from the Community one item and Emotional two items withdrawal subscales. Following item reduction, each scale exhibited excellent fit to the Rasch model. A item Summary scale was shown to fit the Rasch model after subtesting the items into three subtests corresponding to the Community, Family and Emotional subscales, indicating that items from these three subscales could be summed together to create a total measure for social withdrawal. Conclusion Removal of four items from the Social Withdrawal Scale led to a four factor solution with a item hierarchical Summary scale that were all unidimensional, free for DIF and well fitted to the Rasch model. The scale is reliable and allows clinicians and researchers to measure social withdrawal in MND along a unidimensional construct. Introduction Motor neurone disease MND is a progressive neurodegenerative disease of unknown aetiology that is characterised by weakness in limb and bulbar muscles, culminating in respiratory failure and death. No curative treatments exist for the disease. Progression is often rapid and may present a serious challenge for patients with MND who need to cope not only with a terminal diagnosis but also with the intense demands of a potentially steep decline in physical function. There is a growing body of literature which demonstrates, perhaps paradoxically, that quality of life in MND is only weakly related to impairments in physical function that define the disease [1â€"4]. The psychological consequences of the illness and their relationship to patient quality of life have been increasingly examined over recent years and findings have shown strong relationships between social support, depression, coping, fatigue and patient quality of life [4â€"8]. Social withdrawal has not only been described as the condition in which an individual experiences a desire to make social contact, but is unable to satisfy that desire [9] , but may also be described as a conscious desire for reduced social interaction due to increased anxiety or embarrassment [10,11]. People with MND often experience social withdrawal from family, friends and events occurring outside the home. Patients commonly report that they are less socially attached following diagnosis, including fewer visits from friends and church attendances and may describe visits to their doctor or MND clinic as their most common form of social interaction [11]. Low levels of social interaction are related to increased levels of psychological distress in MND patients. Conversely, high levels of social support are related to increased quality of life in MND [2]. Recent calls have been made to develop psychological therapies specifically for MND patients and their carers [14,15] and, given its relationship with quality of life and depression, social withdrawal may make a point of departure for future interventions. A disease-specific measure has been designed to assess social withdrawal from the perspective of the MND patient across four domains measuring withdrawal across domains of Community, Family, Emotional and Physical Withdrawal [16]. The original scale consists of 24 items scored along a four point Likert-type response ranging from Strongly Disagree scored 0 to Strongly Agree scored 3. Items were derived from semi-structured interviews carried out with MND patients. Consistent with the patient-led rationale of the original study, domains were conceptually based on the manner in which interviewed MND patients described their experiences of social withdrawal. The original study found SW, particularly from the community, to be strongly associated with depression and physical symptoms of the disease [16]. Further research using this measure has found SW from family and friends to be associated with reduced quality of life [17]. Other researchers using the MND-SWS Scale have found higher levels of social

withdrawal in patients who were struggling to cope with the disease. Those patients found to have difficulty in coping also scored highly for depression and anxiety [18]. In addition to the inherent risks of developing scales on small samples, measures developed using classic test theory CTT will always be ordinal, which may affect the accuracy of arithmetic operations and comparison of raw scores [21]. A further caveat of the four disparate factors of the original scale was that no analysis was conducted to confirm that they could also form a single unidimensional construct, allowing estimation of a total score for social withdrawal. The Rasch model [22] is a modern psychometric approach that permits interval-level measurement from pencil-and-paper questionnaires. Rasch techniques have been shown to successfully reduce the number of items on questionnaires [23] , a particularly important issue when developing questionnaires for disabled populations [24]. The impetus of the current study is to assess the psychometric and scaling properties of the MND-SWS from a Rasch measurement perspective and, in doing so, to evaluate the psychometric properties of the four subscales of the MND-SWS, and to provide a unidimensional Summary scale of social withdrawal. Patients were unselected for age, sex, and symptom presentation or disability status. Where patients were unable to complete the pack by themselves a nurse or caregiver was allowed to act as a scribe. Each participant gave informed consent. Ethical permission was granted for this study from relevant hospital committees in the U. Statistical analysis An initial exploration of the factor structure of the existing scale was undertaken with a confirmatory factor analysis CFA based upon the four domain structure. The purpose here is to provide confirmation of the structure so as to include the extant domains within the Rasch analysis. The CFA factors will be rotated using oblique Geomin rotation with weighted least squares mean- and variance-adjusted estimation. More rigorous post-hoc tests of unidimensionality will be undertaken within the Rasch analysis detailed below. Prior to this, a non-parametric probabilistic Mokken model will be used to screen the domain items for a probabilistic structure that would be consistent with the Rasch model [29]. Rasch analysis ensures that the fundamental scaling properties of an instrument are assessed alongside traditional psychometric assessments of reliability. The model operationalises the formal axioms of measurement order, unidimensionality and additivity [31]. Unlike classical approaches, it allows the creation of interval level measurement from questionnaire measures given certain criteria [32]. A sample size of will provide accurate estimates of item and person locations irrespective of scale targeting [33]. Analyses used to assess whether the scale conforms to Rasch model expectations are briefly explained below. A comprehensive review with a more detailed explanation of the Rasch analytical process may be found elsewhere [34]. Rasch model fit is primarily indicated by a non-significant deviation from model expectations across a range of fit statistics. For example, the summary chi-square statistic should be non-significant, after adjusting for multiple testing. In addition, both person fit and item fit are assessed by their residual mean values. This examines the differences between the observed data and model expectations for each person and each item estimate. Reliability for Rasch scales is described as the extent to which items distinguish between distinct levels of functioning and is shown statistically using the Person Separation Index PSI where 0. Scale unidimensionality is assessed using a post-hoc comparison of two independent estimates, which are subjected to a t-test. These estimates are derived from the loadings on the first principal component analysis of the residuals, and the latent estimate of each person and its standard error calculated independently for each test. Rasch analysis permits the evaluation of important psychometric criteria, including local dependency, category threshold disordering and differential item functioning DIF. Local dependency occurs when two questions on a scale are too similar, leading to artificially inflated reliability. Item category threshold disordering occurs where patients cannot reliably distinguish between response categories i. Differential item functioning occurs when different demographic groups within the sample respond in a different way to a certain question. In the present study DIF was assessed by age, sex and functional ability. Further details of Rasch analysis are comprehensively provided elsewhere [26,34]. For the analysis of DIF by functional impairment, scores on the ALSFRS-R were categorised into three groups representing patients in the lower, middle and upper tertiles within the sample. When necessary, items are removed one at a time. Once an item is removed the resultant scale is reassessed for fit, dimensionality, local dependency and DIF. This iterative process is repeated until an acceptable solution is found. This process has been used in previous Rasch studies [26,38].

UNIDIMENSIONAL SCALING OF SOCIAL VARIABLES pdf

7: Social Research Methods - Knowledge Base - Scaling

A unidimensional scale can't capture that type of achievement. The Major Unidimensional Scale Types There are three major types of unidimensional scaling methods.

What level of data is involved nominal, ordinal, interval, or ratio? What will the results be used for? Should you use a scale, index, or typology? What types of statistical analysis would be useful? Should you use a comparative scale or a noncomparative scale? Should there be an odd or even number of divisions? Odd gives neutral center value; even forces respondents to take a non-neutral position. What should the nature and descriptiveness of the scale labels be? What should the physical form or layout of the scale be? Scale construction method[edit] It is possible that something similar to your scale will already exist, so including those scale s and possible dependent variables in your survey may increase validity of your scale. Begin by generating at least ten items to represent each of the scales. Administer the survey; the more representative and larger your sample, the more confidence you will have in your scales. Review the means and standard deviations for your items, dropping any items with skewed means or very low variance. Run a principal components analysis with oblique rotation on your items and the other items for scales it will be important to differentiate from your own. Request components with eigenvalues greater than 1. It is easier if you group the items by targeted scales. The more distinct the other items, the better your chances your items will load only on your own scale. These are candidates to drop. These components and their items are candidates to drop. Look at the candidates to drop and the components to be dropped. Is there anything that needs to be retained because it is critical to your construct? For example, if a conceptually important item only cross loads on a component to be dropped, it is good to keep it for the next round. Drop the items, and rerun asking the program to give you only the number of components after dropping the uninterpretable and single-item ones. Go through the process again starting at Step 3. Run the Alpha program asking for the Alphas if each item is dropped. Any scales with insufficient Alphas should be dropped and the process repeated from Step 3. For better practices, keep the final components and all loadings of yours and similar scales selected to be used in the Appendix of your scale. Level of measurement The type of information collected can influence scale construction. Different types of information are measured in different ways. Some data are measured at the nominal level. That is, any numbers used are mere labels; they express no mathematical properties. Some data are measured at the ordinal level. Numbers indicate the relative position of items, but not the magnitude of difference. An example is a preference ranking. Some data are measured at the interval level. Numbers indicate the magnitude of difference between items, but there is no absolute zero point. Examples are attitude scales and opinion scales. Some data are measured at the ratio level. Numbers indicate magnitude of difference and there is a fixed zero point. Ratios can be calculated. Composite measures[edit] Composite measures of variables are created by combining two or more separate empirical indicators into a single measure. Composite measures measure complex concepts more adequately than single indicators, extend the range of scores available and are more efficient at handling multiple items. In addition to scales, there are two other types of composite measures. Indexes are similar to scales except multiple indicators of a variable are combined into a single measure. The index of consumer confidence, for example, is a combination of several measures of consumer attitudes. A typology is similar to an index except the variable is measured at the nominal level. Indexes are constructed by accumulating scores assigned to individual attributes, while scales are constructed through the assignment of scores to patterns of attributes. While indexes and scales provide measures of a single dimension , typologies are often employed to examine the intersection of two or more dimensions. Typologies are very useful analytical tools and can be easily used as independent variables , although since they are not unidimensional it is difficult to use them as a dependent variable. Comparative and non comparative scaling[edit] With comparative scaling , the items are directly compared with each other example: Do you prefer Pepsi or Coke? In noncomparative scaling each item is scaled independently of the others example: How do you feel about Coke? Comparative scaling techniques[edit] Pairwise comparison scale â€" a respondent is presented with two items at a time and asked to select one example: This is an

ordinal level technique when a measurement model is not applied. Krus and Kennedy elaborated the paired comparison scaling within their domain-referenced model. The Bradley–Terry–Luce BTL model Bradley and Terry, ; Luce, can be applied in order to derive measurements provided the data derived from paired comparisons possess an appropriate structure. Rasch model scaling â€" respondents interact with items and comparisons are inferred between items from the responses to obtain scale values. Respondents are subsequently also scaled based on their responses to items given the item scale values. The Rasch model has a close relation to the BTL model. Rank-ordering â€" a respondent is presented with several items simultaneously and asked to rank them example: Rate the following advertisements from 1 to This is an ordinal level technique. Bogardus social distance scale â€" measures the degree to which a person is willing to associate with a class or type of people. It asks how willing the respondent is to make various associations. The results are reduced to a single score on a scale. There are also non-comparative versions of this scale. Q-Sort â€" Up to items are sorted into groups based on rank-order procedure. Guttman scale â€" This is a procedure to determine whether a set of items can be rank-ordered on a unidimensional scale. It utilizes the intensity structure among several indicators of a given variable. Statements are listed in order of importance. The rating is scaled by summing all responses until the first negative response in the list. The Guttman scale is related to Rasch measurement; specifically, Rasch models bring the Guttman approach within a probabilistic framework. Constant sum scale â€" a respondent is given a constant sum of money, script, credits, or points and asked to allocate these to various items example: If you had Yen to spend on food products, how much would you spend on product A, on product B, on product C, etc. Magnitude estimation scale â€" In a psychophysics procedure invented by S. Stevens people simply assign numbers to the dimension of judgment. The geometric mean of those numbers usually produces a power law with a characteristic exponent. In cross-modality matching instead of assigning numbers, people manipulate another dimension, such as loudness or brightness to match the items. Typically the exponent of the psychometric function can be predicted from the magnitude estimation exponents of each dimension. Non-comparative scaling techniques[edit] Visual analogue scale also called the Continuous rating scale and the graphic rating scale â€" respondents rate items by placing a mark on a line. The line is usually labeled at each end. There are sometimes a series of numbers, called scale points, say, from zero to under the line. Scoring and codification is difficult for paper-and-pencil scales, but not for computerized and Internet-based visual analogue scales. The same format is used for multiple questions. It is the combination of these questions that forms the Likert scale. This categorical scaling procedure can easily be extended to a magnitude estimation procedure that uses the full scale of numbers rather than verbal categories. Phrase completion scales â€" Respondents are asked to complete a phrase on an point response scale in which 0 represents the absence of the theoretical construct and 10 represents the theorized maximum amount of the construct being measured. The same basic format is used for multiple questions. Semantic differential scale â€" Respondents are asked to rate on a 7-point scale an item on various attributes. Each attribute requires a scale with bipolar terminal labels. Stapel scale â€" This is a unipolar ten-point rating scale. Thurstone scale â€" This is a scaling technique that incorporates the intensity structure among indicators. Scale evaluation[edit] Scales should be tested for reliability , generalizability, and validity. Generalizability is the ability to make inferences from a sample to the population, given the scale you have selected. Reliability is the extent to which a scale will produce consistent results. Test-retest reliability checks how similar the results are if the research is repeated under similar circumstances. Alternative forms reliability checks how similar the results are if the research is repeated using different forms of the scale. Internal consistency reliability checks how well the individual measures included in the scale are converted into a composite measure.

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Scaling is the branch of measurement that involves the construction of an instrument that associates qualitative constructs with quantitative metric units. Scaling evolved out of efforts in psychology and education to measure "unmeasurable" constructs like authoritarianism and self esteem.

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The three most popular unidimensional scaling methods are: (1) Thurstone's equal-appearing scaling, (2) Likert's summative scaling, and (3) Guttman's cumulative scaling. The three approaches are similar in many respects, with the key differences being the rating of the scale items by judges and the statistical methods used to select the.

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