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Analyzing Likert Data

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Abstract: *This article provides information for Extension professionals on the correct analysis of Likert data. The analyses of Likert-type and Likert scale data require unique data analysis procedures, and as a result, misuses and/or mistakes often occur. This article discusses the differences between Likert-type and Likert scale data and provides recommendations for descriptive statistics to be used during the analysis. Once a researcher understands the difference between Likert-type and Likert scale data, the decision on appropriate statistical procedures will be apparent.*

Introduction

Over the years, numerous methods have been used to measure character and personality traits (Likert, 1932). The difficulty of measuring attitudes, character, and personality traits lies in the procedure for transferring these qualities into a quantitative measure for data analysis purposes. The recent popularity of qualitative research techniques has relieved some of the burden associated with the dilemma; however, many social scientists still rely on quantitative measures of attitudes, character and personality traits.

In response to the difficulty of measuring character and personality traits, Likert (1932) developed a procedure for measuring attitudinal scales. The original Likert scale used a series of questions with five response alternatives: strongly approve (1), approve (2), undecided (3), disapprove (4), and strongly disapprove (5). He combined the responses from the series of questions to create an attitudinal measurement scale. His data analysis was based on the composite score from the series of questions that represented the attitudinal scale. He did not analyze individual questions. While Likert used a five-point scale, other variations of his response alternatives are appropriate, including the deletion of the neutral response (Clason & Dormody, 1994).

Likert response alternatives are widely used by Extension professionals. By the time of this article's preparation, at least 12 articles published in the 2011 *Journal of Extension* had used some form of a Likert response. In 2010, at least 21 articles published in the *Journal of Extension* used the technique. The articles published in 2011 included 4-point Likert alternatives (Behnke & Kelly, 2011; Robinson & Shepard, 2011), five-point Likert alternatives (Diker, Walters, Cunningham-Sabo, & Baker, 2011; Elizer, 2011; Hines, Hansen, & Falen, 2011; Kalambokidia, 2011; Kroth & Peutz, 2011; Singletary, Emm, & Hill, 2011), six-point Likert alternatives (Allen, Varner, & Sallee, 2011; Beaudreault & Miller, 2011; Wyman et al., 2011), and a seven-point Likert alternative (Walker, Vaught, Walker, & Nusz, 2011).

While variations of the Likert response alternative have become common in Extension research, common usage has also created misuses or mistakes. One mistake commonly made is the improper analysis of individual questions on an attitudinal scale. Before we discuss the analysis

of Likert data, let's review the basic concepts of the procedure.

Likert-Type Versus Likert Scales

Clason and Dormody (1994) described the difference between Likert-type items and Likert scales. They identified Likert-type items as single questions that use some aspect of the original Likert response alternatives. While multiple questions may be used in a research instrument, there is no attempt by the researcher to combine the responses from the items into a composite scale. Table 1 provides an example of five Likert-type questions.

Table 1.
Five Likert-Type Questions

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. 4-H has been a good experience for me.	SD	D	N	A	SA
2. My parents have provided support for my 4-H projects.	SD	D	N	A	SA
3. My 4-H involvement will allow me to make a difference.	SD	D	N	A	SA
4. My 4-H advisor was always there for me.	SD	D	N	A	SA
5. Collegiate 4-H is important in the selection of a college.	SD	D	N	A	SA

A Likert scale, on the other hand, is composed of a series of four or more Likert-type items that are combined into a single composite score/variable during the data analysis process. Combined, the items are used to provide a quantitative measure of a character or personality trait. Typically the researcher is only interested in the composite score that represents the character/personality trait. Table 2 provides an example of five questions designed to be combined into a Likert scale measuring eating habits.

Table 2.
Five Likert Questions Designed to Create a "Healthy Eating" Likert Scale

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I eat healthy foods on a regular basis.	SD	D	N	A	SA
2. When I purchase food at the grocery store, I ignore "junk" food.	SD	D	N	A	SA
3. When preparing meals, I consider the fat content of food items.	SD	D	N	A	SA
4. When preparing meals, I consider the sugar content of food items.	SD	D	N	A	SA

5. A healthy diet is important to my family.	SD	D	N	A	SA
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Steven's Scale of Measurement

Both Likert-type and Likert scale data have unique data analysis procedures. To understand the options, one must start with the Steven's Scale of Measurement (Ary, Jacobs, & Sorenson, 2010). The Steven's scale consists of four categories: nominal, ordinal, interval, and ratio.

In the nominal scale, observations are assigned to categories based on equivalence. Numbers associated with the categories serve only as labels. Examples of nominal scale data include gender, eye color, and race. Ordinal scale observations are ranked in some measure of magnitude. Numbers assigned to groups express a "greater than" relationship; however, how much greater is not implied. The numbers only indicate the order. Examples of ordinal scale measures include letter grades, rankings, and achievement (low, medium, high). Interval scale data also use numbers to indicate order and reflect a meaningful relative distance between points on the scale. Interval scales do not have an absolute zero. An example of an interval scale is the IQ standardized test. A ratio scale also uses numbers to indicate order and reflects a meaningful relative distance between points on the scale. A ratio scale does have an absolute zero. Examples of ratio measures include age and years of experience.

Analyzing Likert Response Items

To properly analyze Likert data, one must understand the measurement scale represented by each. Numbers assigned to Likert-type items express a "greater than" relationship; however, how much greater is not implied. Because of these conditions, Likert-type items fall into the ordinal measurement scale. Descriptive statistics recommended for ordinal measurement scale items include a mode or median for central tendency and frequencies for variability. Additional analysis procedures appropriate for ordinal scale items include the chi-square measure of association, Kendall Tau B, and Kendall Tau C.

Likert scale data, on the other hand, are analyzed at the interval measurement scale. Likert scale items are created by calculating a composite score (sum or mean) from four or more type Likert-type items; therefore, the composite score for Likert scales should be analyzed at the interval measurement scale. Descriptive statistics recommended for interval scale items include the mean for central tendency and standard deviations for variability. Additional data analysis procedures appropriate for interval scale items would include the Pearson's r , t -test, ANOVA, and regression procedures. Table 3 provides examples of data analysis procedures for Likert-type and Likert scale data.

Table 3.
Suggested Data Analysis Procedures for Likert-Type and Likert Scale Data

	Likert-Type Data	Likert Scale Data
Central Tendency	Median or mode	Mean
Variability	Frequencies	Standard deviation
Associations	Kendall tau B or C	Pearson's r
Other Statistics	Chi-square	ANOVA, t -test, regression

Summary

The data analysis decision for Likert items is usually made at the questionnaire development stage. Do you have a series of individual questions that have Likert response options for your participants to answer or do you have a series of Likert-type questions that when combined describe a personality trait or attitude? If your Likert questions are unique and stand-alone, then analyze them as Likert-type items. Modes, medians, and frequencies are the appropriate

statistical tools to use. If you have designed a series of questions that when combined measure a particular trait, you have created a Likert scale. Use means and standard deviations to describe the scale. If you feel a need to report the individual items that make up the scale, only use Likert-type statistical procedures. Keep in mind that once the decision between Likert-type and Likert scale has been made, the decision on the appropriate statistics will fall into place.

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