Identification of alternative statistics for analyzing ordinal data in guidance and counseling research

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Abstract: In analyzing the needs of the counselee, an assessment is needed. Needs assessment cannot be separated from statistical tests as a tool. The purpose of conducting research is to find alternative statistical methods for analyzing ordinal data in Guidance and Counseling research. This includes a number of important elements which overall aim to improve the quality, validity and reliability of future Guidance and Counseling research results. In Guidance and Counseling research, identifying appropriate alternative statistics for analyzing ordinal data is important. This is because ordinal data often appears in the form of rating scales, questionnaires and subjective scales. Some alternative statistics that can be used include the Mann-Whitney U Test, Wilcoxon Matched Pairs Signed Rank Test, Kruskal-Wallis On-Way Analysis of Variance Test, and Friedman Analysis of Variance Test. This research is a type of literature study or literature study. Literature studies are intended to search for relevant theoretical sources that suit the research topic being discussed. The use of alternative statistics can be applied and developed based on research findings to analyze ordinal data in the context of guidance and counseling. By using appropriate alternative statistics, researchers can analyze ordinal data accurately and obtain meaningful findings in Guidance and Counseling research.
Keywords: Alternative Statistics; Guidance and Counseling Assessment; Ordinal Data.

Introduction

In Guidance and Counseling research, data analysis plays an important role in identifying differences and relationships between the variables studied (Priatna, 2017). However, in the middle of the analysis process, problems often arise related to the type of data collected. One type of data commonly found in guidance and counseling research is data on an ordinal scale (Wahyuningrum, 2020). This ordinal data arises when respondents are asked to provide ratings or assessments on certain variables (Fernandes & Akhrani, 2022). Even though it has a meaningful sequence of values, the distance between these values is not known with certainty.

In order to overcome this problem, an analytical approach is needed that is appropriate to the nature of ordinal data. Therefore, this article aims to identify alternative statistics that can be used to analyze ordinal data in the context of Guidance and Counseling research. Apart from that, the theories underlying the use of alternative statistics will also be discussed to provide a deeper understanding of the analytical methods applied. Thus, this article will provide not only a practical understanding, but also a strong theoretical foundation for the use of alternative statistics in ordinal data analysis.

Research in the field of Guidance and Counseling often involves the collection and analysis of ordinal data, such as ratings of client satisfaction, anxiety levels, or self-evaluation scores. Ordinal data, which represents categories with order but without consistent spacing between categories, demands a sound analysis approach to ensure the validity and reliability of research findings (Sitorus, 2011). However, in practice, ordinal data analysis is often ignored or analyzed using statistical methods that are not completely appropriate, such as parametric statistics which assume interval or ratio data.

Alternative statistical approaches that are better suited to ordinal data are becoming increasingly important to consider in order to improve the quality of research in Guidance and Counselling. The identification and use of appropriate alternative statistics can provide a more accurate and meaningful picture of the phenomenon under study, and can help researchers and

practitioners make more precise and effective decisions based on existing data (Hamali et al., 2023).

In Guidance and Counseling research, ordinal data often appears when respondents are asked to provide ratings or assessments on certain variables. An ordinal scale has a meaningful sequence of values, but the distance between those values is unknown. Therefore, an analysis approach that considers the ordinal nature of the data is important.

This article aims to identify and evaluate various alternative statistics that can be used to analyze ordinal data in Guidance and Counseling research. By presenting a review of related literature as well as relevant case studies, it is hoped that this article can contribute to the development of a more thorough and valid research methodology in this field. Through a better understanding of existing statistical options, it is hoped that in the future researchers will be able to choose analytical tools that best suit the characteristics of the data they have, so that they can improve the quality and reliability of their research results.

Method

This research uses a literature study method which aims to identify and evaluate various alternative statistical methods that can be used to analyze ordinal data in guidance and counseling research. Literature collection is carried out by searching for articles, books and scientific publications that are relevant to the research topic. Literature sources were searched through academic databases using keywords such as "ordinal data analysis", "nonparametric statistics", "guidance and counseling research", and "alternative statistical methods". In addition, the references of the articles that were found were also checked to find additional relevant literature. The selected literature is analyzed to identify various alternative statistical methods used to analyze ordinal data. Each method is analyzed based on basic principles, advantages, disadvantages, and applications in the context of guidance and counseling research. Data obtained from the literature is then synthesized to provide a comprehensive picture of the statistical options available.

Results and Discussion

The main assumption of most tests is that the data are measured at least on an interval measurement scale and there is a requirement that the distribution of the data meets the assumption of a normal curve. However, some data is ordinal data, ordinal data is data that can be sorted from high value to low value.

As with interval data, there are several methods for assessing relationships and significant differences. Thus, we can talk about correlation, differences between two groups of ratings, and differences between more than two groups of ratings. Statistics that are based on distributions that meet the criteria of a normal distribution (i.e. normal curve, bell curve) are called parametric statistics. Statistics that are not based on a normal distribution or do not meet the assumptions of a normal distribution are called nonparametric statistics. Statistics for ordinal data (e.g., ratings and rating scales) are examples of nonparametric statistics (Sutton, 2020). Several alternative statistical tests that can be used to analyze ordinal data in guidance and counseling research include (Rosana & Setyawarno, 2016):

1. *Mann-Whitney U Test*

The Mann-Whitney U test can be used if the data does not match the assumptions required for the t test. If the data is ordinal data, then the t test cannot be used. The Mann-Whitney U test can be used to test differences between two independent groups of ordinal data. An example is the client's assessment of counselors from two different institutions. Given two sets of ratings, and want to know whether one set of ratings is statistically different from the other set. The analysis results provide the Mann-Whitney U value and

significance value (p). If the p value is significant (e.g., < .05), it can be assumed that the difference between ratings did not occur by chance. This is a reliable distinction. Conversely, if the U value is not significant, we cannot assume that the differences between groups of counselors are significant.

In testing the null hypothesis which states that there is no real difference between the two groups of data and where the data is taken from unrelated samples, the Mann-Whitney U test can be carried out. This test is also called the U test, because it is to test the null hypothesis , the case is calculated a statistical number called U. The procedures carried out for the Mann-Whitney U Test are: (1) stating the hypothesis and the real level α; (2) ranking the data without paying attention to the sample category; (3) adding up the rankings according to each sample category and calculating the U statistic, with the formula $U = n1n2 + [n1(n1+1)/2] – R1$, or $U = n1n2 + [n1(n2+1)/2] – R2$; and (4) drawing statistical conclusions regarding the null hypothesis (Supranto, 2002).

The Mann-Whitney U test is a form of testing in non-parametric statistical analysis, where the test is used to test the similarity of the distribution of two independent populations with the assumption that the distribution of the two populations is continuous and the measurement scale of the data is at least ordinal (Yanti, 2007). If in the first stage a decision has been obtained whether H0 is rejected or accepted, then the second stage does not need to be carried out, thus the Mann-Whitney U Test is considered more efficient because it can reduce the sample size so that it can save costs and time (Spurrier & Hewett, 1975).

Mann-Whitney U Test requirements, including; (1) the sample data is not normally distributed, (2) two sample groups are independent or unrelated or have no influence on each other (the sample members of the two groups are different), (3) the sample scale is ordinal or interval data, (4) the number of samples the same in both groups. The Mann–Whitney U test can be used if the goal is to show differences between two groups in the values of an ordinal, interval, or ratio variable. This is a non-parametric version of the t test that can be used for interval, ratio, or continuous data unless there are large deviations from parametric assumptions. The assumptions that must be met in the Mann-Whitney U Test are (Yudhira, 2021):

a. The dependent variable data scale is interval, ordinal, or ratio.
b. If the scale is interval or ratio, the normality assumption is not met. (Normality can be known after the normality test).
c. Data comes from two groups. (If the data comes from three or more groups, it is best to use the Kruskal-Wallis One-Way Analysis of Variance Test).
d. Variables are independent of one another, meaning the data comes from different groups or is not paired.
e. The variances of the two groups are the same or homogeneous. (Because the distribution is not normal, the appropriate homogeneity test to carry out is Levene's Test, where the Fisher F Test is intended if the normality assumption is met).

Apart from considering the direction of the difference, the Mann-Whitney U Test also considers the relative size of the difference. The Mann-Whitney U test is used in Guidance and Counseling research to evaluate the effectiveness of interventions or guidance programs. In Guidance and Counseling research, alternative statistical identification of the Mann-Whitney U Test can be used if the researcher wants to assess two different things, which will then produce a conclusion, which conclusion can add insight to the researcher himself and the reader.

2. Wilcoxon Matched Pairs Signed Rank Test

Wilcoxon Signed Rank Test or also called Wilcoxon Match Pair is a non-parametric test to analyze the significance of differences between two pairs of data on an ordinal scale

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but which are not normally distributed (Field, 2013). In Guidance and Counseling research, identification of alternative statistics Wilcoxon Matched Pairs Signed Rank Test can provide valuable insights in analyzing ordinal data (Jati, 2017). Data analysis using the Wilcoxon Matched Pairs Signed Rank Test can provide a deeper understanding of comparisons or changes in the same group of individuals before and after a particular intervention.

The Wilcoxon test is useful in analyzing ordinal data generated by the same participant at two different times. The Wilcoxon test can be used to determine whether there is a significant difference between the ranking obtained on the midterm exam and the ranking obtained at the end of the lecture. The Wilcoxon test will produce a W test value and a probability level that can be used to determine the significance of the difference between the two times (Field, 2013).

The following are some of the advantages of the Wilcoxon Test which are explained by (Sutton, 2020):
a) Does not rely on normal distribution assumptions. The Wilcoxon test does not require the assumption of a normal distribution of data, so it can be used when this assumption is not met.
b) Suitable for ordinal data: The Wilcoxon test is suitable for analyzing ordinal data, where data is measured on an ordinal or categorical scale.
c) Resistant to outliers. The Wilcoxon test is resistant to outliers or extreme values that can influence the analysis results, thereby providing more stable results. Resistant to outliers. The Wilcoxon test is resistant to outliers or extreme values that can influence the analysis results, thereby providing more stable results.
d) Suitable for paired data. The Wilcoxon test is suitable for analyzing data generated by the same participant at two different times, so it can be used to evaluate differences before and after intervention or treatment.

The Wilcoxon test is important in guidance and counseling research, because this test does not require the assumption of a normal distribution in the data. This makes it an appropriate choice when ordinal data are used in guidance and counseling research, where such assumptions may not be met. Its non-reliance on the assumption of a normal distribution in the data, makes it a suitable choice for ordinal data analysis. Therefore, guidance and counseling research can rely on the Wilcoxon Matched Pairs Signed Rank Test as an effective and relevant statistical analysis method in extracting valuable information from ordinal data.

The Wilcoxon test has important implications in Guidance and Counseling research because it allows researchers to evaluate significant differences between two measurement times taken on the same participant. In the context of guidance and counseling, this can be used to assess the effectiveness of counseling interventions or guidance programs on participants. The results of the Wilcoxon Test can provide important information regarding significant changes in measured variables over time, which can help in evaluating the impact of a counseling intervention on participants.

The results of the discussion show that the Wilcoxon Test can be used effectively to analyze ordinal data in Guidance and Counseling research. The Wilcoxon test uses an analogue to the dependent samples or correlated samples t test, which allows the comparison of two sets of data produced by the same individuals or similar in relevant characteristics. In the context of Guidance and Counselling, the Wilcoxon Test can be used to evaluate significant differences between variables measured over time, which can help in evaluating the impact of a counseling intervention or guidance program on participants. The results of the Wilcoxon test provide a W test value and a probability level that can be used to determine the significance of the difference between the two times.

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The Wilcoxon test is a nonparametric test used to compare two conditions depending on paired data. The Wilcoxon test is a statistical method that is useful if the assumption of normality is not met or if the data is ordinal. However, interpretation of research results must be carried out with caution and the specific context of the research must be taken into account. This test is often used in guidance and counseling research to evaluate the effectiveness of counseling interventions or guidance programs. Measuring changes before and after intervention, evaluating the effectiveness of counseling techniques, assessing the absorption of guidance program implementation, analyzing individual development over a certain period of time and longitudinal research to identify significant changes over time are some of the implications of the Wilcoxon Test in the context of Guidance and Counseling research.

3. Kruskal-Wallis On-Way Analysis of Variance Test

The Kruskal-Wallis test is a nonparametric test used to compare significant differences between more than two groups in ordinal data. This test tests whether the median ratings of the groups are significantly different. This test is also called the Kruskal-Wallis H Test and One-Way ANOVA on rankings. This test can be seen as an extension of the Mann-Whitney U Test to test differences between more than two groups. The Kruskal-Wallis H test does not require normally distributed data and can be used with ordinal data.

If groups of children are rated on their attention in three different classes, the ratings can be analyzed using the Kruskal-Wallis H Test to determine whether there are overall (i.e., omnibus) differences in the ratings between the three groups. The results provide the H test value and probability value (p). If the overall analysis is significant, then each pair of groups can be compared to see which group differences are significant. Keep in mind that in a three-group study such as Classes A, B, and C, there are three possible comparisons: A and B, A and C, B and C (Sutton, 2020).

The Kruskal-Wallis test is a non-parametric statistical test that can be used to test whether there is a significant difference between groups of independent variables and the dependent variable. The Kruskal-Wallis test is a non-parametric test used to measure whether there is a difference in the average value of more than two independent sample groups. The Kruskal-Wallis test is commonly used in comparison design research (Fahrurrozi et al., 2022).

The Kruskal Wallis test is a nonparametric test used to test significant differences between more than 2 groups. This test is suitable for use in guidance and counseling research because it does not require the assumption of data normality. In addition, this test also does not require the assumption of homogeneity of variance. Therefore, the Kruskal Wallis Test is more flexible in testing differences between groups that differ in the dependent variable. In the Kruskal Wallis Test, the data must be in ordinal form or in the form of an interval and ratio scale which is then converted to an ordinal scale. This test works by comparing data rankings between groups. The process involves sorting the data from smallest to largest, then giving each data a ranking. After that, this test will calculate the number of ratings for each group.

The Kruskal Wallis test produces an H test statistic which is used to test the null hypothesis that there are no significant differences between the groups. If the p-value resulting from this test is smaller than the previously determined significance level, then the null hypothesis is rejected and it can be concluded that there is a significant difference between the groups in the dependent variable.

In Guidance and Counseling research, it is important to be able to identify significant differences between different groups on a particular dependent variable. One of the statistical methods used to test this difference is the Kruskal Wallis Test (Rahaju et al.,

2023). Benefits of the Kruskal Wallis Test in Guidance Counseling Research (Steele et al., 2014):

a. Testing for significant differences: The Kruskal Wallis test allows researchers to test for significant differences between groups in a particular dependent variable. This helps in identifying factors that have the potential to influence outcomes in Guidance and Counselling.

b. Alternative to parametric tests: Kruskal Wallis test is a good alternative to parametric tests such as One-Way ANOVA. If the data does not meet the assumptions of normality or homogeneity of variance, the Kruskal Wallis Test is a more appropriate choice to test differences between groups in Guidance and Counseling research.

c. Flexibility in measurement scales: The Kruskal Wallis test can be used for both ordinal scale data and interval/ratio scale data. This allows researchers to test differences between groups in various types of data commonly used in Guidance and Counseling research.

The Kruskal Wallis Test is important in Guidance and Counseling research, because nonparametric and does not require the assumption of normality in the data, can handle ordinal and interval/ratio data converted to an ordinal scale, alternative to parametric tests such as One-Way ANOVA if the data does not meet the assumptions, lexible in the number of groups to compare. With this test, researchers can analyze differences between groups in Guidance and Counseling research more easily and accurately.

4. Friedman Analysis of Variance Test

The Friedman Analysis of Variance test is a nonparametric test for significant differences among data collected at multiple points in time. Data must be on an ordinal measurement scale. The results produce FM statistics and probability values. Sometimes the FM statistic is referred to as Friedman's Q. In some software programs, the output will produce a chi-square value, which may be confusing, but if you use the Friedman procedure in the software, then the output shown as chi-square is the Friedman Test value. Counseling researchers may use the Friedman Test when they wish to compare groups' progress ratings at three different treatment times (i.e., repeated measures). For example, participants in intervention-focused group counseling can complete intervention assessments after weeks 1, 4, and 7. These scores can be analyzed to determine whether changes significantly improve across weeks of the group intervention.

The Friedman Analysis of Variance test is used in statistics to test a number (k) of paired samples, where the number of samples tested is more than two, with a minimum data scale in ordinal form. Paired here can mean a combination, that is, the treatment given is repeated in every condition encountered in the field during the data collection process. The Friedman Analysis of Variance test does not require the assumption that the population studied is normally distributed and has a homogeneous variance (Soekiman et al., 2017). The Friedman Analysis of Variance test requires that there are no repetitions in the experimental treatment unit, meaning that there is exactly one observation for each treatment in each block or group, namely at least 3 treatments are given (Lubis et al., 2015).

Soekiman et al., (2017) revealed that the Friedman Analysis of Variance test aims to test whether n samples (more than two samples) come from the same population or not, and if the data to be tested is data with a nominal or ordinal data scale category, interval or ratio type data, however not normally distributed, and the number of data is below 30.

The Friedman Analysis of Variance test is carried out to determine the differences between two or more related sample groups. The data analyzed is ordinal data. Therefore, if the data in guidance and counseling research is in interval or ratio format, it is best to convert it to ordinal format first. This test is an alternative to one-way analysis of variance.

This test is carried out if the parametric statistical assumptions are not met or because the sample is too small.

When conducting guidance and counseling research, the Friedman Analysis of Variance Test can be an alternative to Repeated Measures Anova when the standardized residual values of one or all of the variables are not normally distributed after carrying out the normality test. This can be done if the samples used are 3 or more samples that are related to each other, if there are only two samples, the Wilcoxon test can be used.

In Guidance and Counseling research, identifying appropriate alternative statistics for analyzing ordinal data is important. Some alternative statistics that can be used include the Mann-Whitney U Test, Wilcoxon Matched Pairs Signed Rank Test, Kruskal-Wallis On-Way Analysis of Variance Test, and Friedman Analysis of Variance Test. By using appropriate alternative statistics, researchers can analyze ordinal data accurately and obtain meaningful findings in Guidance and Counseling research.

Through this research, it is hoped that a better understanding will be created about the use of alternative statistics in analyzing ordinal data in the context of Guidance and Counseling. (Unaradjan, 2019). The results of this research can make an important contribution to the development of research methodology and better decision making in the field of Guidance and Counselling.

Conclusions and Suggestions

In guidance and counseling research, ordinal data appears when respondents provide ratings or assessments on certain variables. An ordinal scale has a meaningful sequence of values, but the distance between those values is unknown. Therefore, it is important to use an appropriate analytical approach. Several alternative statistical tests that can be used to analyze ordinal data in guidance and counseling research include Mann-Whitney U, Wilcoxon Matched Pairs Signed Rank, Kruskal-Wallis One-Way Analysis of Variance, and Friedman Analysis of Variance. The use of alternative statistics can be applied and developed based on research findings to analyze ordinal data in the context of guidance and counseling..

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