# *Statistics without math for psychology*

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Dancey, C. P., & Reidy, J. (2019). *Estatística sem matemática para psicologia*. 7. ed. Porto Alegre, RS: Penso.

The book title is presented as an invitation to psychologists who wish to venture into quantitative research, but who little know or understand mathematical formulas and concepts. This edition maintains the theoretical contents of past issues, but updates the literature, the exercises and the reflections from the feedback received in previous publications.

The main objective of the book is to provide an understanding of statistics and its application in data analysis, without the need to understand formulas and complex calculations. This objective is achieved through a clear presentation of chapters' structure The first five are the basis for understanding the rest of the book, as they seek to enable the reader with the fundamentals of the tests, their handling, and interpretation.

In the first chapter, "Variables and Research Design," the authors provide the basis for the use of statistics in research projects, explaining the concepts in a theoretical way, without the need for mathematical formulas as stated in the book's purpose. By desensitizing the criticisms of statistics, the authors aim to demonstrate the applicability in the appropriate contexts. Through a simple language and associations with the phenomena studied by psychology, they follow a logical path to clarify the basic concepts, but reflective on how to

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use those variables for psychological science, considering their singularities. Altogether, the authors discuss what a variable is, how to use it, how to measure it, how to design and plan a survey, the data analysis, the types of statistical procedures that can be applied, which variables should be considered to ensure the reliability of the results, and they also present which statistical tests can be used for each type of research.

As a result, the second chapter, "Introduction to SPSS", seeks to present the 23rd version of the program, a specific statistical package for the social sciences. Through screenshots, the authors familiarize the reader with the software's interface and demonstrate the step-by-step use associating it with the knowledge explained in the first chapter. In general, the program identifies the possibility of making relationships among variables, comparing means and variances in order to identify whether a difference in results is statistically significant. Considering that the program is in English, for those who are unfamiliar or have difficulty with the language and also for beginners, this chapter can be used as a tutorial.

Chapter 3, "Descriptive Statistics," explores the main ways of analyzing quantitative research data. In order to do this, it goes through the concepts, basic and essential statistical terms for the understanding of descriptive statistics in a clear, explanatory and illustrative way. These include differences between population and sample, ways of measuring descriptive data and which fit into each study format, and which elements should be considered when choosing the data description measure. In addition, they correlate with some SPSS functions, such as exploring and describing descriptive statistics and exploratory data analysis, providing tips and tutorials for the processes presented.

Continuing the topic, in Chapter 4, "Probability, Sampling, and Distributions," presents how to draw conclusions from data. Based on the concepts learned in the previous chapters, this chapter clearly demonstrates what is and how to use inferential statistics, that is, how to draw conclusions about the population from sample data of a study. To do so, the authors make it possible to understand the probabilities, distributions, estimates, standard error, confidence intervals and the error bar diagrams. At the end of the chapter, the reader perceives the possibilities of applying all concepts in the phenomena of psychology and enhances a broad and careful look at data interpretation.

Chapter 5, "Testing for Hypotheses and Statistical Significance," broadens the knowledge of inferential statistics and covers other ways of applying probabilities and sample distributions to test the hypotheses of a survey. As a way of getting around the conflicts related to the possible differences between the research sample and the general population, Dancey and Reidy develop throughout the chapter the strategies that can be used for this. Finally, they

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correlate with SPSS tools and identify which statistical choices should be made, depending on the research design.

From this point, the authors begin to describe, in detail, statistical tests in each chapter. It is noticeable that language comes to follow the concepts previously explained, however, if they were assimilated, there are no difficulties in understanding; however, the authors also recall some of the concepts.

Thus, Chapter 6, "Correlation Analysis: Pearson's r," discusses ways of analyzing relationships between variables: correlations and their nuances, their purposes, and their magnitude. The authors also present Pearson's parametric test, showing several ways of visualizing the variance using explanatory figures. Through SPSS, among their possibilities, they demonstrate their use with bivariate correlations, dispersion diagrams, and partial correlations.

While in Chapter 7, "Analysis of differences between two conditions: the t-test", Dancey and Reidy develop content on the differences between groups/intragroup and participants in a research on the "t-test" parametric test, as well as on which applications and the characteristics are necessary in research, so that it is possible to use this type of test, such as, for example, to have a population study with normal distribution.

The following chapter, "Issues of Significance," describes ways of analyzing and describing data from another perspective, considering the probability of accepting sampling error characterized by the difference between the actual size of the population and the size of the study sample, they also bring us reflections and critiques about the criteria of significance adopted in science. In addition, the authors still present the factors to be considered according to the studies and the experiments, in order to maximize the results.

Chapter 9, "Measures of association", explores the theme of relationships and associations between variables that began in chapter 6. However, at this point, they argue from categorical variables (such as of sex and ethnic group, for example). The authors discuss the ways of analyzing adjustments of measures and also the ways of describing the results obtained through chi-square distribution and Cramer's V.

In Chapter 10, "Analysis of differences between three or more conditions," Dancey and Reidy gradually begin to characterize more complex forms of analysis. They identify the analysis of variance and increase the knowledge of the reader for three or more conditions as well as the parametric ANOVA test, which is responsible for performing the analysis of variance, that is, to identify the differences of the study values and their source of variation.

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Chapter 11, "Analysis of variance with more than one VI", broadens the information on ANOVA, with respect to the analyzes using *factorial ANOVA.* It demonstrates its possibilities of use with independent variables (also called explanatory or predictive variables) and their respective delineations, conditions, degrees and interaction effects. One of the most important aspects of the chapter refers to the caution that authors have to us readers, so we are able to read, interpret and describe the data correctly.

In Chapter 12, "Regression analysis," the authors add content to the correlation analysis discussed in Chapter 6. Dancey and Reidy discuss the effects of one variable on another, their applicabilities and their particularities. Through scientific citations, they present to readers the bivariate linear regression and multiple regression in a visual and exemplified way.

While in Chapter 13, "Analysis of three or more groups controlling the effects of a covariate," the title itself makes clear the author's intent. To do so, the chapter presents the covariance analysis technique, ANCOVA. They clarify what is a covariate, in which conditions it can be used, its designs, how to use it and how to present the data, again exemplifying, associating with SPSS and using figures and tables.

Chapter 14, "Introduction to Factor Analysis", Dancey and Reidy introduce a new subject, which is based on the content discussed so far: it is the analysis of factors anchored in multivariate statistics. In this part, the authors broaden the content for factor analysis with correlation patterns among sample participants. As in previous chapters, they conceptualize, distinguish, exemplify, demonstrate the ways of analyzing, interpreting and describing the data of this type of analysis while demonstrating its use through SPSS.

In Chapter 15, "Introduction to Multivariate Analysis of Variance (MANOVA)," the authors elaborate on a subject briefly mentioned earlier: multivariate statistics. The chapter clarifies that the difference from MANOVA to other forms of analysis is the possibility of working with more than one dependent variable (which is related to the other variable, also known as a criterion variable). As well as elucidating its use with dependent and independent variables, inter and intra-participants, among other assumptions, always supporting in the contents previously approached. However, Dancey and Reidy cautiously mention all the necessary care in dealing with this type of analysis, because it is not as uncomplicated as it appears.

The last chapter, "Non-parametric statistics", differs from the topic presented up to this point. In this final chapter, the authors describe that their use is associated with samples and asymmetric data. For this reason, they cannot be analyzed by parametric statistics. In this way, Dancey and Reidy portray the conditions to the usage, why they are less used on current

researches and how to use alternatives to the tests: Pearson's r, Student's t-test and ANOVA for this specific data model. Those are: Spearman's rho, Mann-Whitney or Wilcoxon and Kruskal-Wallis or Friedman. In this part, they approach their respective functions and locations on SPSS.

After the presentation of all chapters, the authors present the answers to all the questions and exercises carried out throughout the book. In the appendixes, they add complementary information to those previously covered. They also present a list with suggestions of readings to those who wish to continue immersion on the statistical universe.

Finally, I noticed that the existence of sessions in each chapter with the content overview, summaries with the main concepts, discussion points, alert tables, as well as the exercises and questions tables, allow the use of the topics read and the assimilation of content to the reader who is less used to statistical questions. The activities showed throughout each chapter, not just in the end, allowed an immersion in the content and made it possible to verify if the essential information was understood. Still, the boxes present on the text deepen the theme that is being worked on, with suggestions of literature, questions, and reflections. In addition, many chapters demonstrate how to use statistical concepts and tools in the SPSS program.

One can see the caution that the authors spent throughout the book to provide complete immersion in the statistical universe even for the less familiar with the topic. Thus it could be achieved the aim of the book. Dancey and Reidy are able to satisfy readers with a fluid reading that is comprehensible to those who are already habituated to statistics, but also to those who are starting or want to start a journey through quantitative research.

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