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Reframing Your Perspectives

*All truths are easy to understand once they are discovered;
the point is to discover them.*

(Galileo Galilei, 1632)

Introduction

Just because you are doing descriptive research does not mean you have to be limited solely to using descriptive statistics. This may sound like a simple statement. Nevertheless, it is based on a fundamental statistical concept that needs to be recognized. Unfortunately, many textbooks thoughtlessly commingle “descriptive statistics” with “descriptive research.” As a result, it is easy to unwittingly assume that researchers doing descriptive research are constrained to using descriptive statistics. However, this delimitation needs to be corrected.

The mission of this book is to provide you with information and insights about various multivariate procedures so that you can abolish this misconception and reframe your outlook concerning descriptive research. With this fresh perspective, you can add power and depth to your descriptive research, taking charge of your data. This transformative journey will inspire and motivate you to approach your research in new and innovative ways.

The overlooked concept that disproves this limited view of descriptive research is an essential principle of multivariate statistics. This principle is that multivariate procedures can be used for both descriptive and inferential purposes. “Many statistical techniques are applicable to both descriptive and inferential analyses” (Kachigan, 1991, p. 7). Consequently, *just because you are doing descriptive research does not mean you have to be limited solely to using descriptive statistics.*

This book intends to get you to think about using multivariate statistics as descriptive tools in your descriptive research and to orient you to various multivariate procedures that you can then integrate into your descriptive research. This fresh view will put you on the road to

expanding the boundaries for analyzing your data and uncovering many new insights embedded in it. *Almost magically, these procedures can make the invisible visible.*

A strength of this book is that it will accelerate your journey in perspective transformation and learning about multivariate procedures. It will do this by following the wise advice of Albert Einstein. One of Einstein's powerful insights was to "make everything as simple as possible, but not simpler." Simplicity fosters clarity, which is a prerequisite for reframing your perspectives on research methods and charting a new course in your data analysis approach. In addition, Einstein's comment about science applies to mathematics: "Most of the fundamental ideas of science are essentially simple, and may, as a rule, be expressed in a language comprehensible to everyone."

Einstein's quest for simplicity and clarity is attained in this book by embracing a nonmathematical approach to introduce the multivariate statistical procedures essential for descriptive research. The focus is on clarity and accessibility, enabling graduate students and researchers in education and the social sciences to grasp the concepts without being burdened by complex mathematical details. Each chapter is designed to demystify procedures such as cluster analysis, discriminant analysis, and factor analysis, emphasizing their practical applications and interpretations. This approach is appropriate because applied social researchers generally do not need to have a firm grasp of the mathematical derivation of the statistical procedures; instead, they should concentrate on learning to use and interpret these procedures (Klecka, 1980, p. 23).

This nonmathematical approach prioritizes understanding over computation, guiding you through the rationale behind these techniques and demonstrating how they can be effectively utilized in your descriptive research. The inclusion of SPSS, R, and Excel instructions facilitates hands-on experience, making it easy to implement these methods in real-world scenarios. Additionally, excerpts and abstracts from actual publications and dissertations illustrate how to present descriptive research results, further enhancing your ability to apply what you learn. This emphasis on practical applications will leave you feeling prepared and ready to apply your new knowledge.

This focus on the conceptual underpinnings and practical implications of these multivariate procedures seeks to empower you to use these tools confidently in your descriptive research, fostering a deeper appreciation for the insights they can provide. By understanding and effectively using these techniques, you will gain confidence and capability in your research. Overall, presenting these multivariate procedures in a nonmathematical format makes these techniques approachable and relevant, ensuring you can effectively integrate them into your work without requiring extensive mathematical training.

As you journey down this new road concerning descriptive research, it is essential to recognize that the road of multivariate statistics is wide. There are numerous other books dealing with multivariate statistics. Some are general in their approach, while others focus in-depth on a single multivariate procedure. You will undoubtedly want to investigate and study these resources as you delve into these various procedures and use them more in your research. The introduction you get from this book and the experience gained from implementing the lessons you learn from this book will better prepare you for this ongoing professional development. Importantly, this book will get you started on this rewarding journey.

Our Journey to Reframing

Your journey to reframing your perspectives toward using multivariate procedures in your descriptive research will continue the exploratory journey initiated by the faculty and graduate students at Montana State University's Center for Adult Learning Research. The mission of the Center was to conduct research on adult learning. In 1988, the Center's staff, Dr. Gary J. Conti and Dr. Robert A. Fellenz (1991), initiated a groundbreaking inquiry into the idea of learning strategies used by adults. "Learning strategies are the techniques or skills that an individual elects to use to accomplish a learning task. . . . They are techniques rather than stable traits, and they are selected for a specific task" (Fellenz & Conti, 1989, pp. 7–8). Five crucial areas of learning strategies emerged from a study of the literature in the fields of adult education and cognitive psychology, specifically, (1) metacognition, (2) metamotivation, (3) memory, (4) critical thinking, and (5) resource management (Conti, 2009, pp. 888–889).

Recognition of the importance of real-life learning and the impact of learning strategies on adult learning activities led to the development of an instrument to assess these strategies (Conti, 2009). The Self-Knowledge Inventory of Lifelong Learning Strategies (SKILLS) is a tool that assesses the use of various learning strategies in real-life learning situations (McNeil, 2012). It consists of a series of six scenarios depicting real-life learning situations that necessitate various levels and types of learning. Each scenario is followed by 15 questions assessing how likely an individual is to use specific learning skills or techniques to resolve that learning issue. There are two similar versions of SKILLS.

The 15 questions identify specific applications of the 15 learning strategies that compose SKILLS. These 15 strategies, in turn, flow from 5 specific learning areas that identify the theoretical framework of the instrument. In taking SKILLS, the learner must first select four of the scenarios that seem most relevant to that person's life. The participant is then asked to indicate

which 5 of the 15 strategies they would “Definitely use,” “Probably use,” or “Not likely use” to solve the learning problem. This ranking of tasks on four scenarios takes approximately 20 minutes. Scores on the instrument are determined by giving three points to each strategy chosen for definite use, two points for those marked probably use, and one point for those not likely to be used. Points for each of the 15 strategies on the four selected scenarios are summed to give a total score for each strategy. These total scores for each strategy can also be added to determine the degree to which each strategy area is used over the four scenarios.

SKILLS was our starting point on the journey to learning about and applying multivariate statistics for descriptive research. Why? Because, as Robert Frost (2002) so insightfully observed in “The Road Not Taken”:

*Two roads diverged in a wood, and I---
I took the one less traveled by,
And that has made all the difference.
(p. 105)*

As you can easily discern from the SKILLS design, it is a difficult inventory to score. It is even more challenging to analyze for group research. We had two divergent roads to choose from. One road, the most traveled, was smooth and paved with simple descriptive statistics and various univariate statistical procedures. This road was well-worn but offered minimal insights into our data. The other road was uncharted. Its signposts were new to us, with labels for multivariate procedures like cluster analysis, discriminant analysis, and factor analysis. We instinctively sensed that we needed to learn and apply these multivariate procedures to make the invisible nature of this new area of learning strategies visible.

Our initial dilemma exemplifies the magnitude of our problem and the critical need for reframing our perspective on statistical procedures. Each SKILLS participant had 60 responses (15 responses per scenario $\times$ 4 scenarios), with 3 responses in each of the 5 learning strategy areas. How could we determine if the respondents differed on each item? Univariate procedures suggested doing 60 separate Analyses of Variance tests. But—what then?! Suppose half of the analyses had significant results. How do you interpret these? How do you relate the individual findings to the others? We learned the frustration and impossibility of this task through our failures with it. There had to be a better way to attack this problem and get sensible results. Suddenly, the purpose, logic, and process of discriminant analysis became clear! Instead of examining 60 items individually, why not examine them collectively all at once? Moreover, why not explore the interaction simultaneously within the procedure instead of trying to decipher it individually from the significant ANOVA results?

Thus, the first discriminant analysis that we ran on our SKILLS data reframed our perspectives and launched us on the journey of using multivariate procedures to explore the new area of adult learning strategies. With it, we were able to analyze all of the variables simultaneously. With each new study and student dissertation, we gained new insights related to the concept of adult learning strategies. This led to our use of cluster analysis and factor analysis as additional tools for an even more insightful understanding of adult learning strategies.

Reframing our perspectives and journey with multivariate procedures has been exhilarating and productive. New learning always is. However, it was also challenging. We had to learn the distinctions of each procedure. We had to check and recheck to ensure that we were interpreting the results correctly. These were not tedious tasks. Instead, they were necessary as security checks to add rigor to our research. One of the central functions of this book is to present the results of our journey, enabling you to learn from them and accelerate your perspective reframing and transition to using multivariate procedures in your descriptive research.

Note About References

The format and content of this book are designed to put you on the path to reframing your viewpoint related to descriptive research and to provide you with the tools for reframing your perspective, including the use of multivariate statistics. The references in this book can be valuable tools for you in this reframing. As such, it is essential to note that these references reflect the time frame for the reframing journey of the programmatic research team. Like others who have learned and applied multivariate statistics and written about their experience to help others, “We have cited sources which we found to be valuable for our own understanding of the subject” (Kim & Mueller, 1978a, p. 12).

The references listed in this book follow the rules established by Gary Sinise as Ken Mattingly in the 1995 movie *Apollo 13*. After the oxygen tank exploded on the Apollo spacecraft, Mattingly worked in a simulator at the Mission Control Center on the ground to devise a survival plan for regulating the spacecraft’s electrical power. When an assistant handed him a flashlight for his work, Mattingly said, “That’s not what they have up there. Don’t give me anything they don’t have on board.” Similarly, the references provided in this book are precisely those available to and used by the programmatic research team. You can gather additional and current references in your quest to use multivariate methods in your research. However, the references in this book align with Mattingly’s additional comment: “Give me the exact same conditions they’ve got in there now, and I need the present status of every instrument.” Fittingly,

the word *instrument* has a double meaning when applied to the tests and measures utilized by the programmatic research team. Fulfilling Mattingly's charge, these references can give you the same perspectives as those of the programmatic research team, alert you to the same opportunities they saw, and motivate you to adopt multivariate methods as they did.

Revealing the Opening Quote

In literature, the *reveal* is a writing device to link previously exposed information with a key element of the story. In this book, the *Revealing the Opening Quote* section at the end of each chapter will link and summarize how the quote at the beginning of the chapter relates to the chapter's content. In other words, what does Galileo's insight that *all truths are easy to understand once they are discovered; the point is to discover them* have to do with reframing your perspectives.

A crucial proposition of this book is that descriptive research designs are more comprehensive than the use of descriptive statistics. The critical truth about multivariate statistics is that they can be used for descriptive purposes and inferential functions. In his classic *The Dialogue Concerning the Two Chief World Systems*, the noted astronomer, physicist, and engineer Galileo pointed out that *all truths are easy to understand once they are discovered; the point is to discover them*. With this book, you will *discover* the truth about the descriptive powers of several multivariate statistical procedures. The *point* of this discovery is that you can use these multivariate procedures to enhance your research data and enliven your research.

In this chapter, we reflect on Galileo Galilei's insightful quote: "All truths are easy to understand once they are discovered; the point is to discover them." This statement is particularly relevant as we emphasize the need for researchers using a descriptive design to reframe their perspectives. Traditionally, many have viewed descriptive research as confined to simple descriptive statistics. However, by expanding your viewpoint to include the descriptive functions of multivariate procedures, you can unlock a deeper understanding of your data.

For many researchers, there can be a tendency to limit descriptive research to basic descriptive statistics, viewing it through a narrow lens. However, Galileo's assertion challenges us to expand our understanding and seek more profound truths. By embracing a broader perspective that includes multivariate procedures, researchers can unlock a wealth of insights that go beyond simple descriptive measures.

This chapter emphasizes the importance of discovery in the research process. Reframing your perspective allows you to recognize the rich descriptive functions that multivariate techniques can offer, such as identifying patterns, relationships, and underlying structures in complex

datasets. By recognizing the broader potential of descriptive research, you not only enhance your analytical toolkit but also enrich your overall understanding of the data you encounter. Embrace this opportunity to discover new truths, and let them guide your research endeavors moving forward.

Galileo's quote serves as a powerful reminder to remain curious and open-minded in your research endeavors. By pursuing a comprehensive view of descriptive research, you will not only enrich your own understanding but also contribute to the broader landscape of knowledge within your field.