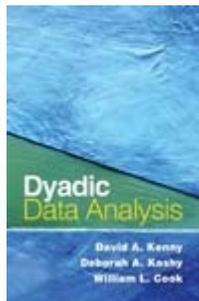


## Interdependent Data in Psychological Research: Statistical Nuisance or Substantive Opportunity?

A review of



### **Dyadic Data Analysis**

by David A. Kenny, Deborah A. Kashy, and William L. Cook

New York: Guilford Press, 2006. 458 pp. ISBN 978-1-57230-986-9. \$52.00



---

Reviewed by

[Noel A. Card](#)

Data from dyads or small groups are relevant to nearly every branch of psychological research. To provide just a few examples, clinical researchers must consider the relationship between therapist and client or among participants in therapy groups, developmental researchers investigate (for example) relationships children have with their parents and peers, cognitive psychologists must consider the interplay between different brain regions, and

social psychologists have, at the very center of their focus, behaviors and attitudes between individuals. Despite the inherently interpersonal context of our field, psychologists have for too long not fully studied the interdependent nature of individuals' cognitions, emotions, and behaviors. One reason for this failure to study interdependence is the historic reliance on statistical models that assume independence among observations. This has led to the widespread use of analytic strategies that either ignore or try to get around this interdependence, nearly always with detrimental results, and worse yet, have diverted attention away from the interdependence that is so critical to our areas of study.

*Dyadic Data Analysis* by David Kenny, Deborah Kashy, and William Cook describes methods of data analysis that do not try to get around violations of the assumption of independence but instead make this interdependence that is such a natural part of our field the focal point for analysis. By providing readers with a well-written, nontechnical description of various forms of interdependence and how they can be quantitatively analyzed, the authors make a tremendous advancement of our field. Simply put, this book has the potential to drastically advance the ways that researchers conceptualize, design studies, and analyze data involving interdependent processes.

In the remainder of this review I briefly describe the topics covered in this book. I then discuss the strengths of this work, readers who might benefit from this book, and the place of this book in psychological science.

## **An Overview of the Book**

Although this is a book describing statistical methods, the presentation is not organized around specific methods. Instead, the authors organize the book around common research questions and types of interdependent data, providing advice on how to answer these questions using various analytic methods (including

analysis of variance [ANOVA], multiple regression, multilevel modeling, and structural equation modeling). This organization is representative of a message that is consistent throughout the book: The goal of these analyses is to answer substantively important questions about interdependence. In other words, although this book is filled with descriptions of how to perform sophisticated quantitative analyses, the book is really about how to draw conclusions about dyadic data using these analytic tools.

The book consists of 15 chapters ranging from general issues to specific topics. The first 2 chapters describe basic issues in dyadic data analysis. Specifically, Chapter 1 introduces general considerations of dyadic data, including basic definitions, commonly used dyadic designs, and important practical advice on how researchers can structure their databases to represent dyadic structure. Chapter 2 lays the foundation for basic statistical analysis of interdependence by providing clear guidelines for evaluating the magnitude and statistical significance of dependence in several situations (i.e., continuous or categorical data, distinguishable or indistinguishable dyads). Perhaps the most important part of the chapter, however, is that describing the consequences of ignoring dependence. The key point readers should take from this section is that methods of data analysis that properly model interdependence are desirable whenever there are theoretical or empirical reasons to expect dependencies in the data.

In the next three chapters, the authors describe approaches to analyzing data from two-person dyads. Chapter 3 describes how researchers can evaluate within-dyad effects (e.g., the effect of gender on an outcome within heterosexual couples), between-dyad effects (e.g., the effect of relationship length on an outcome), and combinations of within-dyad and between-dyad effects using ANOVA, regression, and basic nonparametric analyses. Chapter 4 considers more sophisticated multilevel models for studying these effects, and Chapter 5 similarly introduces the use of structural equation modeling for the analysis

of dyadic data. It is worth noting that although these chapters cover sophisticated methods of data analysis, the authors do not assume that readers are familiar with these approaches; instead, they provide introductions to each of these approaches and adapt a more conceptual than technical description. They also provide much practical advice across these chapters regarding the strengths and limitations of using each approach to answer various questions.

Chapters 6 and 7 continue to present information on analyzing data from dyads, here focusing on specific questions that can be answered. Chapter 6 describes methods of comparing variances and covariances within and across dyads; although these sorts of analyses (comparing variances and/or correlations) are often not adequately considered by researchers, the authors demonstrate the substantive importance of these questions in dyadic research. This consideration provides the foundation for the topic of Chapter 7, the actor–partner interdependence model (APIM). The APIM is applicable to dyads in which predictor variables are mixed (varying both within and between dyads) and has been used in many recent studies. The authors provide a clear description of the APIM and its conceptual interpretations, and then provide detailed instructions and examples of fitting the APIM to both exchangeable and distinguishable dyads using regression, multilevel modeling, and structural equation models.

The next four chapters move beyond the dyad to consider group interdependence. One of the most powerful and sophisticated methods of analyzing this interdependence is with the social relations model (SRM), which is the focus of Chapters 8 and 9 (see also Kenny, 1994). Specifically, Chapter 8 introduces the SRM as a flexible conceptual and analytic approach to identifying individual and dyadic effects within small groups of interdependent people, and then provides an overview of the effects and computation of variances and covariances within the SRM. Chapter 9 extends the discussion of the SRM of the previous chapter to situations in which group members have distinct roles.

Chapter 10 describes the analysis of one-with-many designs, a design in which a set of focal persons has interdependent relations with multiple individuals (who are not shared across focal persons). The analysis of these one-with-many designs has not been extensively considered, despite their fairly common usage, so this chapter alone represents a valuable contribution to the field. Chapter 11 considers social network analysis (SNA), a vast set of methods of analyzing interdependencies within groups. After briefly defining some central terminology of SNA, the authors provide an overview of the common indices obtained from this method (e.g., centrality, transitivity, subgroups) and present the *p1* model as an extension of the SRM that is specifically designed for dichotomous ties (rather than interval measures assumed by SRM). Overall, this chapter provides a tantalizing overview of SNA that can serve as a starting point for researchers, if not a complete guide in itself (for a more extended treatment, see Wasserman & Faust, 1994).

The next three chapters present some advanced topics in dyadic data analysis. Chapter 12 describes ways of analyzing similarity within dyads, a seemingly simple task that contains many hidden challenges. The authors begin by providing a thorough review of the most commonly used indices of dissimilarity (various types of difference scores) and similarity (various measures of association), concisely describing the calculation, advantages and disadvantages, and appropriate situations for each. Chapters 13 and 14 describe methods of analyzing longitudinal dyadic data (for further consideration of analyzing longitudinal interdependent data, see Card, Selig, & Little, in press). Specifically, Chapter 13 describes how interval outcomes can be analyzed using cross-lagged regression, longitudinal extensions of the APIM, multivariate growth-curve models, cross-spectral analysis, and nonlinear dynamic models. Chapter 14 continues this discussion of longitudinal dyadic data by considering situations in which the dependent variable is dichotomous. Here, the authors consider sequential analysis within

log-linear and multilevel logistic models, as well as event history analysis, in which the time to a dichotomous outcome (e.g., the termination of a relationship) is predicted.

Chapter 15 concludes the book with a presentation of specialized models not considered elsewhere in the book, including mutual influence and common-fate models (which are similar to the APIM), triadic interdependence, and other aspects of group interdependence (viewing the rest of a group as the “partner” in the APIM; controlling for network autocorrelation in inferences made at the individual level). The authors then provide an important overview of the statistical and conceptual meanings of interdependence, as well as reiterate important points regarding study design and measurement. To conclude this chapter and the book, the authors describe the “seven deadly sins” of dyadic data analysis, errors in the analysis of dyadic data that are all too common in psychological research.

### **Strengths of the Book**

Perhaps the most important contribution of this book lies in the fact that it is the first comprehensive treatment of how researchers can quantitatively analyze various patterns of interdependent data. This focus facilitates more realistic modeling of the interdependence that is so inherent within psychological phenomena, and the thorough guidance this book provides will allow researchers to reconsider interdependence as an analytic opportunity rather than a statistical nuisance to be ignored, avoided, or otherwise removed from investigation.

In addition to the focus itself, the book is exceptionally well written. The authors have clearly made great efforts to ensure that the book is straightforward and accessible by writing in an extremely clear and engaging manner, relying on both basic and advanced analytic approaches (and gently introducing the more advanced analytic approaches), and providing numerous examples

to illustrate the analytic strategies described. The previously mentioned organization of the book around approaches to answering substantive questions (rather than around specific statistical approaches) also engages the reader and does much to draw in investigators from all disciplines. Although quantitative books do not necessarily have reputations as page-turners, this book reads like a good mystery—drawing the reader in with interesting questions, then providing satisfying answers that the reader can readily relate to his or her own research.

In addition to these broad strengths, a few more minor (yet important) features merit mention. The authors have included sample syntax in a variety of programming languages that users can use as models for their own data analyses. Further syntax examples are available on an accompanying website, which also includes the data for these examples as well as corrections and updates to the material presented in this book. Finally, the book itself is aesthetically well designed: The text is clearly organized, the tables and figures are attractive and easy to read, and the index is complete and useful.

### **Recommended Audience for This Book**

An important consideration of any book is who should read it. The answer to this question is simple: any psychologist who is interested in studying interdependent phenomena. Given the range of subdisciplines within psychology for which this interdependence is relevant, this casts a very wide net. It is probably not an overstatement to conclude that every psychologist who conducts or reads about quantitative analyses should read this book. Fortunately, the authors have written this book to be accessible and engaging to readers from a variety of disciplines.

An equally appropriate question, and one that is relevant for a book presenting sophisticated quantitative material, is what sort of prerequisite knowledge one should have before reading this

book. Again, the answer to this question is broad. Although the book sometimes relies on sophisticated quantitative techniques, the prerequisite knowledge for this book is fairly minimal: Readers with a solid foundation in ANOVA and multiple regression will certainly be able to conduct many of the analyses described in this book. At the same time, this book presents novel, often sophisticated methods of data analysis, so even readers with extensive quantitative training will learn much from this book. In short, although a more extensive quantitative background will enrich the reading, it is certainly not necessary for readers to understand and apply the analytic strategies described in this book.

Perhaps the most difficult question to answer is, What is the place of this book in the data-analytic training of psychologists? My answer to this question is twofold. First, I consider this book essential reading for any psychologist who claims to have adequate training in data analysis. Interdependent processes are too critical in psychological science for us to continue to ignore, and this book is the most comprehensive description of how we can analyze these interdependencies. Second, I consider this book valuable reading both early in psychologists' training, perhaps immediately after introductory courses in multivariate statistics, and later in psychologists' training after they have more exposure to advanced quantitative methods. Of course, more seasoned researchers will also find this book valuable and may even wish this book had been available earlier in their careers.

## **Conclusions**

Although major paradigm shifts in the field are difficult to predict, I believe that this book has the very real possibility of sparking an important change in how researchers conceptualize, study, and quantitatively analyze interdependent processes. It is probably not an overstatement to conclude that traditional methods of data

analysis that assume independence of observations have made it difficult to study interdependent phenomena and may have even led us away from theorizing about such phenomena; this book provides a way of bringing such interdependence back into our data analyses and scientific scope. Sternberg (1992) identified eight features of publications that have had a large impact on the field of psychology; these publications (a) have an important message that goes beyond temporary fads, (b) are broad in terms of topic and intended audience, (c) are well written, (d) are accessible and of interest to a broad audience, (e) provide concrete examples, (f) show why the message is important, (g) speak in an engaging voice, and (h) strike a responsive chord. While the outcome of this eighth aspect remains to be seen (but about which I am optimistic), the first seven describe this book perfectly. For these reasons, I expect that this book will have a substantial impact on the field and highly recommend it to all psychologists who study interdependent phenomena.

---

## References

- Card, N. A., Selig, J. P., & Little, T. D. (Eds.). (in press). *Modeling dyadic and interdependent data in developmental research*. Mahwah, NJ: Erlbaum.
- Kenny, D. A. (1994). *Interpersonal perception: A social relations analysis*. New York: Guilford Press.
- Sternberg, R. J. (1992). *Psychological Bulletin's* top 10 "hit parade." *Psychological Bulletin*, 112, 387–388. [PsycINFO](#)  
[Article](#)
- Wasserman, S., & Faust, K. (1994). *Social network analysis: Methods and applications*. New York: Cambridge University Press.

PsycCRITIQUES  
1554-0138

August 15, 2007, Vol. 52, Release 33,

Article 152

[© 2007, American Psychological Association](#)