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INTRODUCTION TO THE PSYCHOLOGY RESEARCH HANDBOOK

Frederick T. L. Leong and James T. Austin

We are happy to see the continued interest in the *Psychology Research Handbook* (PRH) and are pleased to introduce the third edition. With this edition, we have kept the overarching framework of presenting the research process as a series of cognitive scripts. As in the second edition, Hershey, Jacobs-Lawson, and Wilson (this volume) provide a detailed discussion of this framework in Chapter 2. We had noted in the previous edition that researchers have directed substantial attention to the content, structure and process, and development of competence among scientists (Aiken, West, & Millsap, 2008; Aiken, West, Sechrest, & Reno, 1990; Azmitia & Crowley, 2001; Kuhn, Amsel, & O'Loughlin, 1988; Nisbett, 1993; Tweney, Doherty, & Mynatt, 1981).

Research on the emergence of scientific thinking from an educational perspective summarized by McComas (2014) can contribute as well. Using this work about knowledge and skill as a starting point, we have organized the issues involved in conducting research and in learning the domain. As a result, the key organizing principle behind this edition of the *Psychology Research Handbook* (PRH) remains our conviction that cognitive scripts can be applied to the acquisition of higher-order research skills (cf. Hershey, Wilson, & Mitchell-Copeland, 1996). The application of scripts involves consideration of the research process as a procedural knowledge structure (Abelson, 1981; Galambos, Abelson, & Black, 1986; Schank & Abelson, 1977). Such a knowledge structure serves to sequence the activities involved in uneventful "normal science" research, and provides sufficient flexibility to accommodate changes in technology, conceptual structure, or immediate situation. In using the cognitive script framework, the current *Handbook* is distinctive from other research books by helping the reader/researcher move from descriptive knowledge to procedural knowledge.

Therefore, we have maintained a developmental-educational perspective on scripts for the research process to guide graduate students and research assistants. The research script is a function of exposure and activity. In learning the research process, descriptive knowledge is first acquired during undergraduate psychology classes and sometimes through volunteer research group participation. It can be amplified thereafter through graduate school, other research experiences, and either conducting or consuming research that yields procedural knowledge. Working from this assumption, it should be possible to assess how well different individuals, at different stages of their training, possess scripts for conducting various types of research. Hershey et al. (1996) published a study to evaluate the plausibility of scripts for research. Their study involved asking different groups of participants to generate the "steps" of the research process within an interval bounded by two phrases: "get a research idea" and "publish a paper." Using four groups sampled along a novice–expert continuum (e.g., introductory psychology students, graduate students, assistant professors, full professors), their results indicated qualitative and quantitative

differences in the scripts generated. Specifically, the scripts generated by novices (undergraduate students) differed from those who are presumably more expert (professors). A famous example of this is Bem's (2002) chapter on how to write an empirical research article that distinguishes between what students are taught to do and what seasoned researchers actually do.

Another application of the script concept to research consists of elaborating individual differences in expertise. How might the same general cognitive structure be manifested differentially across scientists? How might development proceed from novice to expert over a period of 10 years or more? Both the current and previous editions of this handbook have been based on our procedural analysis of the scientific research process that was used to generate the schematic for this handbook. As the chapter by Hershey and associates indicates, the research script is substantiated by empirical studies (Hershey et al., 1996) and is applicable to the teaching process (Wilson & Hershey, 1996).

This third edition of the *Handbook* contains many of the chapters from the previous edition, which have been significantly updated. However, some of these chapters have either new coauthors or totally new coauthors due to life changes (e.g., retirements, deaths). There is even a father–son collaboration! We believe that these new authors of previous chapters provide new perspectives to the core topics covered in the *Handbook*. At the same time, this edition is also based on an updated and expanded view of the research process in view of developments in the last decade. We have therefore added new chapters to reflect those changes.

There is a new chapter on alternative data collection strategies by Stupica, Stupica, and Christiansen. In this chapter on alternative strategies for data collection, Stupica et al. begin by noting what they will *not* cover and relate that list to other chapters in this edition as well as to additional sources (psychoneuroimmunology). They do include observational methods based on their suspicion of neglect (which we share) by researchers. Organized along constructs typical in psychology, specifically cognition, emotion, and behavior, the chapter presents brief descriptions of each alternative strategy (e.g., interviews, experience sampling, content analysis, reaction times) and its use in a published journal article, along with a few other references for further reading or investigation. The program Linguistic Inquiry and Word Count (LIWC) is an example of a software tool. This chapter serves as a resource for emerging researchers that are the target reader population for our handbook.

Another new chapter covering power and evidence is written by Lo, Bhaktha, Mauck, and O'Connell. In this chapter, Lo, Bhaktha et al. delve into issues of statistical power that are crucial for researchers at any stage of expertise, whether producing or consuming research. In addition to theory, they provide guidance on power analysis tools or software (including the ubiquitous R). Overarching this chapter, Lo, Bhaktha et al. are clear about the role of power in evaluating research evidence quality.

Third, there is a chapter on SEM by Bryne (this volume) that provides a general overview of the basic concepts that underlie SEM methodology and illustrates the method with one example of how this methodological strategy can be used in testing for the validity of hypothesized factorial structure. In her overview, she describes what is meant by the term *structural equation modeling*, followed by an explanation of the basic concepts, structural components, graphical symbols, and two basic types of models common to SEM analyses. Consistent with the *Handbook* theme that research skills consist of a series of cognitive scripts, Byrne (this volume) provides an annotated illustration of the SEM approach. In the illustrative example, she outlines the specific steps involved in testing

for the validity of a confirmatory factor analytic (CFA) model by using a popular scale for measuring adolescent self-concept. The example examines a 2-factor structure comprising Physical Self-Concept (Appearance) and Social Self-Concept (Peers) from the original 4-factor nonacademic scale of the Self Description Questionnaire I (Marsh, 1992; SDQ I) using the Mplus program (Muthén & Muthén, 1998–2015, Version 7.4). Bryne (this volume) also refers the reader to a more extensive coverage to the SEM approach in her other publications (Byrne, 2006, 2012b, 2016).

One of the recent challenges in research methods in psychology is the seeming lack of replicability and reproducibility in our research findings. In Chapter 35, Keller and Cesario (this volume) address this development in research methodology regarding replicability and reproducibility in psychology. In this chapter, they address the role of replication in psychology by providing an overview of the most recent debates on replication within the field followed by a discussion of recent methodological advances to address the issue. They review the historical attention to the issue as well as recent key studies that have raised widespread concern about the problem. This review includes the development of the Open Science movement in the field. Their chapter also presents recently developed tools to assess and improve replicability of the field. These tools include comprehensive guidelines for conducting replication studies, a more critical and nuanced approach to evaluating the results of replication studies, as well as the incredibility index. Keller and Cesario (this volume) end with a discussion of best practices in conducting replication studies.

A brief note on language: gender may be stated as binary occasionally throughout the text for the purpose of statistical examples, but we acknowledge there is more gender diversity than these simplified calculations suggest. It may be useful to consider gender, just like race, as a set of categories (moving from a t-test framework to an ANOVA one).

In conclusion, we hope that this latest edition will continue to serve as a valuable resource for the research training of graduate students and research assistants in psychology and related fields. We look forward to the current edition of the *Handbook* serving as an important guide to the acquisition of essential procedural knowledge about the research process either as a textbook or a reference volume. In the interest of both formative and summative evaluation, we also invite instructors, graduate students, and research assistants to send us feedback as they use this *Handbook* (Frederick Leong, email: fleong@msu.edu and James Austin, jta_associates@outlook.com) in terms of improving the content within chapters or suggesting new content for future editions.