Evaluating and conducting intervention studies: a guide for speech and language therapists

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Contents

Preface

Why did we write this book?

Those who work in caring professions aim to implement interventions to do good. Often, however, it is hard to know how effective we have been: would change have occurred if we hadn't intervened? Is it possible we are doing more harm than good? To answer these questions and develop a body of knowledge about what works, we need to evaluate interventions.

In medicine, practitioners who wish to evaluate treatments typically have access to expert statisticians and methodologists, who can advise them on the most efficient research designs and up-to-date analyses. However, in many fields, professionals who administer interventions have little or no training in research design, and no support from professional statisticians. The training of speech and language therapists (known as speech-language pathologists or logopeds outside the UK) does not usually include much instruction in research methodology and statistics - particularly as this relates to evaluation of interventions, which is a complex and thorny topic. It seemed, therefore that there was a need for a basic text that would explain the rationale and potential pitfalls of intervention research, as well as providing a template for good practice in the evaluation and design of intervention studies.

As we shall see, demonstrating that an intervention has an impact is much harder than it appears at first sight. There are all kinds of issues that can arise to mislead us into thinking that we have an effective treatment when this is not the case. Much of the attention of methodologists has focused on how to recognise and control for unwanted factors that can affect outcomes of interest. But psychology is also important: it tells us that own human biases can be just as important in leading us astray. Good, objective intervention research is vital if we are to improve the outcomes of those we work with, but it is really difficult to do it well, and to do so we have to overcome our natural impulses to interpret evidence in biased ways.

Who is this book for?

Although the inspiration for the book came from interactions with speech and language therapists, and the illustrative cases are from that discipline, the basic principles covered here are relevant for any field where a practitioner aims to influence outcomes of those they work with. This includes professions allied to medicine and education.

What is covered?

This book is not a how-to-do-it manual, so much as a why-to-do-it. Our main goal is to instill in the reader awareness of the numerous sources of bias that can lead to mistaken conclusions when evaluating interventions. Real-life examples are provided with the aim of providing an intuitive understanding of these issues. Of course, it is not much use telling people what *not* to do if you don't also give guidance on approaches that are effective. We will illustrate ways in which different research designs can overcome problems, but it is beyond the scope of this book to give detailed instructions on how to implement different methods: instead, we will point readers to other sources that give more in-depth information.

We expect that many readers will have little or no background in statistics. Lack of statistical training is a massive obstacle to practitioners who want to do intervention research: it not only makes design and analysis of a study daunting, but it also limits what a potential researcher can take from the existing literature. This book should be seen as complementing rather than substituting for a technical introduction to statistics. Many readers may be reluctant to study statistics in more depth, but it is hoped that the account given here will give them confidence to approach statistics in the published literature with a more critical eye, to recognise when the advice of a professional statistician is needed, and to communicate more effectively with statisticians.

Intervention research is a branch of science, and you can't do good science without adopting a critical perspective – to the research of yourself as well as others. We hope this book will make it easier to do that and so to improve intervention research in speech and language therapy as well as other fields.

Dorothy Bishop & Paul Thompson

Chapter 1

Introduction

You can label chapter and section titles using `{#label}` after them, e.g., we can reference Chapter 1. If you do not manually label them, there will be automatic labels anyway, e.g., Chapter 3.

Figures and tables with captions will be placed in `figure` and `table` environments, respectively.

```r
par(mar = c(4, 4, .1, .1))
plot(pressure, type = 'b', pch = 19)
```

Reference a figure by its code chunk label with the `fig:` prefix, e.g., see Figure 1.1. Similarly, you can reference tables generated from `knitr::kable()`, e.g., see Table 1.1.

```r
knitr::kable(
  head(iris, 20), caption = 'Here is a nice table!',
  booktabs = TRUE
)
```

You can write citations, too. For example, we are using the **bookdown** package (Xie, 2021) in this sample book, which was built on top of R Markdown and **knitr** (Xie, 2015).

Figure 1.1: Here is a nice figure!

Table 1.1: Here is a nice table!

Sepal.Length	Sepal.Width	Petal.Length	Petal.Width	Species
5.1	3.5	1.4	0.2	setosa
4.9	3.0	1.4	0.2	setosa
4.7	3.2	1.3	0.2	setosa
4.6	3.1	1.5	0.2	setosa
5.0	3.6	1.4	0.2	setosa
5.4	3.9	1.7	0.4	setosa
4.6	3.4	1.4	0.3	setosa
5.0	3.4	1.5	0.2	setosa
4.4	2.9	1.4	0.2	setosa
4.9	3.1	1.5	0.1	setosa
5.4	3.7	1.5	0.2	setosa
4.8	3.4	1.6	0.2	setosa
4.8	3.0	1.4	0.1	setosa
4.3	3.0	1.1	0.1	setosa
5.8	4.0	1.2	0.2	setosa
5.7	4.4	1.5	0.4	setosa
5.4	3.9	1.3	0.4	setosa
5.1	3.5	1.4	0.3	setosa
5.7	3.8	1.7	0.3	setosa
5.1	3.8	1.5	0.3	setosa

Chapter 2

Literature

Here is a review of existing methods.

Chapter 3

Methods

We describe our methods in this chapter.

Chapter 4

Applications

Some *significant* applications are demonstrated in this chapter.

4.1   Example one

4.2   Example two

Chapter 5

Final Words

We have finished a nice book.

Bibliography

Xie, Y. (2015). *Dynamic Documents with R and knitr*. Chapman and Hall/CRC, Boca Raton, Florida, 2nd edition. ISBN 978-1498716963.

Xie, Y. (2021). *bookdown: Authoring Books and Technical Documents with R Markdown*. R package version 0.22.