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Kathy Conklin , Ana Pellicer-Sánchez , Gareth Carrol
Frontmatter
More Information

Eye-Tracking

Eye-tracking is quickly becoming a valuable tool in applied linguistics research as it provides a real-time, direct measure of cognitive processing effort. This book provides a straightforward introduction to the technology and how it might be used in language research. With a strong focus on the practicalities of designing eye-tracking studies that achieve the standard of other well-established experimental techniques, it provides valuable information about building and designing studies, touching on common challenges and problems, as well as solutions. Importantly, the book looks at the use of eye-tracking in a wide variety of applied contexts including reading, listening and multimodal input, writing, testing, corpus linguistics, translation, stylistics and computer-mediated communication. Each chapter finishes with a simple checklist to help researchers use eye-tracking in a wide variety of language studies. Discussion is grounded in concrete examples, which will allow users coming to the technology for the first time to gain the knowledge and confidence to use it to produce high-quality research.

Kathy Conklin is an associate professor in psycholinguistics at the University of Nottingham. She has expertise in the use of eye-tracking to understand processing in a first and a second language.

Ana Pellicer-Sánchez is a senior lecturer in applied linguistics and TESOL at the UCL Institute of Education. Her research centres on the teaching and learning of vocabulary in a second and foreign language and makes use of eye-tracking.

Gareth Carrol is a lecturer in psycholinguistics and a researcher in figurative and formulaic language at the University of Birmingham. His work focuses on idioms and utilises psycholinguistic methods, principally eye-tracking, to investigate questions relating to processing, learning and use in first and second language speakers.

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A Guide for Applied Linguistics Research

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Contents

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Figures

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More Information

Tables

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Preface

The eyes provide a window into the mind.

Eye-tracking can in part make this statement a reality. More specifically, by tracking people's eye-movements, we can determine what they are attending to and for how long. By extension, we can make inferences about what they might be thinking about and how much cognitive effort they expend in doing so. We don't need to set an additional task (although we often do); we can simply ask participants to read a text, look at an image or watch a video as they normally would on a computer screen. Importantly, eye-tracking provides a rich moment-to-moment data source. Because of its advantages, it is an essential and well-established research tool in psychology and psycholinguistics, as well as in more applied fields like translation studies. Increasingly, it is being used more widely in a range of applied linguistics domains. While it might seem that eye-tracking is a magic potion that can make our studies more natural, authentic, less contrived, etc., it is simply a tool. Like all tools, it is only as good as the uses we put it to. Even with the best equipment and high-quality materials, with no training we are far more likely to build a rickety shack than a good, sturdy house. Without a clear understanding of the limitations of eye-tracking technology and a good foundation in experimental design and data analysis, eye-tracking technology will likely tell us very little. The goal of this book is to provide readers with a good foundation so that eye-tracking can become a useful and valuable research tool in applied linguistics research.

One aim of this book is to provide researchers with a good understanding of what eye-tracking is and what it can do given the current technical constraints of the equipment. Our focus is on the main eye-tracking systems that are used in language research: SR Research EyeLink, Tobii and SensoMotoric Instruments (SMI)[1] systems. We do not advocate the use of any one system over and above the others. We simply provide information about technical specifications and the dedicated software that the systems use to design experiments and analyse data. This should help readers gain an awareness of the kinds of studies that are appropriate and/or easier to carry out with particular systems.

The book is intended to be broad and inclusive, to make eye-tracking understandable, accessible and achievable for any language researcher coming to the technology for the first time. We expect the primary audience of the book to be applied linguists, and it covers a range of topics that will be of particular interest to them. However, the book can also be a resource for people in fields where eye-tracking is well established, but the researchers themselves are making a start with the technology. The sheer volume of language research making use of the technology will prove daunting for anyone starting out with it, no matter the field. Thus, in this book, we explain the basic assumptions of eye-tracking, which are

[1] Eye-tracking manufacturers and software developers are constantly updating to ensure that their methods are advanced and up-to-date, which means that the landscape is constantly shifting. After the book was written, Apple acquired SensoMotoric Instruments. This will likely pose challenges for SMI users, as the level of support and the pace of developments may change or even cease entirely.

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often not fully spelled out. Understanding these is the first step in producing good research with the technology.

A predominant theme throughout the book is the methodological considerations we should take into account when designing studies. We try to relate all of our discussions to concrete examples. In Chapters 1, 4 and 5 we spell out methodological concerns largely in regard to existing research. This serves two purposes. First, it provides some sense of the existing eye-tracking literature. Second, it lays out some well-established means for dealing with a range of methodological concerns. In Chapter 6, we turn to more uncharted territory and provide a discussion of methodological considerations when using eye-tracking in very applied fields, which have generally been less explored. We have tried to describe a range of 'test cases' where we think eye-tracking could be fruitfully employed, as well as a few examples where it has already been used. Importantly, the focus in this chapter is on how we can meaningfully use eye-tracking with 'authentic' materials. A recurring topic is the trade-off between maintaining authenticity and modifying the experimental input in various ways so that we can acquire particular kinds of data.

In this book we walk people through eye-tracking from start to finish, and it can be read from cover to cover to gain a comprehensive overview of eye-tracking technology and its use in (applied) language research. However, the book is also written in such a way that it can be used as a resource for studying particular topics. Thus, if a reader already has some knowledge about eye-tracking in reading, he/she may not need to read Chapter 4 on reading research before diving into the discussion of eye-tracking reading tests in Chapter 6. Because we intend sections of the book to be somewhat self-contained, this means that there is some repetition in places. Similarly, in Chapters 2 and 7, where we talk about the different eye-tracking systems, readers may want to read them from start to finish if they want to learn more about the available systems – maybe because they are considering buying one. However, in many cases researchers may only have access to a particular eye-tracker. Thus, they may only want to read the sections that are specifically relevant to their system. Again, allowing the discussion to be, at the same time, inclusive and compartmentalised leads to a certain level of repetition.

This book would have been difficult to write without the help and support of manufacturers and colleagues. Thanks to people who have either read and commented on sections of the book, or helped with guidance on and demonstration of certain aspects of the system: Kurt Debono, William Schmidt, Sam Hutton, Marcus Johnson and Jiye Shen of SR Research; Ricardo Matos and Cecilia Lago Albright of Tobii; Meike Mischo and Stefanie Gehrke of SMI; and Richard Lilley of Tracksys Ltd. We would also like to thank our colleagues Steven Frisson and Bodo Winter (University of Birmingham) and Walter van Heuven (University of Nottingham) for their comments on different parts of the book and guidance on the use of some systems, as well as Dave Evans for his attentive proofreading.

Finally, we believe that we have produced a comprehensive overview of (1) the current state of eye-tracking technology for language research; (2) what measuring eye-movement behaviour can tell us in various domains; and (3) how we might extend it to more applied contexts. Our discussion is grounded in concrete examples to allow new users of the technology to gain the knowledge and confidence to use the 'tool' to produce high-quality research. We hope that you find it a good and helpful resource.

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