Making Everything Easier!™

Cognitive Psychology

FOR DUMMIES®

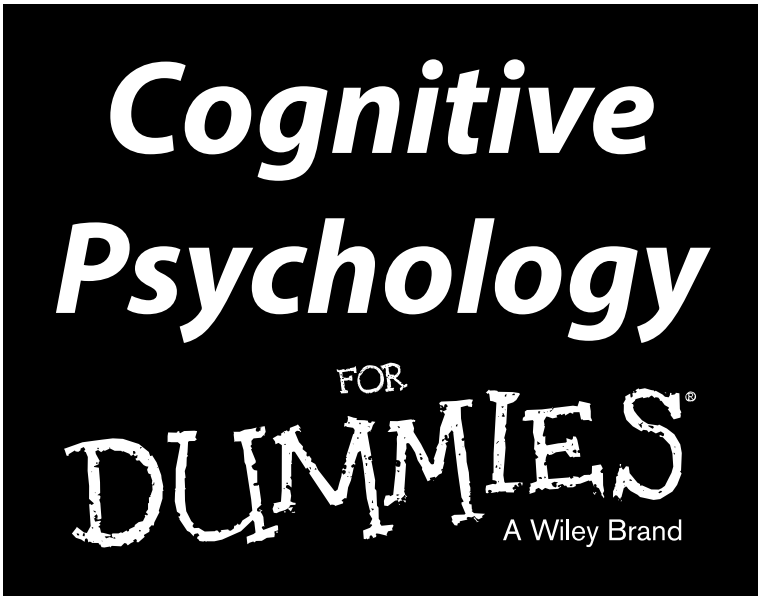
A Wiley Brand

Learn to:

- Grasp the fundamentals of cognitive psychology
- Apply key concepts concerning perception, memory, language and thought
- Write better research reports

Dr Peter J. Hills, PhD
Senior Lecturer in Psychology

Dr J Michael Pake
Senior Lecturer in Psychology


Cognitive
Psychology
FOR
DUMMIES®
A Wiley Brand

Cognitive Psychology

FOR DUMMIES®

A Wiley Brand

by Dr Peter J Hills and
Dr J Michael Pake

FOR DUMMIES®
A Wiley Brand

Cognitive Psychology For Dummies®

Published by: **John Wiley & Sons, Ltd., The Atrium, Southern Gate, Chichester,** www.wiley.com

This edition first published 2016

Registered Office

John Wiley & Sons, Ltd., The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, United Kingdom

For details of our global editorial offices, for customer services and for information about how to apply for permission to reuse the copyright material in this book, please see our website at www.wiley.com.

For general information on our other products and services, please contact our Customer Care Department within the U.S. at 877-762-2974, outside the U.S. at 317-572-3993, or fax 317-572-4002. For technical support, please visit www.wiley.com/techsupport.

Wiley publishes in a variety of print and electronic formats and by print-on-demand. Some material included with standard print versions of this book may not be included in e-books or in print-on-demand. If this book refers to media such as a CD or DVD that is not included in the version you purchased, you may download this material at http://booksupport.wiley.com. For more information about Wiley products, visit www.wiley.com.

A catalogue record for this book is available from the British Library.

Library of Congress Control Number: 2016930757

ISBN 978-1-119-95321-0 (pbk); ISBN 978-1-119-95390-6 (ebk); ISBN 978-1-119-95391-3 (ebk)

Manufactured in the United States of America

10 9 8 7 6 5 4 3 2 1

Contents at a Glance

Table of Contents

Introduction

The fact that you're reading this book implies that you have an interest in cognitive psychology or you're studying it for a course. In either case, you probably think that you know what cognitive psychology is: the study of all mental abilities and processes about knowing. Clearly, the subject covers a huge range whose contents would barely fit into 50 books the size of this one – with more being written every day!

We think that everybody should be interested in cognitive psychology, because it's fascinating. We know that all aficionados say that (from bell ringers to beer-mat collectors), but cognitive psychology really is! By scientifically studying how people see, remember, know, speak and think, you can truly understand what being human means and what makes all humans special.

About This Book

Cognitive Psychology For Dummies is designed as an introduction to the subject. We cover the historical perspective on cognitive psychology, but also draw on interesting, more recent work.

We adopt an informal writing style, but one that remains technically appropriate and scientifically accurate. We write in plain English (which is tricky, because cognitive psychologists love jargon!). Where we do use technical language you can assume that it's the only way to express something, but overall we make the tone as friendly as possible. We even include some jokes (if you don't spot any, it's because we're not very funny!). At no point are we making fun of anyone (except ourselves).

We endeavour to relate everything in this book to everyday reality, using real-world examples to anchor the more technical information. Nevertheless, cognitive psychologists like to create highly controlled, laboratory-based experiments that, on the surface, bear little resemblance to the real world. Don't fear though; everything cognitive psychologists study has some benefit to humanity.

Most chapters also cover instances of 'when things go wrong'. These discussions show how a particular cognitive ability can go haywire in healthy people (such as visual illusions) or those with brain damage.

This book is for people who need and want to know about cognitive psychology. For the former, we present all the information covered in school and the first year of a university course (anywhere in the world) in a highly accessible way. We map the content onto the most common courses of cognitive psychology. If you simply want to know about cognitive psychology, we present some of the most interesting and fun psychology here too. We pack the book with examples and exercises you can try out and demonstrate on your friends and family to amaze them!

Conventions Used in This Book

We use conventions to help you find your way around this book easily:

- *Italic* text highlights new, often specialist, terms that we always define nearby. These include elements of jargon we just can't escape, though we also use italics for emphasis.
- **Boldfaced** text indicates part of a list or numbered steps.

Unlike most textbooks in psychology, we don't include references or in-text citations. We mention the name of a researcher when we feel that the person's work is important and worth remembering.

We sometimes describe a few of the most important and influential studies, but not always. Be assured, however, that all the results and effects we describe in this book are based on empirical research – we simply don't want to get bogged down in such detail too often.

We also provide a number of sidebars, containing additional information with more detailed theories, methodologies or clinical examples. You can skip over these without missing anything essential, but we think they're interesting and add a lot to the text.

Foolish Assumptions

Hundreds of books on cognitive psychology exist. Many are technical, long, dry, specialised or cover a very narrow area of cognition. We wrote *Cognitive Psychology For Dummies* assuming the following:

- You want to understand how people think, see and remember things.
- You have questions about how the human mind works.
- You're starting a course in cognitive psychology and haven't studied it before.
- You've found other textbooks too complicated, dry or technical.
- You're simply interested in people.
- You have a basic understanding of psychology, probably from an introductory course or reading *Psychology For Dummies*.
- You want to discover a few tips on improving your own cognition.

Icons Used in This Book

Throughout this book, we use icons in the margins to help you find certain types of information. Here's a list of what they mean.

When you see this icon, we're giving you a bit of information that may come in handy someday.

Don't forget the information by this icon! It shows what you need to pick up from the particular paragraph.

Like most sciences, cognitive psychology has a lot of terms and particular usages. We highlight them with this icon so that you can join in the conversation wherever cognitive psychologists gather.

This icon flags text that rises above what you need for a basic understanding of the topic at hand. You can skip these paragraphs if you prefer without harming your comprehension of the main point. We often use this icon when describing studies in detail or the brain regions involved in cognition.

We use this icon to point out how the information under discussion has applications or is observed in reality.

This icon indicates a task or exercise to perform on yourself or someone you know. The exercises are based on examples we provide in the text or on an Internet resource.

Beyond the Book

The area of cognitive psychology is so vast that its contents would fill far more than this book. Given that it's really interesting and exciting, we want to give you as much chance to learn about it as possible, and so we put some extras on the Internet. In addition to the printed chapters, you can find loads more (free!) *Cognitive Psychology For Dummies* information at `www.dummies.com/extras/cognitivepsychology`.

In an online cheat sheet found at `www.dummies.com/cheatsheet/cognitivepsychology`, we include a quick guide to some central cognitive psychology ideas on memory, language and problem solving, among other topics.

Where to Go from Here

We organise this book in a logical representation of how the human brain works (information comes in, is remembered, spoken and thought about), but each chapter is self-contained so that you can dip in and out at your leisure. Except for the first and last parts, each part deals with a different element of cognitive psychology, so you can pick out the sections that you're most interested in or are struggling with the most.

Use the table of contents and index to find what's most relevant to you. If you're new to the subject, you may want to start with Chapter 1 and read the book in sequence, but you don't have to read it cover to cover.

We hope that you find the book educational, informative and entertaining. We think that you'll like it and learn a lot about yourself as you go. If you do, tell your friends about it!

Part I

Getting Started with Cognitive Psychology

Go to www.dummies.com for bonus information about cognitive psychology and almost any other topic that interests you.

In this part . . .

- Understand what cognitive psychology is and why it's so darn important.
- Realise how cognitive psychology influences every aspect of the human experience that involves thinking.
- Find useful tips on how cognitive psychology can improve your cognitive skills in school, college, university and almost all walks of life.

Chapter 1

Understanding Cognition: How You Think, See, Speak and Are!

In This Chapter

- Defining cognitive psychology
- Detailing the discipline's research methods
- Looking at some limitations

How do you know that what you see is real? Would you notice if someone changed her identity in front of you? How can you be sure that when you remember what you saw, you're remembering it accurately? Plus, how can you be sure that when you tell someone something that the person understands it in the same way as you do? What's more fascinating than looking for answers to such questions, which lie at the heart of what it means to be . . . well . . . you!

Cognitive psychology is the study of all mental abilities and processes about knowing. Despite the huge area of concern that this description implies, the breadth of the subject's focus still sometimes surprises people. Here, we introduce you to cognitive psychology, suggesting that it's fundamentally a science. We show how cognitive psychologists view the subject from an information-processing account and how we use this view to structure this book.

We also describe the plethora of research methods that psychologists employ to study cognitive psychology. The rest of this book uses the philosophies and methods that we describe here, and so this chapter works as an introduction to the book as well.

Introducing Cognitive Psychology

Cognitive psychologists, like psychologists in general, consider themselves to be *empirical* scientists – which means that they use carefully designed experiments to investigate thinking and knowing. Cognitive psychologists (including us!) are interested in all the seemingly basic things that people

take for granted every day: perceiving, attending to, remembering, reasoning, problem solving, decision-making, reading and speaking.

To help define cognitive psychology and demonstrate its 'scientificness', we need to define what we mean by a science and then look at the history of cognitive psychology within this context.

Hypothesising about science

Although many philosophers spend hours arguing about the definition of science, one thing that's central is a systematic understanding of something in order to make a reliable prediction. The *scientific method* commonly follows this fairly strict pattern:

1. **Devise a testable hypothesis or theory that explains something.**

   An example may be: how do people store information in their memory? Sometimes this is called a *model* (you encounter many models in this book).

2. **Design an experiment or a method of observation to test the hypothesis.**

   Create a situation to see whether the hypothesis is true: that is, manipulate something and see what it affects.

3. **Compare the results obtained with what was predicted.**

4. **Correct or extend the theory.**

Philosopher Karl Popper suggested that science progresses faster when people devise tests to prove hypotheses wrong: called *falsification*. After you prove all but one hypothesis wrong about something, you have the answer (the Sherlock Holmes approach – if you exclude the impossible, whatever remains must be true!). This is also called *deductive reasoning* (see Chapter 18 for the psychology of deduction).

The scientific method has some clear and obvious limitations (or strengths, depending on the way you look at it):

- **You can hypothesise and test only observable things.** For this reason, many cognitive psychologists don't see Sigmund Freud, Carl Rogers and others as scientists.
- **You must conduct experiments to test a theory.** You can't do research just to find out something new.

Cognitive psychology employs the scientific method vigorously. Everything we describe in this book comes from experiments that have been conducted following this method. Although this does sometimes limit the questions you can ask, it establishes standards that all research must follow.

Describing the rise of cognitive psychology

Before cognitive psychology, people used a variety of approaches (or *paradigms*) to study psychology, including behaviourism, psychophysics and psychodynamics. The year 1956, however, saw the start of a cognitive renaissance, which challenged, in particular, behaviourism. For more background on how cognitive psychology emerged from other scientific disciplines, chiefly behaviourism, check out the nearby sidebar '1956: The year cognitive psychology was born'.

We don't intend to minimise the importance of behaviourism: it ensured that the scientific method was applied to psychology and that experiments were conducted in a controlled way. Cognitive psychology took this strength and carried it into more ingenious scientific studies of cognition.

1956: The year cognitive psychology was born

The behaviourist approach dominated psychology until 1956, when enough people found that it was insufficient to understand human behaviour. Specifically, behaviourism couldn't explain cognition. Part of the issue was that virtually all behaviourist research was conducted on animals (usually rats and pigeons), and perhaps humans are different to animals. Interest in new areas also proved difficult for the behaviourist model to deal with. Imagery, short-term memory, attention and the organisation of knowledge can't be easily interpreted within the behaviourist model, because behaviourists are only interested in observable behaviour.

The attack on behaviourism became venomous, with American linguist Noam Chomsky leading the charge. He claimed that the behaviourist analysis for language learning was wrong (for reasons we discuss in the chapters in Part IV). His attack coincided with a series of other key papers that showed behaviourism was waning and cognitive science was the way forward: George Miller's paper on the magic number seven (see Chapter 8), Allen Newell and Herb Simon's problem-solving model (Chapter 17), and the birth of artificial intelligence. All this happened in 1956. This *cognitive renaissance* culminated in the first textbook on cognitive psychology in 1967 by Ulric Neisser, a German-American cognitive psychologist. He described this book as an attack on behaviourism.

Looking at the structure of cognition (and of this book)

Fittingly, we're writing this book to bring cognitive psychology to a wider audience around the 50th anniversary of the first published cognitive psychology textbook (in 1967).

Applications

In Part I, we review the applications of cognitive psychology and why studying it is important. Cognitive psychology has produced some incredibly exciting and interesting findings that have changed how people view psychology and themselves (as you can discover in Chapter 2). But also, people have learnt a great deal about how best to teach, learn and improve themselves from cognitive psychology, something we address in Chapter 3. The applications of cognitive psychology are so wide that studies are used in such disparate fields as computing, social work, education, media technology, human resources and much more besides.

Information-processing framework

In this book, we follow the *information-processing* model of human cognition. In many ways, this approach to cognition is based on the computer. The idea is that human cognition is based on a series of processing stages. In 1958, Donald Broadbent, a British psychologist, argued that the majority of cognition follows the processing stages we depict in Figure 1-1. The boxes represent stages of cognition and the arrows represent processes within it.

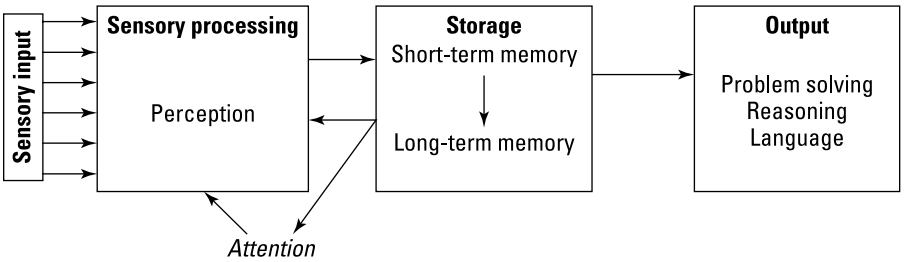


Figure 1-1: Basic processes in cognition according to information processing.

All cognition fits within this framework. Cognitive psychologists research each box (stage) and each arrow (process) in Figure 1-1 in many different domains. In other words, this framework provides a good structure for how to think about and learn about cognitive psychology (and oddly matches the framework of this book).

Your leg bone's connected to your knee bone

Cognitive psychology's favoured information-processing framework corresponds well with how the brain seems to process information. People have sensory organs that detect the world. These connect to parts of the brain devoted to perception (in the case of vision, the *occipital lobe* in the back of the head). The information then passes forward from the perception centres to the attention centres (*the parietal cortex*, just in front of the occipital lobe) and then to the memory centres (the *temporal lobe*, in the middle of the head). Higher-level reasoning and thinking are primarily processed in the *frontal lobes* at the front of the head. Although a gross oversimplification, this description is a nice fit with the information-processing account of cognition.

Information processing may not be as simple as Figure 1-1, progressing in perfect sequence from the sensory input to long-term storage. Existing knowledge and experience may cause some processing to be in reverse. These two patterns of processing are often referred to as follows:

- **Bottom-up processing:** Physical environment and sensation drive brain processing.
- **Top-down processing:** Existing knowledge and abilities drive responses.

All forms of cognitive psychology are based on the interaction between bottom-up and top-down processing. No processing is strictly driven by the stimulus or by knowledge.

Cognitive psychologists like the information-processing framework, because people's interactions with the world are guided by internal mental representations (such as language) that can be revealed by measuring the processing time. Neuroscientists have also found parts of the brain responsible for different cognitive behaviours.

Input

In Part II of this book, we look at the first stage of cognition: input of information. In the computer analogy, this would be a camera recording information or the keyboard receiving key presses.

Cognitive psychologists call the input of information *perception*: how the brain interprets the information from the senses. Perception is different from *sensation*, which is exactly what physical information your senses record. Your brain then immediately changes and interprets this information so that

it's easy to process. This process highlights a linear progression from sensation (Chapter 4) to perception (Chapters 5 and 6).

Attention follows information input (see Chapter 7). *Attention* is the first distinct process of the information-processing account, and it's what links perception with higher-level cognition. Without it, people would simply react to the world in an involuntary manner.

Storage

After you attend to information, it enters your brain's storage system (see the chapters in Part III). The brain has a number of mechanisms for storing and using information, collectively called *memory*. We cover short-term memory in Chapter 8 and long-term memory in Chapter 9. You also have stored knowledge and skills (Chapter 10). Although all this knowledge is highly useful, we can't forget(!) to consider forgetting (Chapter 11), as well as how memory works in everyday life and some of the applications of memory research (Chapter 12).

In the computer analogy of cognition, short-term memory is the RAM: it has limited capacity and simply keeps the information you're currently using available to you. Just as you can't have too many applications or windows open on a computer simultaneously without slowing it down, the same applies to human short-term memory. Long-term memory and knowledge is the hard-disk space – a vast store of information.

Language and thought

Sensation and perception are quite low-level cognitive functions: they're fairly simple processes that many animals can do. Memory is a slightly higher-level cognitive function, but the highest-level functions are the ones that animals can't do, according to some psychologists – language and thought (see Parts IV and V):

- **Language:** The first output stage of information processing. Some psychologists describe it as a human form of communication and it's typically the vocal form of exchanging ideas with other people. We describe language and its relation to other forms of communication in Chapter 13. We cover its structure and the steps needed to produce it in Chapters 14 and 15. We discuss how language relates to other parts of cognition and perception in Chapter 16.
- **Thought:** The second output stage of information processing. Problem solving, reasoning and decision-making (Chapters 17, 18 and 19, respectively) are complex, highly evolved abilities that are an accumulation of extensive experience, knowledge and skill. Plus, don't forget how cognition is affected by emotions (Chapter 20).