Cognitive Communication Disorders

Second Edition

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PLURAL PUBLISHING INC.

Contents

Preface

Welcome to the second edition of *Cognitive Communication Disorders*. The first edition of the book (published in 2011) grew out of a long-standing desire to have a textbook that would serve as a single foundational text for a course on cognitive communication disorders. The first edition apparently filled the need for many instructors, students, and clinicians, and the team at Plural asked me to consider refreshing the material for this edition.

The first step in developing this edition was to contact many of the original authors to secure their support and agreement to revise their original chapters. It also offered an opportunity to rethink the first edition and make some changes to the book. Fortunately, the authors retained from the first edition (Margaret Blake, Fofi Constantinidou, William Hula, and Mary Purdy) were excited at the opportunity to revise and update their original work. I was also pleased to secure the participation of new contributors who provide perspectives that were missing from the first edition (Michael Biel, Nidhi Mahendra, Carol Roth, and Sarah Wallace).

The book remains organized in the same fashion as the first edition. The first three chapters provide the scaffold of cognitive systems that support communication and are the foundation of the communication deficits observed in right hemisphere disorders (RHD), dementia, and traumatic brain injury (TBI).

In Chapter 1, Drs. William Hula and Michael Biel present updated research on attention and attention disorders from the past 5 years. Hula and Biel have also added additional evidence-based material on assessment and treatment of attention that will prove useful to all users of the text.

Next in Chapter 2, Dr. Fofi Constantinidou continues to demonstrate why she is one of the leading researchers in memory and its disorders. Readers will find a comprehensive review of the extant literature on memory and valuable information on mapping theory on to assessment and treatment of memory deficits.

In Chapter 3, Dr. Mary Purdy takes the reader through the complex theory and clinical applications associated with executive functioning and its disorders. As our knowledge of this system continues to evolve, it is increasingly apparent that the social, pragmatic, and communicative deficits associated with RHD, dementia, and TBI are very much related to this important regulator of human behavior.

In Chapter 4, Dr. Margaret Blake once again steers the ship to the juncture where cognition and communication meet. Dr. Blake provides a significant revision to the chapter on RHD that appeared in the first edition. Readers will find a comprehensive review of the deficits associated with RHD and an expanded section on evidence-based assessment and treatment.

In Chapter 5, Dr. Nidhi Mahendra joins the book and provides an excellent review of dementia and related disorders. Readers will be pleased with the expanded coverage of assessment and evidence-based treatment material that will be useful across the board from lecture hall to clinic.

Combat-related mild traumatic brain injury is the signature injury associated with the Iraq and Afghanistan wars. In Chapter 6, Dr. Carol Roth adds a new chapter to the book detailing this devastating injury and its aftermath. Sadly, the extraordinary number of veterans who continue their daily struggle with the aftereffects of their injury make this a timely addition to the book.

Finally, in Chapter 7, Dr. Sarah Wallace joins me in a revision of the original chapter on traumatic brain injury to include expanded material on assessment and treatment. Readers will benefit from Dr. Wallace's expertise in Augmentative and Alternative Communication (AAC) and reading about the value of AAC as a treatment option when dealing with persons with TBI.

With my gratitude to all the contributors to the second edition, I trust you will find this a worthy addition to your professional library.

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Attention

Michael Biel and William Hula

Introduction

In the past two decades, the construct of attention has become increasingly relevant to clinical practice in speech-language pathology. Much of the interest in attention among scientists and clinicians in communication science and disorders can be traced to an increasing awareness of the role of the speech-language pathologist in the rehabilitation of individuals with right hemisphere disorders, traumatic brain injury (TBI), and dementia. Individuals with these conditions often present cognitive communication symptoms or concerns such as distractibility, slowness in performing mental tasks, inability to concentrate, and trouble managing more than one task at a time. These sorts of symptoms have been linked to impairments of attention, and much evidence from cognitive science and neuropsychology suggests that attention is impaired in individuals with these diagnoses. More recently, the role of attention and related constructs has been actively considered in aphasia. This chapter provides an overview of this broad and multifaceted construct. It includes summaries of theoretical ideas about attention; the manifestation of disorders of attention in right hemisphere damage, TBI, dementia, and aphasia; and assessment and treatment of disorders of attention.

William James, an influential psychologist who worked in the late 19th and early 20th centuries, wrote, "Everyone knows what attention is" (James, 1890/1950, p. 403). Despite the fact that James is responsible for many penetrating insights into the functioning of the human mind, on this one point, he was almost certainly wrong: Over a century later, there is no widely agreed on scientific definition for the term *attention*. Indeed, some have argued that there is no single, unitary thing that can be called "attention" (Pashler, 1998). Still, James's influential writing on the topic did capture fundamental ideas about attention that are still used and debated today:

> [Attention] is taking possession of the mind, in clear and vivid form, of one out of what seem several simultaneously possible objects or trains of thought. Focalization, concentration,

> of consciousness are of its essence. It implies withdrawal from some things in order to deal effectively with others. (James, 1890/1950, pp. 403–404)

One important idea included in this description is that attention involves *selection*. Human beings are subjected to a constant barrage of stimulation. Some stimuli, such as the words on this page, the sound of someone talking in the next room, or the feeling of this book in your hands, are external. Other stimuli, such as a memory of recent conversation, an intrusive thought about an upcoming social event, or an emotional state, are internal, arising from your own mental activity. At any given instant, you are consciously aware of only some of these stimuli, and you will respond to or remember fewer still. Because human beings seem to be able to process a relatively small number of stimuli at one time in most situations, attention is considered to be *limited in capacity*. Thus, the human mind's ability to *select* among competing stimuli and its *capacity limitations* are important aspects of attention.

Theories and Models of Attention

This section reviews a few of the seminal experimental findings and theoretical ideas about attentional selection, capacity limitations, and related constructs. This is followed by a description of two more recent frameworks for characterizing neurogenic impairments of attention. Although not all theories or models presented have received extensive clinical application, they are critical for understanding the concept of attention and have formed an important part of the scientific basis for the study and management of attentional impairments.

Theoretical Accounts of Selection

Early attempts to study selective aspects of attention in the laboratory included dichotic listening tasks, in which a listener simultaneously hears two different messages through headphones, one in each ear. Results from such experiments indicated that when listeners were asked to shadow or continuously repeat the message in one ear, they remembered very little about the message presented to the other ear (Cherry, 1953). For example, although listeners often recognized when the speaker in the unattended ear changed from male to female, they could report none of the content and often failed to notice if the speech changed direction by being played in reverse. In another dichotic listening experiment, Broadbent (1956) found that, when subjects were presented with different lists of digits to each ear and asked to recall them, they preferred to report them grouped by ear. When they were required to report digits in simultaneously presented pairs, they were less accurate.

One influential account of a selection mechanism proposed to explain the preceding results was Broadbent's (1958) *early filter* model. As the name of the model indicates, it includes a filter that screens out unattended perceptual information at a relatively early processing stage. According to this model, stimuli receive preliminary analysis in an early sensory store that parcels them into different channels according to broad physical features, such as location or intensity. Only one of these channels, however, is selected for further processing in subsequent limited-capacity stages that support identification, transfer into long-term memory, and selection of a response; stimuli in other channels are filtered out and receive no further processing.

One problematic finding for the early filter model was the observation that subjects in dichotic shadowing experiments occasionally responded to items presented to the unattended ear (Moray, 1959; Treisman, 1960). A related real-world situation occurs when you are carrying on a conversation in a noisy environment, such as a party. In most cases, you are probably pretty successful at focusing on what the person you are talking to is saying and in "tuning out" the conversation that the people standing behind you are having. It would be unlikely that you would remember much, if anything, from this competing conversation. However, if someone behind you says your name, it may "grab" your attention, causing you to briefly reorient the focus of your listening to what the people behind you are saying. One of Broadbent's former students, Anne Treisman (1960), proposed a *filter attenuation* model to account for this so-called cocktail party phenomenon and similar sorts of observations. In this model, early screening of perceptual input occurs, but unlike the early filter model, the result of this screening is to attenuate, rather than completely shut off, the flow of information in the unattended channels. Information in unattended channels is still available to later limited-capacity processing stages but is less accessible, depending on its salience. Thus, if a particular stimulus is primed by the current context (e.g., as a friend's face might be if you were in a crowded airport waiting to pick him up) or if you are generally predisposed toward a stimulus (as you might be with your own name), you might identify, remember, and respond to it even if initially you are focused on something else.

Another kind of account, often referred to as a *late filter* or *late selection* model (Deutsch & Deutsch, 1963), proposed that all incoming stimuli are fully analyzed and identified and that filtering occurs at or just before the point at which a response is selected. The decision about which stimuli are to receive a response is made by a mechanism that essentially chooses the current stimulus that has the highest "importance weighting," which in part is determined from past experience.

Although the early filter, filter attenuation, and late filter models have all been influential, the filter attenuation model has retained the most currency among contemporary cognitive scientists (e.g., Cowan, 1997; Driver, 2001). In recent decades, research has focused less on attempting to model the human information-processing system as a whole and instead has addressed more specific questions (Cowan, 1997, 2010).

One such question concerns the role of attention in visual selection. When you search for something in your environment, the ease and efficiency of the search depend on the distracting stimuli that are present, as well as their relationship to one another and to the target. As a trivial example, spotting a particular friend in a crowd may be difficult because of the overall similarity of people's appearances. However, the search might be made quick and easy if everyone in the crowd were wearing a navy blue suit, whereas your friend was wearing a bright red shirt. Treisman and Gelade (1980) proposed that visual search can be understood in terms of features and their conjunction. In the laboratory, such issues are often investigated by having experimental participants search arrays of shapes or letters for particular targets. In one such experiment, Treisman and Gelade (1980) had subjects search arrays of brown *T*s and green *X*s for target letters that varied according to condition. In some conditions, when the target was a blue *T* or *X* or the letter *S*, a single feature such as color or the presence of curved lines served to differentiate the target from the distractors. In another condition, the target was a green *T*, the detection of which required the successful conjunction of color and shape features. The investigators found that search time increased with display size in the latter condition but that search time remained fast and constant in the single-feature conditions regardless of display size. Treisman and Gelade (1980) proposed that individual visual features are processed rapidly, automatically, and in parallel (all at the same time) but that the processing of specific feature combinations requires focused attention and proceeds by slow, serial (one at a time) examination of each location in the search space.

Theoretical Accounts of Capacity Limitation

The capacity limitation aspect of attention was the focus of Daniel Kahneman's (1973) *resource allocation* theory. According to this theory, human cognitive activity is powered by a pool of resources that is flexibly allocated to various processes according to a number of factors, including task demand, performance criteria, long-term predispositions, and overall level of arousal or alertness. When the resource capacity required by one or more processes exceeds the available supply, performance on tasks supported by those processes will decline. One common way of testing this sort of theory has been to ask experimental participants to perform two tasks simultaneously and to vary the presence (e.g., Caplan & Waters, 1995; Murray, 2000; Murray, Holland, & Beeson, 1997; Wickens, 1976), priority (e.g., Gopher, Brickner, & Navon, 1982; Slansky & McNeil, 1997; Wickens & Gopher, 1977), and/or difficulty (e.g., Caplan & Waters, 1996; Tseng, McNeil, & Milenkovic, 1993; Wickens, 1986) of one or both tasks. When increasing the priority or difficulty of one task causes a decrement in the performance of another, the trading of resources between them is often inferred. The observation that one task interferes with another, however, is often subject to alternative explanations. One important alternative has to do with the notion of structural interference (Kahneman, 1973). Structural interference occurs when two tasks require the same peripheral input channels or output effectors. For example, if understanding a complex spoken message makes remembering a simultaneously presented melody more difficult, this effect could occur because both tasks use the same auditory input channels, rather than because of their joint depletion of a central cognitive resource. It is also possible that concurrent tasks do not interfere with one another. Observations along these lines led subsequent researchers to modify Kahneman's theory of a single, undifferentiated resource capacity by proposing the existence of multiple resource capacities specialized for particular domains of cognition or processing (e.g., Gopher et al., 1982; Wickens, 1980). Examples of domains for which specialized resource pools might exist include verbal versus spatial processing, visual versus auditory processing, and perceptual versus response processing (Wickens, 1980).

Although these resource theories of attention have been useful and influential, they are not universally accepted and have often been criticized for being difficult to falsify. It turns out to be quite difficult in practice to show that dual-task interference is unequivocally due to simultaneous sharing by competing tasks of a limited-capacity cognitive resource. One influential alternative model of dual-task performance is the central bottleneck model (Pashler, 1994), which proposes that certain central cognitive processes related to response selection can be completed for only one task at a time. According to this account, interference and performance limitations are due to mandatory, serial back-and-forth switching between tasks, rather than simultaneous sharing of a limited resource capacity as in resource allocation models.

Working memory is another concept that is related to notions of attentional capacity (Baddeley & Logie, 1999; Cowan, 1999, 2010; Engle, 2002; Just & Carpenter, 1992). Working memory generally can be defined as the ability to actively maintain and manipulate information during task processing. Baddeley's influential model includes a phonological buffer, which supports the maintenance of acoustic and verbal information, and the visuospatial sketchpad, which serves the same function for visual and spatial information (Baddeley & Logie, 1999). A third component, the central executive, coordinates the activity of the phonological buffer and the visuospatial sketchpad. Examples of everyday tasks supposedly requiring working memory include mental arithmetic, such as when calculating a tip in a restaurant or imagining new room configurations when rearranging one's living room furniture (Shah & Miyake, 1999). In experimental and clinical situations, working memory is often assessed by using span tasks, which require a person to hold some information in mind while performing a related or unrelated processing task. For example, in sentence span tasks, which are often used to assess verbal working memory, participants listen to or read lists of sentences (e.g., Daneman & Carpenter, 1980). The processing component of the task is to make true/false judgments about each sentence as it is presented. For the memory component, participants are also asked to recall the last word of each sentence at the end of each list. Another commonly used task that is thought to assess verbal working memory is backward digit span. Some of the core questions in working memory research concern the capacity, or amount of information that can be held in mind at one time, and whether this capacity is shared with, or separate from, the capacity supporting the processing component of the task. It is this notion—mental capacity being