1 Introduction: Psycholinguistics and the Nature of Language

Language Is at the Core of Who We Are

Language is an amazing gift. It is a gift that is at the centre of who we are as a species. Try to imagine what we, as human beings, would be like if we did not have language. Very likely, we would not be human beings.

In many ways, language ability is related to a story I once heard about two lobsters and a dolphin. The story goes something like this:

> Two lobsters are walking along the ocean floor off the coast of Maine. A dolphin swims toward them. At first, they are concerned, but then, they see that the dolphin is smiling and friendly. And indeed, he is! So, they each raise a claw and wave hello. The dolphin waves a flipper back and says, "Good morning! The water is cold today, isn't it." The lobsters wave again and the dolphin swims past. Seconds later, one lobster turns to the other and says, "He seemed nice. But, what's water?"

Language is for us humans what water is for those lobsters. We live in a world in which language is everywhere. So, it is hard to notice and easy to take for granted. But when we do think about it, it seems clear that language shapes who we are as individuals and what we are as societies.

Almost all of our present and past culture is built upon the human capacity for language. As a species, we can transmit learned knowledge from one generation to the next because children typically acquire the language of their parents with ease. We have expanded this ability greatly by developing the

Nature of Language: Psycholinguistic Perspectives on Words, First Edition. Gary Libben.

Published 2026 by John Wiley & Sons, Inc.

technology of writing so that knowledge can be transferred without requiring that the person producing language and the person understanding it be in the same physical location at that same time.

Through language, we humans classify and attempt to understand the world around us. We communicate, attempt to influence each other, and, in the best cases, build cultures. The power of language to enable knowledge transfer across individuals and generations has helped us to develop technologies that advance our well-being and to build increasingly complex social and political structures.

Yet, it is important to note that language is also tied to more emotional aspects of our lives. Jokes make us laugh and warm stories make us smile. Threats create fears and taunts create tears. All of these can be seen as both emotional events and language events. They are at the centre of human relations, and they underline the way in which the threads of languages become the fabric of societies.

As the considerations in this section suggest, a thorough understanding of human language requires that we examine the mental representations that underlie language ability and that we must examine/investigate how language ability becomes the language use that can shape thoughts, feelings, and actions. These are certainly great challenges. They are the challenges that the field of psycholinguistics seeks to meet.

What Is Psycholinguistics?

Psycholinguistics can be defined as the study of the human ability to do language. I believe that the key part of this definition is the sequence "ability to do." The use of the word "do" underlines the fact that, from a psycholinguistic perspective, language is an activity. Psycholinguists seek to understand what happens in the minds of humans when they engage in language activities and how that can shed light on the nature of mental processes and representations.

Quite possibly, the psycholinguistic study of language activity represents the scientific and scholarly endeavour that offers the very best window to how the human mind works. The reason for this is that, as I have noted above, language is the core component of the thought processes that we consider to be uniquely human.

We already know a great deal about language ability – many times more than we did just a few decades ago. Yet, great mysteries and uncharted domains remain. And, this is what makes psycholinguistics both fascinating and important because, as we increase our understanding of language, we also increase our understanding of what it means to have a human mind.

Let me now turn back to the word "ability" in the definition of psycholinguistics mentioned earlier. A reasonable question to ask would be: Why do we

not simply define psycholinguistics in terms of the actual language activities of comprehension and production rather than the ability to perform these activities? The answer to this question is that the term "ability" brings together the notions of capacity and activity. Both of these notions are critical to understanding in psycholinguistics. Of course, psycholinguistics as a discipline is very much concerned with what people actually do when they listen, speak, read, and write. But we are also concerned with the underlying mental knowledge and cognitive organization and processes that make such behaviour possible.

Mostly, humans are completely unaware of such cognitive processes. Most of us rarely think about how we move our mouths to pronounce syllables and words. We rarely reflect on the cognitive operations involved in how we select the words that we use in a sentence. Of course, there are people who do devote conscious effort to such things: Poets must choose just the right sounds, words, and phrases of their language, and learners of a foreign language typically bring conscious effort to matters of accent, vocabulary, and grammar. But even in such cases of conscious effort, the person involved will not be able to use conscious introspection to observe or gain knowledge of the actual cognitive and brain operations that are involved in producing and understanding language. And it is for this reason that psycholinguistics requires specialized research techniques.

The Scope of Skills in Psycholinguistics: Speaking, Writing, Listening, and Reading

As we have already seen, language is very much at the centre of who we are as a species. So, it is not an easy matter to set boundaries on the field of psycholinguistics. Nevertheless, like other academic disciplines, psycholinguistics can be said to have a scope – a domain that it has a special responsibility to understand. Perhaps the best way to define that scope might be in terms of what it means to *do language* when we say that psycholinguistics can be defined as the study of the human ability to do language. It seems to me that *to do language* means to comprehend and use it in a manner that makes an individual a part of one or more communities. So, we can say that the scope of psycholinguistics includes the representations and processes involved in language production and comprehension.

For most of human history, all language production and comprehension involved speech and listening only. Since the advent of written language about 5,500 years ago, at least some members of our species have also been able to use the visual modality for language comprehension and production. Although these were once the skills of the very few, it now seems that any account of language ability that does not include reading and writing would offer an inadequate representation of how humans do language. This

Table 1.1 The four core language activities.

		Language function	
		Production	*Comprehension*
Language modality	Auditory	Speaking	Listening
	Visual	Writing	Reading

perspective is shown in Table 1.1, in which the inclusion of the visual modality creates a matrix of four key language activities. These four key activities comprise the core domains of psycholinguistics. They are the activities that psycholinguistics seeks to understand. If we are successful in achieving this understanding, there is every reason to expect that the benefits and consequences will be far-reaching.

As our discussion continues, we will examine the roles that all four language activities play in how words are represented and processed in the mind in some detail. At present, in order to frame that future in-depth discussion, it might be worthwhile to consider the key properties of each activity and how those properties can inform our overall approach to the understanding of language.

Speaking

The activity of speaking is foundational. It is what we notice most in the development of a child's language ability. Indeed, even casual observation of young children suggests that speaking has a biological dimension. The babbling that typically begins to appear among children at about 4–6 months of age seems to be a kind of speech precursor in the way that crawling is a precursor of walking. This suggests a type of natural unfolding. This feeling of the naturalness of speech seems to be characteristic of the process as a whole.

As an overt behaviour, speaking involves both conscious and unconscious language planning. People make conscious choices about when they will speak and when they choose to remain silent. Persons with multilingual ability make choices about which of their languages they will use at any particular time. In addition, both multilinguals and monolinguals make many other speech production choices, involving, for example, which words to use and which words not to use, how loudly to speak, and how quickly to speak. Yet, it is important to point out that many aspects of speech production are typically very automatic and shielded from consciousness. For example, I think that it is safe to say that, at present, no language user, no matter how hard they try, can consciously introspect on the mechanisms or procedures that enable them to create speech from thought. In addition, for the most part, even those aspects of speech that could be open to introspection are typically not analyzed consciously. For example, most native speakers of English who

have not taken a linguistics course or received other specialized speech training would likely have no idea where they normally place their tongue in order to produce the sound /s/ or what they do with their vocal cords so that the sound /s/ can be changed to the sound /z/. Nevertheless – and this is the amazing part – they manage to perform these activities perfectly well. The lesson is clear: For language users, doing language does not depend on having conscious awareness of how language activity works.

Listening

One thing is certain: *Language comprehension is a whole lot more complicated than it looks*. A good way to think about the phenomenon of listening and aural language processing is to consider an academic lecture. An example of this is depicted in Figure 1.1, which shows an historic painting of Michael Faraday delivering a lecture in 1855. By all accounts, Michael Faraday, whose brilliant insights were foundational to advances in electromagnetism and the practical use of electricity, was a very plainspoken person. He had received little formal education, and he very much valued clear and simple explanations. Nevertheless, when we look at Figure 1.1, it certainly seems that his

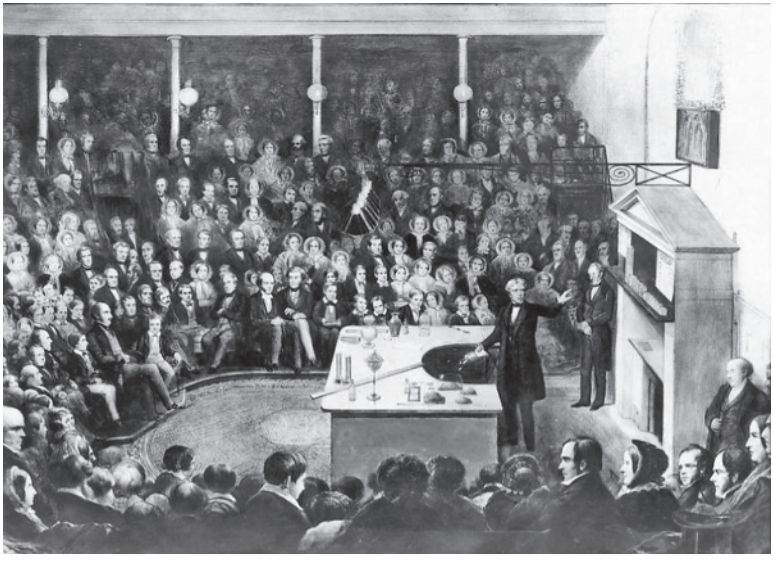

Figure 1.1 Professor Michael Faraday lecturing at the Royal Institution, 27 December 1855, from a painting by Alexander Blaikley, commemorating the Attendance of HRH the Prince of Wales and HRH Prince Alfred, at the Juvenile Course of Lectures, 1855–6 (Alexander Blaikley / Wikimedia Commons / Public Domain).

task is not simple at all – he seems to be the only person in the room doing any work, while at least a hundred other people are just sitting there!

In this way, Figure 1.1 depicts the paradox of auditory language processing. It might look like members of the audience are just sitting there, but, in reality, those who are listening are likely doing at least as much language processing work as the speaker. The speaker presumably knows what he plans to say. He likely has notes that he can refer to, and he has perhaps even rehearsed the lecture. The listeners, on the other hand, have no such supports. They do not have foreknowledge of the words that will be used, they do not have foreknowledge of the sentence structures, and they have no control over the speed at which they will receive language information. Their language processing must work "on the fly" and deal with surprise. Their language comprehension must often take place in the context of ongoing cognitive activity, external distractions, inadequate volume, and errors. Nevertheless, one might imagine that members of the audience in Figure 1.1 are completely unaware of this and very much take their own extraordinary language abilities for granted. They are most likely concerned with their ability to comprehend the scientific concepts presented by Michael Faraday.

Figure 1.1 offers us a framework within which to consider some key questions in the psycholinguistic study of listening:

1. What are members of the audience actually doing in terms of language processing?
2. To what extent do audience members differ from one another in their language processing?
3. To what extent are the psycholinguistic processes involved in listening to a lecture generalizable to other language comprehension contexts (e.g., understanding directions and being part of a telephone conversation)?

It is through these kinds of questions that psycholinguistic research advances. We cannot easily observe the language comprehension activity that audience members are performing. But we can design experiments that will reveal many aspects of that activity. By studying language comprehension across groups and across the lifespan, we can learn about what commonalities exist. We can also learn how people differ from each other in their language comprehension processes and how they may change over time. Finally, the aforementioned question (3) enables us to explore the deeper common features of comprehension, the ones that may span a lecture and a conversation.

Writing

At the outset, it is important to note that there is a very important way in which written language production differs from speech production. Whereas oral language production is a component of human language ability that is

seen across our species, writing is a technical invention. To the best of our knowledge, written language production has been part of human language for only about 5,000 years. For the vast majority of that period, writing has been a skill possessed by very few persons.

Although writing is a relatively new human invention, its effect has been immense. It is almost impossible to imagine a science of psycholinguistics (or any science for that matter) without written language. Writing has given us the ability to capture and concretize language in ways that allow it to be examined. It has allowed language production to be preserved over centuries and across continents so that we can better understand the thoughts, feelings, and preoccupations of persons that would otherwise never have entered into our personal experience.

To Think About

William James (1842–1910), the great founder of psychology in America, considered change to be a fundamental characteristic of thought and consciousness. He pointed out that trying to see thought as static parts might be like holding a snowflake in your warm hand or like "seizing a spinning top to catch its motion" (James, 1892).

However, in many ways, this is what the invention of writing has allowed us to do! Written language is designed to capture the expressions of thought which William James quite rightly noted to be so fleeting.

The writing systems that have been developed so far around the world have differed from one another quite considerably. Some differences are associated with the materials used. For example, *cuneiform* writing used in ancient Mesopotamia over 4,000 years ago was inscribed on clay tablets, for which wedge-shaped characters were well-suited.

Another source of variation among writing systems can be seen as reflecting the views that the inventors of specific writing system may have held about the nature of language. Some writing systems (e.g., Chinese) do an excellent job of capturing word meanings. Other systems (e.g., Korean) tend to focus on syllables and their parts. Finally, languages that use the Latin writing system (e.g., English) tend to focus on representing the sounds of individual consonants and vowels (however, as a great many learners of English as a second language might lament, not always with full success).

In Figure 1.2, the meaning-based Chinese writing system is contrasted with the English sound-based alphabetic system by showing how the word "psycholinguistics" is written in Chinese. Although the differences between the two writing systems are quite dramatic, it is important to note that they do share some common elements. Many Chinese characters do have

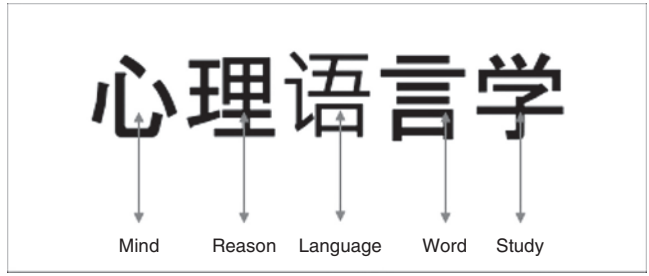

Figure 1.2 The word "psycholinguistics" in Chinese is composed of the subword elements mind + reason + language + word + study.

sound-based features within them. In addition, the English system is not entirely sound based. English spelling often sacrifices sound accuracy to instead reflect the origins of a word. It is for this reason that the word "psycholinguistics" begins with the letter "*p*," even though that "*p*" is not pronounced (which helps us to retain the knowledge that *psycho-* comes from the Greek word for "breath," "spirit," or "soul"). English words, like Chinese words, are also composed of subword elements that together form the meaning of a word. Coincidentally, the number of those elements for the word "psycholinguistics" is identical in Chinese and English. In English, the word is also made up of five subword elements. They are as follows: psycho + lingu + ist + ic + s.

The psycholinguistic study of writing has recently received increased attention in psycholinguistic research. Accordingly, we know a great deal more about the process of writing than we did just a few years ago. In addition, ongoing research promises to shed light on fundamental matters such as whether writers must say words in their heads in order to write them or whether it is possible to use writing to bypass the brain mechanisms associated with spoken production and to express thought directly.

At the outset of this millennium, some language pundits and futurists thought that we might soon see the end of the written word. Indeed, critics had been predicting the dramatic demise of writing since the 1950s. It was feared that the global use of the telephone was going to make letter writing obsolete as a form of communication.

In a way, all of this happened and none of it happened! The telephone became even more prevalent than was predicted (over 90% of the people in the world currently have a phone). However, it would have been nearly impossible to predict that the telephone, invented as a voice transmission device, would currently be used primarily to send and receive text messages. Thus, paradoxically, the telephone has increased rather than decreased the amount of writing that people do.

Reading

The world has never been more literate than it is now. Indeed, we rely on written words in almost all domains of life. We read words in order to make sense of the streets we drive through, the buildings we walk into, the computers we use, the telephones we carry, and every bottle of medicine we buy.

Of the four skills of speaking, listening, writing, and reading, it is reading that has attracted the most psycholinguistic attention thus far. The reason for this has been largely a matter of technology. For most of the history of psycholinguistics, it has been easier and more effective to study how people process written language than to study how they process spoken language. As a result, there is a considerable body of evidence on the mental processes involved in reading English and many other languages.

I am confident that you will feel as I do that many aspects of the knowledge that we possess about reading are simply amazing. To me, one of the most amazing findings is that, although we feel as though our eyes move smoothly through text as we read, psycholinguistic research on reading has revealed that our eyes are in fact always jumping around (both forward and backward). It seems that what we do is more like taking discrete photos at different locations in the text. As we read, we piece these photos together to construct meaning. When our eyes are in fact moving across text, they do so extremely quickly. During very quick eye movements, we are blind! It does not seem that readers are consciously aware of any of this.

Two other aspects of reading behaviour that I find to be amazing are the extent to which reading is both automatic and obligatory. Comprehending spoken and written language is not something that we have any control over. Neither is it something that we can stop. Consider, for example, the sign in Figure 1.3. Of course, the fact that it is impossible to not understand the sign means that the instructions in the sign are impossible to follow.

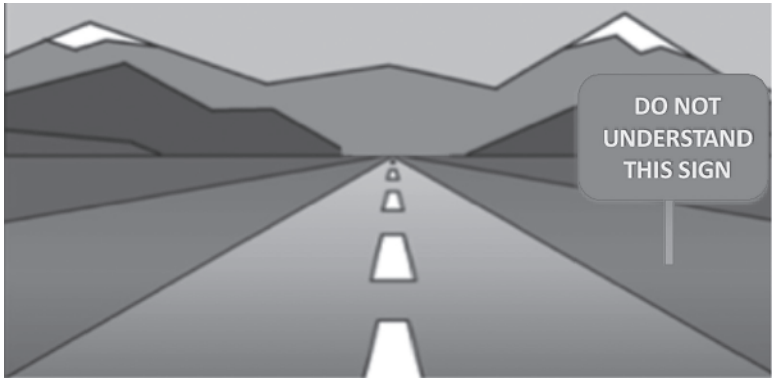

Figure 1.3 The paradox of this sign shows the automaticity of human reading. It also shows how some instructions are impossible to follow.

Additional examples of the automatic and obligatory nature of language comprehension are easy to find. You can do this for yourself by trying your best to not understand the word that is in brackets at the end of this sentence (table).

I expect that you found it impossible to not understand the word. Interestingly, so did I! As a writer, it was just as impossible for me to suppress the comprehension of the word "table" as it likely was for you, the reader. Moreover, it would have been just as impossible for us if I were saying the word and you were hearing it. The conclusion that must be drawn from this is that in all four language activities – speaking, listening, writing, and reading – language comprehension is both automatic and obligatory.

To Think About

There are ways to challenge the psycholinguistic claim that much of language processing is unconscious. For example, we could ask the following questions:

Don't we consciously choose to say this or that?
Can't we consciously choose to say nothing?
Can't we choose to use only one of the languages we are proficient in?

The answer to all these questions is clearly "yes." However, they would not be "yes" if we were talking about language comprehension as opposed to language production. We can't choose to understand this or that, we can't choose to understand nothing, and we can't choose to not understand a language in which we are proficient.

Even when we do have conscious control over language, that conscious control seems to come at a considerable extra cost. In this way, control over language has some commonalities with control over breathing. Of course, it is possible to hold your breath for a while, to take a deep breath, or to breathe only through your nose. But this conscious control requires special effort.

Finally, in this section, we must add an additional feature to the automatic and obligatory nature of language processing. That is that language processing is also fast – really fast! Research has suggested that a good deal of the cognitive processing of words takes place in less than a fifth of a second. The recognition of a word has been shown to take place in about a twentieth of a second. Typically, this is well before a reader is consciously aware of having seen the word. This speed with which the processing of words takes place may account for why much of our processing of words is unconscious. Because conscious processing is slow, it just does not have enough time to catch up.

Language Skills Are Part of an Integrated System

Although we often feel like we are engaging in only one language activity at a time, all language activities are part of an integrated language system in which speaking, listening, writing, and reading are all intertwined. For example, I might feel as I write this text that I am simply producing type-written language. But the fact is that, as I write, I am also understanding the language, perhaps even hearing in my head the words that I am typing. The same would be true if I were speaking instead of writing. The reason for this is that activating any component of the language system in the mind activates all components. Language production and comprehension, both in the spoken and written modalities, are expressions of a single integrated system. As we will see in our discussion of bilingualism in Chapter 9, this integration extends across languages as well as within languages. There is strong evidence that the cognitive language systems of bilinguals and polyglots are also highly integrated so that activating a word in one language automatically and obligatorily activates its equivalents in a person's other languages. This coactivation of languages within the mind of speakers suggests that becoming proficient in multiple languages can have advantages that extend to your first language competence and perhaps to other aspects of cognition.

Language Activity Is a Type of Mind Reading

As I have noted in the previous section, a great deal of language processing is unconscious and automatic. In most situations, language processing is something that just happens within and between humans. This leads to the next and perhaps deeper question about language processing: What are we really doing when we are doing language? I think that the answer to this question is this: What we are really doing when we are *doing language* is reading each other's minds. We use our ability to read each other's minds to achieve both positive and less positive outcomes. There seems little doubt that everything that we have been able to do together – to build cities, to invent tools, and to transmit cultural values – would be impossible if we were not mind readers. It is language that has given us that ability, and it is the words of a language that are the elements of the exchange system that makes mind reading possible.

To gain a different perspective on the mind reading aspects of language use, we might consider the perspective of a housecat. It is very common for a housecat to observe people in conversation. What might the cat make of the whole thing? We can presume that the cat sees people moving their mouths. The cat probably also hears the sounds and can differentiate among speech volumes and perhaps intonation patterns. But, even if the cat could do all those things, and even if it could relate them to one another, it seems pretty

unlikely that the cat would ever come to the idea that what is being observed is humans reading each other's minds. But that is exactly what humans do when they are doing language! Somehow, encoded in our minds are the linguistic patterns, the social conventions, and the computational mechanisms that enable us to function as members of a family, of a social group, of a generation, and of a large-scale language community.

I have claimed that the psycholinguistic study of language activity represents the scientific and scholarly endeavour that offers the very best window to how the human mind works. Thinking about how language use is a type of mind reading reinforces this view, and thinking about the role of words in that *mind reading activity* gives us a very concrete and effective way to better understand the characteristics of the system as a whole.

A Focus on the Words of Language

Words may be considered to be the foundation upon which our mind reading ability is built. Words allow us to create knowledge that we can keep, share, and develop together. This shared knowledge encompasses what we conceptualize, what connections we can create among those conceptualizations, and how we relate to them cognitively and emotionally. In this book, my goal is to bring forward the most important core concepts in psycholinguistics by focusing on how words constitute the backbone of language ability.

The Road Ahead

The next chapter offers us an opportunity to reflect on how we have started to develop scientific knowledge about how words are represented in the mind and brain. I will discuss some of the fascinating advances that were made in the studies of words in the brain by nineteenth century neurologists and how this laid the foundation for many later developments in psycholinguistics. In Chapter 3, we then move to explore the nature of words and their representation in the mind more deeply and, in Chapter 4, how those words may be organized in the cognitive network of vocabulary that is called "the mental lexicon."

From these foundations, I explore with you new developments that I think help us to understand the deeper questions in the study of words and the nature of language. In Chapters 5 and 6, I discuss how the nature of language is shaped by the need for very fast processing of incoming stimuli and how the inherent unpredictability of language stimuli requires that we maximize all opportunities for comprehension and knowledge creation.

In Chapters 7 and 8, we will discuss some new (and, in my view, exciting) ways to think about language in the mind and brain. This will be followed in Chapter 9 by a discussion of how words are organized in the minds and

brains of bilinguals and multilinguals. As we will discuss in that chapter, it is crucial to appreciate that, around the world, monolinguals are in the minority. Most people have functional ability in at least two languages.

Finally, in Chapter 10, we will have the opportunity to reflect both on our understanding, so far, concerning words of the nature of language and what the key next questions in the study of language and lexical processing may be.

A note about approach: Throughout this book, my goal is to focus on the most important issues, while, at the same time, ensuring that the content is as accessible as possible. The book represents many of my personal perspectives on psycholinguistic theory and practice. I have focused on words and have tried to restrict the examples that I use to those found in the English language. This is designed to maximize accessibility as, together, we explore the beauty and intricacy of the nature of language.

In a Nutshell

- Language is at the core of who we are.
- Psycholinguistics can be defined as the study of the human ability to do language.
- It reveals the underlying properties of mental processes.
- It addresses the challenge that much of language processing is unconscious.
- Psycholinguistics spans the domains of speaking, listening, writing, and reading.
- In each domain, we see that much of language processing is unconscious, automatic, obligatory, and fast.
- The four language skills of speaking, listening, writing, and reading are best seen as different expressions of a single highly integrated cognitive system.
- Language skills are part of an integrated cognitive system that extends across languages as well as within languages.
- Language activity is a type of mind reading.
- Words constitute the backbone of language and an excellent perspective from which to explore its nature.
- Around the world, monolinguals are in the minority. Most people can speak more than one language.

Further Reading

- I have included an amazing book as further reading for this initial chapter. The book is a report of the 1953 Summer Seminar Sponsored by the Committee on Linguistics and Psychology of the Social Science Research Council in the United States. I am amazed by how deep the discussions are and how they targeted what I consider to be many of the core

questions that have dominated subsequent psycholinguistic research. It is listed below as a journal article by Osgood et al. (1954), but it is in fact a little over 200 pages in length.

- I have also included a book by Chomsky (2015) that presents a very specific, well-argued perspective on the nature of language and human language ability.

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