OVERVIEW:

1. What is psycholinguistics?
2. How linguistics and psychology are different
3. Why linguistics and psychology can work together

1. What is psycholinguistics?

1.1 Psychology and language are both huge topics with long (and mostly separate) histories, so it's not surprising that psycholinguistics is a very big area, with many researchers doing many different kinds of things. I hope this class demonstrates just how diverse psycholinguistic research can be, but I also want you to get a feeling for how it all fits together.

1.2 What's it all about?

1.2.1 Linguists have been studying language with psychology in mind for a long time (see, e.g., Bloomfield, 1914, 1933), and psychologists have been studying language for a long time too (see, e.g., Boring, 1950).

1.2.2 The term "psycholinguistics" was invented during the "cognitive revolution" in the late 1950s and early 1960s, when scholars from many fields (psychology, computer science, linguistics, philosophy, etc) hoped to unify their research in a grand program to understand the human mind: "cognitive science". A classic early example is Miller & Chomsky (1963), which links generative syntactic theory, sentence processing, and mathematics.

1.2.3 But linguistics and psychology have maintained quite separate research traditions. The conflicting feelings that linguists have about psychology were expressed by the great American linguist Leonard Bloomfield, whose opinion shifted between the writing of his two major books:

Bloomfield (1914, p. 323): "As language is in its forms the least deliberate of human activities, the one in which rationalizing explanations are most grossly out of place, linguistics is, of all the mental sciences, most in need of guidance at every step by the best psychologic insight available."

Bloomfield (1933, p. 32): "In the division of scientific labor, the linguist deals only with the speech signal [...]; he is not competent to deal with problems of physiology or psychology. [...] The findings of the linguist [...] will be all the more valuable for the psychologist if they are not distorted by any prepossessions about psychology."
1.2.4 The confusion is reflected even the name of the field. "Psycholinguistics" sounds like a branch of linguistics, not psychology. Psychologists like Carroll often say "psychology of language," implying it's a branch of psychology (cf. also 心理語言學 vs. 言語心理學).

1.2.5 This division is reflected in the distinction between "competence" and "performance" (Chomsky, 1965), even though it has also long been criticized both by linguists (e.g., Derwing & Baker, 1978) and by psychologists (e.g., Edelman & Christiansen, 2003).

1.3 Organizing (psycho)linguistics into a four-dimensional diagram:

- Levels of processing
- Depth of processing
- Direction of processing
- Development of processing

Fourth dimension: Time, i.e., development.

2. How linguistics and psychology are different

2.1 Miller (1990, p. 321) considers three ways in which linguistics and psychology differ:

- "...the competence-performance distinction: linguists and psychologists talk about different things." Linguists care about knowledge, while psychologists care about use.

- "... the structure-function distinction: linguists and psychologists ask different questions of the same thing." Linguists see language as an object, while psychologists see it as a process.

- Miller's preferred analysis:

"For what it is worth, my own view is that linguists and psychologists subscribe to different theories of explanation. Linguists tend to accept simplifications as explanations. For example, a grammarian who can replace language-specific rewriting rules with X-bar theory and lexicalization feels he has explained something: the work formerly done by a vast array of specific rules can now be done with a simple schema. For a psychologist, on the other hand, an explanation is something phrased in terms of cause and effect, antecedent and subsequent, stimulus and response. To an experimental psychologist, X-bar theory is not an explanation; rather, if it is true, it is something to be explained."
2.1.4 Consistent with Miller's analysis, Chomskyan syntacticians often compare their science with physics (e.g., Freidin & Vergnaud, 2001), since as the foundation science, it's the only one that can't rely on causal explanations (science can't study the "cause" of the fundamental physical laws, only find the simplest and most elegant versions). However, all other sciences (chemistry, biology, geology, psychology) favor explanations in terms of causal mechanisms.

A mechanistic science like psychology prefers theories of processing (which involve cause-effect relationships in time) over theories of structure. It also wants to describe phenomena (e.g., language) in terms of lower levels (e.g., brain activities) rather than in terms of even more mysterious abstractions (e.g., Universal Grammar).

2.2 So in what sense is grammar "psychologically real"? Following Marr (1982), Neeleman & van de Koot (2010) argue that it's real in a different way from psychological processes. Namely, grammar is not a component of a process (top figure), but rather a high-level functional description of psychological processes (bottom figure).

This high-level description (which Marr called computation) is still crucial, since though learning and evolution, it constrains the two lower levels (algorithm and implementation).

For example, native speakers and second-language (L2) learners may use different processing algorithms, which may also be implemented in physically different ways in their brains. Yet L2 learners still need to make their grammar (computation) similar to that of L1 speakers, so that they can communicate. Indeed, as L2 learners get more fluent, their processing algorithms and neural implementation become more and more L1-like (French & Jacquet, 2004).
2.3 Both linguistics and psychology are "scientific" in the sense of testing hypotheses with empirical observations, but because of their fundamental differences, the steps in this procedure are different:

<table>
<thead>
<tr>
<th></th>
<th>Psychology</th>
<th>Linguistics</th>
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<tbody>
<tr>
<td>(1) Choose a topic</td>
<td>Memory, learning, perception, decision-making, language, etc</td>
<td>Language: structure, history, acquisition, use, etc</td>
</tr>
<tr>
<td>(2) Propose a hypothesis</td>
<td>Cause-and-effect performance model of processing, involving perception, production, memory, and/or learning</td>
<td>Elegant competence model of grammar, involving rules, constraints, representations, and/or innate factors</td>
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<tr>
<td>(3) Collect data</td>
<td>Experiments (if language, focus on reading), quantified observations, computer modeling, statistics</td>
<td>Native speaker intuitions, descriptions of attested patterns in natural language (reading is taboo)</td>
</tr>
<tr>
<td>(4) Interpret your results</td>
<td>Empiricist arguments: driven by direct concrete implications of the raw data (cause and effect)</td>
<td>Rationalist arguments: driven by abstract logic (simplicity and elegance)</td>
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3. Why linguistics and psychology can work together

3.1 Starting from the "cognitive revolution", both focus on the "mind" (as an abstraction of the action of the physical brain)

3.1.1 The notion of "mind" was taboo among American and British psychologists (and linguists) between 1900 and 1960 or so, during the dominance of behaviorism.

For example, B. F. Skinner's book *Verbal behavior* (1957) tried to describe the psychology of language entirely in terms of physical inputs (stimuli) and physical outputs (the behaviors, or responses), with "mind" playing no role:

"In teaching the young child to talk, [at first] [a]ny response which vaguely resembles the standard behavior of the community is reinforced. When these begin to appear more frequently, a closer approximation is insisted upon. In this manner, very complex verbal forms may be reached." (pp. 29-30)

3.1.2 An important blow against behaviorism was struck by Chomsky (1959) in a extremely negative review of Skinner (1957). Some sample comments:

"A typical example of 'stimulus control' for Skinner would be the response ... to a painting with the [utterance] *Dutch*. [Such] responses are asserted to be 'under the control of extremely subtle properties' of the physical object or event.... Suppose instead of saying *Dutch* we had said *Clashes with the wallpaper, I thought you liked abstract work, Never saw it before, Tilted, Hanging too low, Beautiful, Hideous, Remember our camping trip last summer?*. ... Skinner could only say that each of these responses is under the control of some other stimulus property of the physical object.... This device is as simple as it is empty.... (p. 31)
"In the bar-pressing experiment, response strength is defined in terms of rate of emission [of behavior].... [Skinner claims that this concept works for language too.] For example, [Skinner writes that] 'if we are shown a prized work of art and exclaim Beautiful!, the speed and energy of the response will not be lost on the owner.' It does not appear totally obvious that in this case the way to impress the owner is to shriek Beautiful in a loud, high-pitched voice, repeatedly, and with no delay (high response strength)." (pp. 34-35)

In short, Chomsky argued that Skinner's view was either correct but meaningless, or meaningful but incorrect.

3.1.3 Chomsky also attacked the application of associationism to language. Associationism is the claim that psychology consists merely of complex associations between stimuli and responses derived from experience; the internal structure of the "mind" is otherwise irrelevant. This view has influenced work in connectionism, as we will see later.

One example: Associative chain theory was used by some behaviorists to explain aspects of human behavior, including how people create sentences; sentences were just a chain of words, each one associated to the next one.

One reason Chomsky (1957) invented his most famous sentence (in (1) below) was to highlight that the associative chain theory can't be the right way to analyze language:

(1) Colorless green ideas sleep furiously. \{weak associations but grammatical\}
(2) Healthy young joggers run quickly. \{strong associations and grammatical\}
(3) Quickly young run joggers healthy. \{weak associations and ungrammatical\}
(4) Healthy joggers run quickly run. \{strong associations but ungrammatical\}

Conclusion: Mere associations are not sufficient to explain the psychological processing of language. We also need a theory of structure (here, syntax), which is psychologically real, and thus we must posit a mind to hold this structure.

However, later we'll see there are ways to get around Chomsky's argument and make a form of associative chain theory that kind of works for syntax.

3.2 Another similarity is that both linguistics and psychology view themselves as grounded in biology (i.e., the operation of the physical brain), though until very recently both tended to ignore this foundation (mainly because the brain is a lot harder to study than behavior, as we will see).

Consistent with Marr's three-level logic, we will save discussion of brains (implementation) for the end of the semester, and focus instead on psychological processing (algorithms). Also, you need to do your own original research this semester, and for an introductory class, brain research is too expensive (if you use machines) or ethically tricky (if you work with aphasic patients).
3.3 Another similarity: Both linguists and psychologists love kids:

Since Chomsky (1965), linguists have seen the study of language acquisition as key to a central mystery: where do worldwide linguistic diversity and universals come from?

Psychologists see language development as an important window into the big question of cognitive development in general (going back at least to Vygotsky and Piaget in the 1930s).

3.4 The most important similarity between linguistics and psychology is that since the cognitive revolution, both treat the mind as an information processing system.

"Information processing" is like "word processing" or "food processing": it takes information and changes it into a different form. That is, it works by translating information in one code (e.g., acoustic representations) into another (e.g., phonological representations). That is, the mind is imagined to be like a computer program.

3.4.1 That's why linguists talk about "derivations" and "inputs" and "constraints" and "spell-out" and "crashing": all of these are computer metaphors.

3.4.2 And that's why psychologists talk about "memory retrieval" and "parsing" and "top-down processing": all computer metaphors.

3.5 Most fundamentally of all, both linguistics and psycholinguistics look at the same data, namely language use (Myers, 2007).

3.5.1 Thus there's no difference between "linguistic data" and "psycholinguistic data"!

"Grammar" + "Processing" + Other stuff... ⇒ Observed data
[permanent knowledge?] [time-dependent?] [random?]

3.5.2 For example, informal acceptability judgments are common in theoretical linguistics to study grammar. This is actually a "psycholinguistic" task that can be used in sophisticated experiments, and analyzed statistically. But still, the same task can be used to study grammar (e.g., McDaniel & Cowart, 1999), or to study processing (e.g., Luka & Barsalou, 2005).

3.5.3 A review of experimental studies on Chinese grammar (so beyond the scope of this class) is given in Myers (forthcoming), available on my website.

REFERENCES

Derwing, B. L., & Baker, W. J. (1978). On the re-integration of linguistics and psychology. In R. N. Campbell & P. T. Smith (Eds.), *Recent advances in the psychology of language: Formal and


