Chapter 22

SPEECH ERRORS: RETROSPECT AND PROSPECT[1]

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This paper examines three directions for the course of future research on speech errors: observational refinement (ways of improving how speech errors are collected and analyzed), experimentation (ways of testing hypotheses concerning the nature of speech errors), and theoretical integration (ways of improving and extending our theories). The paper also proposes a general theory of speech production at the semantic level, which summarizes a number of facts concerning errors in lexical retrieval.

The years since Meringer's (1895) groundbreaking work have seen a growing interest in speech errors, beginning first in clinical psychology (see, for example, Freud, 1901), then in linguistics (e.g., Sturtevant, 1947; Wells, 1951; Hockett, 1967; Fromkin, 1971), and spreading now to experimental psychology (e.g., Boomer and Laver, 1968; MacKay, 1971; Motley and Baars, 1976). We all owe Meringer an indirect debt, and many of us (e.g., Freud, 1901; Sturtevant, 1947; MacKay, 1972a; Celce-Murcia, 1973) owe him a direct debt for providing our first source of carefully collected and catalogued data. Vienna seems an especially fitting place to express our gratitude and to assess the accomplishments stemming directly or indirectly from Meringer's work.

We can begin by commending the sheer courage of our enterprise. Following directly in Meringer's footsteps, we have risked the patience and amicability of our friends, families, and colleagues to collect speech errors whenever and wherever they occur in our everyday lives. We have defied the *Zeitgeist* by advocating theories, metatheories, and paradigms that are somewhat ahead of their time. We have dared to advocate radically new methodologies within our respective fields, since speech errors do not fit the traditionally accepted techniques of either psychology or linguistics. We have reached an impressive degree of consensus on goals and methods:

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To develop a viable theory of cognitive processes, where errors serve not as a discovery procedure for such a theory, but as data for crediting or discrediting alternative theories. We have come to recognize some of the special advantages and disadvantages of our data and agree on procedural questions to a surprising degree. Gone are the procedures of "proof by imagination," and "counterproof by lack of imagination," "proof by example," and "disproof by counterexample" (cf. MacKay, 1973). The complexity of speech errors shows that a large number of uncontrollable factors can determine any one error, and we now advance hypotheses only when examples greatly outnumber counterexamples. We have convinced ourselves and many others that errors are important and that theories of normal cognitive systems must be capable of breaking down in the same way as the actual system, which is to say that theories unable to explain the errors are necessarily incomplete or incorrect explanations of the actual mechanism. And we have significantly extended our understanding of the planning and execution of articulatory programs.

Yet I cannot escape the impression that we have had less effect on the world than we might have and that the full impact of our work is still to come. The question is what more might be done and where do we go from here. This chapter considers three directions for the course of future research: observational refinement, experimentation, and theoretical integration.

1. Observational Refinement

Our basic observations are collections of naturally occurring speech errors. To refine these observations we must consider ways of improving them, ways of extending them, ways of furthering their description, and ways of refining their analysis.

1.1. *Observational Reliability*

If a corpus of errors is inaccurately recorded, or collected haphazardly on the basis of some theoretical bias (conscious or unconscious), conclusions based on that corpus will be questionable. The situation would be analogous to a badly designed experiment, where no amount of data analysis could overcome the flaws in design. Meringer (1895) realized the importance of observational reliability, and his methods of data collection have much to recommend them, even today. He was clearly not interested in collecting anecdotal data, as once occurred in studies of animal behavior. Lacking the tape recorder, he nevertheless noted the possibility of misrecording an error when hearing conditions were less than optimal. If possible, he interrogated his speakers at the time of error, to verify his records, to exclude nonerrors reflecting, say, intentional humor, and to resolve ambiguities in classification that arise whenever simple records or surface characterizations of errors are considered. To illustrate one such problem in classification, consider a typical example, *The door is not open, I mean, closed.* Although surface appearances suggest a simple

substitution of *open* for *closed,* speaker interrogation revealed that in fact the error was a complex blend of synonymic constructions: "The door is open" and "The door is not closed."

Meringer was also sensitive to individual differences and situational effects, and, where atypical, reported the age, sex, educational background, and state of health, intoxication, or fatigue of his speakers. He outlined the context in which each error occurred, recording verbatim what the speakers had just said and what they were about to say, and, when relevant, what they had just heard or seen, whether verbal or nonverbal.

The possibility of selectivity in recording errors cannot be ruled out entirely, but there is every reason to believe that Meringer's corpus was free of major selectional biases since he appeared less interested in confirming any theories of his own than in classifying speech errors, much as a zoologist would classify newly discovered species of animals. He even made special note of errors falling outside prior classifications and was apparently so thorough in his collection of errors and so exhaustive in his interrogation of speakers that he became very unpopular among his acquaintances at the University of Vienna (Sturtevant, 1947).

With the advent of the tape recorder and recent refinements of field procedures (cf. Heynes and Lippitt, 1954; Webb and Campbell, 1966), we are now in a position to improve greatly on Meringer's procedures. Tape recorders overcome the problem, pointed out by Bawden (1900), that speech errors occur so frequently that writing them all down is impossible. Having several trained judges independently transcribe errors from a tape recording also enables estimates of reliability, since even high fidelity recordings do not always guarantee completely reliable representation of speech errors. For example, I found that subjects listening to tapes of Schafer's (1968) *Pardon My Blooper* under optimal hearing conditions often failed to agree with each other or even with themselves on hearing the same error on subsequent occasions.

1.2. *Observational Extension*

Certain theoretically important classes of speech errors occur too infrequently for any one person to collect enough of them, and as Bawden (1900) points out, analysis of speech errors becomes valuable only "when the errors are collected in large numbers and interpreted in the light of inductive generalizations from a wide range of data." Enlarging our collections by at least an order of magnitude seems both desirable and feasible. With the help of trained assistants, it should be possible to extend greatly our collections. Training people to hear, collect, and classify speech errors should not be difficult, especially since speakers often generate surface cues such as "I mean," "excuse me," or "sorry" that indicate the occurrence of an error (see DuBois, 1974). A large-scale program of this kind will require elaborately specified and standardized data collection procedures along with carefully spelled-out ways of protecting the privacy and psychological well-being of our "subjects" or "informants." A campaign to broaden our base of public support may also be nec-

essary since we are not yet completely free from the prejudice that collectors of errors are nuisances and that speech errors are best ignored as weird phenomena that occur once in a while to disturbed individuals under unusual circumstances of interest mainly to psychiatrists. Nonetheless, we have come a long way since the time of Freud (1901). Recent successes in the fields of ethology and social psychology have greatly increased the respect for naturalistic observation, and the time seems ripe for very large-scale data collection using the technological and methodological innovations in field procedures developed within the last few decades.

1.3. *Extension to Other Domains*

The present volume extends our naturalistic observations to slips of the ear, again following directly in Meringer's footsteps. Meringer also developed small but extremely valuable collections of errors in reading and comprehension, in thinking and recall of names and errors in action, for example, looking at a thermometer rather than a clock in order to determine the time of day. Such errors as Meringer collected are important for theories of memory, thinking, reading, hearing, and comprehension, but we need many more observations with less possibility of selectivity and greater attention to the immediate situational context in which the errors occurred.

1.4. *Analytic Refinement*

How can we get the most out of existing observations? Data evaluation procedures, especially statistical procedures, have undergone a major revolution since Meringer's time. Statistical procedures are necessary whenever a large number of uncontrolled factors could influence a phenomenon or its observation, as in the case of speech errors. Given large numbers of speech errors, statistical procedures also enable us to sharpen our hypotheses and to isolate and determine the power of variables in our data. On the debit side, statistical procedures require a lot of hard work; but this is a price that science has always been willing to pay for analytic refinement. It is to our credit that the spirit of the statistical revolution is apparent in every recent study of speech errors, although inexplicitly where it is assumed rather than demonstrated that examples greatly outnumber counterexamples relating to some hypothesis.

1.5. *Descriptive Refinement*

Innovations such as the microscope or computer do not change the basic data, but greatly aid in their description. Since Meringer's time, psychology has developed techniques of data description that are in some ways comparable to the microscope, for example, factor analysis and other scaling techniques. These techniques can greatly aid the description of speech errors. By way of illustration, consider the observation of Meringer (1895) and many others that word substitutions (*table, I mean, chair*) are sometimes semantically similar. This description cries out for re-

finement. How often and to what extent are substituted words semantically similar? Are there clearly definable subcategories of semantic similarity within the domain of word substitutions? Are word substitutions more often semantically similar than other categories of speech errors? And what is the nature and distribution of the semantic relationships between intended and intruding words: How often is the semantic similarity a matter of logical relations such as inclusion, implication, contradiction, antonymity, subordination, superordination, of part-whole relations, of co-occurrence in usage, of clichés, or of referential similarities? As a first step in answering such questions, we need a way of measuring semantic similarity; and since generally accepted, theoretically based semantic similarity metrics do not yet exist, we must define semantic similarity in some theoretically neutral way.

The following experiment illustrates one well worked-out way. A group of 24 subjects rated the similarity in meaning of over 200 word pairs, using a seven-point scale: 0 representing very different in meaning (e.g., *bird-machine*) and 6 representing very similar in meaning (e.g., *crippled-deformed*). Unbeknown to the subjects, the word pairs were either chosen at random from a dictionary (to serve as anchor points for the "semantically different" end of the scale), or were components of speech errors: word substitution pairs; word reversal pairs; word blend pairs. The ratings were reliable and displayed intuitive or face validity since blend pairs, which often involve synonyms, were rated as highly similar in meaning, whereas random pairs were rated as highly different. Mean similarity ratings were blends, 4.3; word substitutions, 2.8; word reversals, 1.2; random words, .7. Every difference taken in any combination was highly significant ($p < .01$) except for word reversals versus random words, which were statistically equivalent ($p > .10$). To determine subcategory effects, word substitutions were further subdivided into "phonologically similar" pairs (operationally defined) versus "others" (about 94% of the data). Mean similarity ratings were .9 for "phonologically similar" pairs and 3.0 for "others." "Other" pairs differed reliably from all remaining categories ($p < .01$), but phonologically similar pairs were statistically equivalent to reversal pairs and random words ($p > .10$). These findings suggest that semantic similarity plays a systematic role in blends and word substitutions (and perhaps in paradigmatic errors in general) but not in word reversals (or perhaps any other class of syntagmatic errors). The lower similarity ratings for "phonologically similar" versus "other" substitutions further justifies this subcategorization, and indicates that word substitutions are interpretively heterogeneous, an important finding for the theory of conceptual availability, discussed later in this chapter.

The greater similarity ratings for blends versus substitutions indicates that although substituted words are similar, they are less similar than words that blend, even with phonologically similar pairs excluded. Another remarkable difference between blends and substitutions is that antonyms frequently substitute for one another but never blend. Antonym substitutions, for example, *good,* for *bad* or *open* for *closed* are commonplace, but no one has ever observed blends of antonyms, for example, "clopen" (a combination of *open* and *closed*) or "bood" (a combination of *bad* and *good*). These observations suggest that blends and sub-

stitutions reflect different underlying mechanisms. Specifying the details of these mechanisms is impossible at present, but one plausible hypothesis is that word substitutions occur and are corrected when two distinct concepts call upon the intruding and intended forms in succession, whereas blends occur when one and the same concept simultaneously activates two psychologically synonymous forms. For example, a person experiencing something between a draft and a breeze has a concept for which two words are equally appropriate and may come out with "dreeze," the blend of *draft* and *breeze* reported in Fromkin (1973).

2. Experimentation

Analyses of naturally occurring speech errors enjoy face validity (there can be no question of experimental artifact), but are subject to serious interpretive limitations, for example, the fragmentary data problem (see MacKay, 1972a). An additional, as yet undiscussed problem is that studies of speech errors constitute a type of problem-solving discipline involving proof by adduction. We adduce answers to problems such as "Why do word substitutions involve semantically similar words?" The answers provide a satisfactory explanatory fit to the problem they are designed to solve, but since most problems can be solved in many different ways, any one solution may be nonunique. Theories based on adduction must be supplemented by more powerful verification procedures: for example, by experiments based on induction and deduction. Experiments allow the control over observational variables, linguistic variables, and subject variables that is necessary to verify or falsify theoretical claims or hypotheses. Every scientific endeavor recognizes the value of experimentation; the important question is what are the most fruitful experimental strategies, the best ways of maximizing the advantages and minimizing the disadvantages of both experimental and naturalistic observation? I can see four, each with special advantages and limitations discussed in the following section.

2.1. *Simulation Strategy*

Simulation studies try to recreate the determinants of a specific class of speech errors in the laboratory. An example is Brown and McNeill's (1966) tip-of-the-tongue study. What Brown and McNeill did was examine everyday tip-of-the-tongue occurrences, hypothesize their underlying determinants (e.g., fatigue, and relative unfamiliarity with the word for expressing some concept), and then simulate these conditions in the laboratory by reading definitions of obscure words to undergraduates in the late evening. Results of Brown and McNeill's simulation are well known and illustrate the value of this strategy. Other examples are MacKay (1971) and Motley and Baars (1976), who exploited the simulation strategy to study spoonerisms and "Freudian slips." The simulation strategy is especially useful when natural errors are difficult to record, few in number, or otherwise difficult to analyze, but even the most successful simulation provides us with little more than a large, well-

analyzed natural corpus. Given such a corpus, the main advantage of laboratory simulation lies in the possibility of exploring the effect of new and more subtle variables and in possible "spin-off" discoveries. As an illustration of spin-off possibilities, consider MacKay and Soderberg's (1971) simulation of linguistic blends in the finger movement system. The finger movement errors they observed, known as "homologous intrusions," demonstrated the role of hitherto unsuspected factors in motoric intrusions, shed new light on the manual motor system, and suggested a general interpretation of motoric blends. As MacKay (1973:802-803) pointed out, "Like synonymic intrusions, homologous intrusions reflect the incursion of one motor program or another, simultaneously activated motor program and in some sense . . . represent the optimal case for a cross-talk model of motor intrusions: The interacting programs for the right and left hand are simultaneously activated at a peripheral level and provide observable rather than inferential evidence for a cross-talk interpretation."

2.2. *Hypothesis Testing*

We take maximum advantage of both experimental and naturalistic observation by basing our theories first on naturalistic phenomena and only later on experiments. In the case of speech errors the hypothesis testing strategy is as follows: We use detailed analyses of naturally occurring speech errors to develop a model of the speech production system and then subject the assumptions and predictions of the model to laboratory test. Often, however, the hypothesis testing study gives rise to many more errors than the naturalistic corpus on which it was originally based. An example is MacKay (1976) who used Meringer's tiny corpus of tense transformations (e.g., *hat verschrieben aufzuschreiben* instead of *hat verschprochen aufzuzchreiben,* spelling after Meringer) to develop the hypothesis that past tense verbs are stored in the internal lexicon as a base form (e.g., *run*) plus derivational rules that are triggered by an abstract marker, [+past], in producing the surface form *ran.* To test this hypothesis, subjects heard a series of verbs, one at a time, and produced the past tense for each as quickly as possible. The time to produce various past tense forms suggested that the final articulatory program is constructed by means of derivational rules. Even more convincing evidence for these rules was found in the errors that occurred: regularizations (e.g., *digged*); partial alternations (e.g., one person, hearing *catch,* changes the final consonant but not the vowel, producing *cat* instead of *caught*); misalternation (e.g., one person, given *ride,* produced *rid* instead of *rode,* following the pattern of *hide-hid* and *slide-slid*); and misinflections (e.g., *take-taken* instead of *took*). Less frequent occurrences included nontransformations (e.g., *build-build* instead of *built*), backformations, and stutters. In all, there were 367 production errors (more than all existing naturalistic collections combined across languages), collected in less than 20 hours of recording. In addition, there were 106 instances of mishearing, for example, *wade* misperceived as *weighed,* which revealed surprising systematicities of their own.

Another hypothesis-testing study providing large numbers of fascinating errors is

MacKay (1966), where subjects completed sentence fragments, some of which were ambiguous, unbeknown to the subjects. The study was primarily designed to determine the time to complete the fragments, but the completions contained 258 errors that are of interest in their own right. They include systematic misreadings, for example, an ambiguous fragment "Although the idea of Hitler was awful" was misread as *Although that idea of Hitler's was awful;* tangential completions, for example, *Knowing that visiting relatives can be bothersome, I was confused;* spoonerisms, for example, *Having a ball with his case, Merry Pason, I mean Perry Mason...;* word substitutions, for example, *Before stopping arguing in the court, Wimbleton was perjured, I mean, disqualified;* and ungrammatical completions, for example, *Knowing the minister's hope of marrying Anna was impractical, he disbanded the idea.*

2.3. *Direct Induction Strategy*

There are many techniques for directly inducing speech errors, and some have been extensively studied, for example, delayed auditory feedback (Fairbanks and Guttman, 1958). When the auditory feedback from the voice is played back to the ears with a fraction of a second delay, speakers reliably generate large numbers of errors. Some are theoretically important, for example, fusions of speech sounds (MacKay, 1973a), and many, but not all, are phonological in nature: transpositions, prolongations, omissions, slurrings, substitutions, and repetitions of phonological components. The full potential of delayed auditory feedback and more recent techniques developed by Baars (1977) and others have yet to be tapped within the direct induction strategy. The goal of this strategy is to determine what theoretically interesting factors increase or decrease the probability of various types of experimentally induced errors. An example of the direct induction strategy appears in MacKay and Bowman (1969), who used errors induced by delayed auditory feedback to demonstrate an effect of practice at the conceptual level of speech production. German-English bilinguals repeated a sentence such as "Then the wanderlust seized him as it once had his grandfather," 12 times, each time at maximal rate. The subjects then put on a pair of earphones and produced another "transfer" sentence as rapidly as possible with delayed auditory feedback. The "transfer" sentence had either identical or completely different meaning from the practice sentence. For example, "Dan packte auch ihn wie einst den Grossvater die Wanderlust" has identical meaning with the preceding sentence although the word order, surface structure, and phonology differ radically.

The results were dramatic: significantly fewer errors for transfer sentences with identical meaning. Moreover, the same transfer effect occurred with monolinguals producing synonymic sentences such as "The woman noticed a famished little infant on the road" and "The lady observed a small hungry child in the street." Such findings illustrate the value of direct induction techniques for theories of the speech production system, such as the theory of conceptual availability discussed in section 3.

2.4. *Subject Selection Strategy*

Meringer viewed subject selection as a convenient means of collecting speech errors. This strategy, combined with experimental techniques, is now commonplace and does not differ from the direct induction strategy except in surface details. See, for example, MacKay (1969), who observed large numbers of errors and the factors that influence them by having a group of stutterers read carefully controlled sentences at maximum rate.

3. Theoretical Integration: The Theory of Conceptual Availability

Our theories can be greatly improved. In some areas we need theoretical diversification: clearly articulated rival hypotheses for stimulating further research. In other areas we need theoretical integration of what is already known. In the area of retrieval processes, for example, we are now in a position to integrate a large number of isolated pockets of fact into a general theory. Retrieval processes determine what, whether, when, and how information in memory becomes available for generating a response, recognizing an input, or solving a problem. Lexical retrieval is an especially interesting example because of the size of the internal lexicon (50,000 items in some cases), its stability (we rarely forget words entirely), its access time (under .5 sec for object names), and its degree of organization (which determines speed of access in all large memories from encyclopedias to computer libraries). The interface between the internal lexicon and the conceptual level is the most important component of lexical retrieval; and the concept of conceptual availability integrates a number of facts concerning this component, some experimental and others naturalistic. The main dimensions of the theory are outlined in the following section.

3.1. *Conceptual Suppression*

Conceptual suppression is a major determinant of conceptual availability, and the role of conceptual suppression in speech errors has been widely discussed. An example from Freud (1901) is the substitution of *battle scared* for *battle scarred* in reference to someone unconsciously considered cowardly.

However, the nature and generality of the phenomenon of conceptual suppression has been more clearly demonstrated in recent experiments on the comprehension of ambiguous sentences. In processing ambiguous sentences, people see either one meaning or the other, but MacKay (1970) has shown that the other "unseen" meaning is usually processed to some extent and becomes suppressed or abnormally unavailable during retrieval of the "seen" meaning.

3.2. *Conceptual Disinhibition*

Concepts that have been suppressed become especially available or hyperactive when released from suppression. Rebound availability of concepts plays a major role in the phenomenon of "semantic blending" as seen in the effects of the "unseen" or

suppressed meanings that frequently crept into the completion of ambiguous fragments in MacKay (1966). Examples are: *After stopping arguing in the court, Wimbleton was perjured, I mean, disqualified* (where the speaker reported awareness of the meaning *tennis court* and not *court of law*); *Discussing the problems with the mathematicians in Germany, Oppenheimer grew red in the face* (where the speaker visualized *mathematical problems* and not *mathematician problems*); *Claiming the work was done over on the roof, he asked them to do it again* (where the speaker was only conscious of the meaning "completed over there" and not "redone"). Rebound availability resulting from conceptual disinhibition may also be responsible for the fact that subjects often become aware of the "unseen" meaning after completing an ambiguous sentence, as well as for the many errors (discussed in the following section) that occur in completing ambiguous sentences.

Conceptual disinhibition may even play a role in "displaced synonymic intrusions" such as *He put the sack in the bag, I mean, car* (from Goldstein, 1968). If selecting *sack* requires suppressing *bag* at the conceptual level, this intrusion may reflect rebound availability of the concept for "bag." Freud (1901) was quite correct in stressing the importance of suppressed concepts in speech errors and other phenomena in our everyday mental lives.

3.3. *Conceptual Salience*

Not all concepts are psychologically equivalent. Freud (1901) documented many errors suggesting the special availability of concepts important to the personal life history of a particular speaker. However, some concepts have systematic or universal salience for everyone. In the visual system, conceptual salience reflects built-in biases in the way the perceptual system represents colors, shapes, distances, or spatial relations. Consider color for example. Some color concepts such as "red" are more salient or easier to learn (Rosch, 1973), distinguish (Heider and Oliver, 1972), and recall (Heider, 1972) than others such as "brown" quite independently of whether people have names for the colors (cf. Heider, 1972). If, as Berlin and Kay (1969) argue, color concepts can be arranged in terms of a saliency hierarchy, this hierarchy should predict the relative availability of color concepts, which in turn should predict the relative probability of speech errors: Words for salient concepts such as "red" should substitute words for less salient concepts such as "brown" more often than vice versa, a prediction that should hold for color term substitutions in any language.

3.4. *Contextual Factors*

Contextual factors play a major role in determining the availability of concepts, and contextually determined conceptual availability has contributed to the occurrence of many speech errors. Meringer (1908) collected an entire class of such "situ-

ational intrusions," that is, word substitutions attributable to objects just noticed, words just read or heard said, the social relationship between speaker and listener, things recently thought of or weighing on one's mind.

3.5. *Conceptual Practice*

Availability of a concept depends on familiarity and practice in using it. Evidence for effects of practice at the conceptual level are found in MacKay and Bowman (1969), discussed in the preceding section. Perhaps, when producing a sentence, we execute a set of semantic analyses or procedures (see Miller and Johnson-Laird, 1976). Performing these analyses takes time, and like other mental operations, the time they take depends on practice at the conceptual level.

3.6. *Conceptual Complexity*

Conceptual complexity plays the role in speech errors and retrieval time that one would expect under the theory of conceptual availability. Concepts such as "present time" are simpler and more readily available than concepts such as "past time" (MacKay, 1976). Concepts such as "circle" or "square" are simpler and more readily available than concepts such as "oval" or "triangle" (cf. Koffka, 1935). Concepts such as "one" or "singular" are simpler and more readily available than concepts such as "many" or "plural" (Olson, 1974). So are concepts such as "tall" versus "short," and "before" versus "after" (Clark and Clark, 1977).

3.7. *Processing Capacity*

Availability of concepts depends on the attention or processing capacity devoted to them. The effect of attention on conceptual availability is illustrated in the dichotic listening task where people pay attention to concepts arriving in one input channel (say, the left ear) and ignore those on the other channel (the right ear). Dichotic listening experiments show that concepts underlying attended inputs are orders of magnitude more available than concepts underlying unattended inputs and that certain relational concepts may never become available at all without attentional analysis (cf. MacKay, 1973b).

3.8. *Conceptual Coherence*

Some complex concepts are more coherent than others, and coherent concepts are more readily available than incoherent concepts. For example, "table" is a more coherent and readily available concept than "furniture" for referencing an object to which both concepts apply: Sharing more attributes with one another, exemplars of the concept "table" are easier to recognize and conceptualize than pieces of furniture (see Rosch, 1973).

3.9. *Conceptual Connectivity*

No concept is an island unto itself: All are interconnected in many different ways, and the moment to moment fluctuations in conceptual availability that characterize our everyday mental lives is largely attributable to conceptual connectivity. For example, the concept "robin" is connected to the concept "bird" so that increasing the availability of one concept increases the availability of the other. Factors such as typicality (operationally defined by Rosch, 1973) may determine the strength of the connection: Since robins are "more typical" birds than chickens, availability of the concept "robin" increases the availability of the concept "bird" more than does the concept "chicken."

3.10. *Conclusion*

In conclusion, the theory of conceptual availability summarizes a number of facts concerning lexical retrieval, but further work is needed to determine how the dimensions of the theory interact or overlap. Speech errors will undoubtedly continue to play a major role in future elaborations of the theory, whether from natural collections, simulation studies, induction studies, or hypothesis testing studies such as those discussed in the preceding section. The prospects for future studies of speech errors seem good.

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