patients with early and late left-hemisphere lesion: A PET study. *Neuropsychologia*, *37*, 545–557.

Porter, D., Howseman, A. M., Joseph, O., & Turner, R. (1997). ISMRM, 5th Scientific Meeting, 1621.

Vargha-Khadem, F., Isaacs, E., & Muter,V. (1994). A review of cognitive outcome after unilateral lesions sustained during childhood. *Journal of Child Neurology*, *9*, 2S67–2S73.

How language adapts to the brain. Herman Kolk, Nijmegen Institute for Cognition and Information, Catholic University of Nijmegen, The Netherlands.

Agrammatic speech is a phenomenon that is characterized by syntactic simplification, morphological omission and a low rate of speech. Within a group of agrammatic speakers, these symptoms vary in the degree in which they occur, from just above normal to a level of highly abnormal behavior. This quantitative variation must be a central fact in our theories of agrammatic speech. In our adaptation theory , we account for this type of variation in two ways (Kolk, 1995). First a reduced temporal window of variable size is thought to underly the agrammatic deficit. Second, the degree in which language adapts to this deficit varies between patients and tasks. We have distinguished two kinds of adaptation: corrective and preventive. Corrective adaptation consists of internal restart of the computational process. Because parts of the representation are already active, bringing the representation to threshold can occur faster. Many internal restarts will lead to a low rate of speech. Preventive adaptation consists of overusing normal simple structures, in particular elliptical constructions of varying types.

In my talk, I will review the evidence we have recently collected in favor of this theory. The temporal window hypothesis is supported by the finding that passive constructions which are rare in free conversation, start to appear after syntactic priming (Hartsuiker, & Kolk, 1998). The restart hypothesis of low speech rate entails that agrammatic patients largely rely on inner, prearticulatory monitoring rather than on monitoring via the outer auditory loop. In accordance, we found that presenting white noise—which blocks the outer loop—leads to a reduction in the number of corrected errors in normals but has no effect on the agrammatics (Oomen, Postma, & Kolk, in press). The overuse hypothesis predicts that agrammatics will overuse the elliptical repertoire employed by normals in specific pragmatic contexts. Kolk (in press) found a high degree of similarity between the elliptical repertoires used by normals, agrammatics and 2–3 year old children. De Roo, Kolk, and Hofstede (submitted) observed that a subpart of this repertoire (NP + Adjective and NP + Adverb) which is infrequent in free conversation, starts to appear more frequently in normals when they are requested to describe pictures using only two-word sequences. Finally, by means of a recently developed 'sentence-order and inflection test' we were able to show that another subpart of the repertoire (NP + Nonfin V) significantly increased in frequency in embedded relative to simple main clauses. In contrast, there was no effect on inflectional error rate. Canonicity of word order had no effect on any of the output parameters.

References

De Roo, E, Kolk, H. H. J., & Hofstede, B. M. (submitted). Structural and informational features of syntactically reduced speech: A comparison of normal speakers and Broca's aphasics.

Hartsuiker, R. J., & Kolk, H. H. J. (1998). Syntactic facilitation in agrammatic sentence production. *Brain and Language*, *62*, 221–254.

Kolk, H. H. J. (1995). A time-based approach to agrammatic production. *Brain and Language*, *50*, 282–303.

Kolk, H. H. J. (in press). Does agrammatic speech constitute a regression to child language? A three-way comparison between agrammatic, child and normal ellipsis. *Brain and Language*

Oomen, C., Postma A., & Kolk, H. H. J. (in press). Prearticulatory and postarticulatory self-monitoring in Broca's aphasia. *Cortex*

Discreteness and interactivity in spoken word production by aphasic and nonaphasic speakers. Ardi Roelofs, Max Planck Institute for Psycholinguistics, Nijmegen, The Netherlands.

A hotly debated issue in spoken word production concerns the extent to which production is discrete or interactive. In particular, does activation cascade from level to level and is there production-internal feedback of activation? Recently, Rapp and Goldrick (2000) evaluated a number of theoretical positions on this issue by examining their ability to explain error patterns in picture naming from aphasic and nonaphasic speakers. The error findings are: (1) a lexical bias, (2) a mixed semantic-phonological error bias, (3) a pattern of only semantic errors arising from either a semantic or "post-semantic" locus of damage, and (4) an absence of the mixed-error bias with semantic damage and its presence with post-semantic damage. To evaluate the positions, Rapp and Goldrick manipulated discreteness and interaction parameters in two specific connectionist models that were supposed to represent the full theoretical spectrum. They concluded that the error biases and the effect of locus of damage refute feedforward models and favor a restricted-interactive model with production-internal feedback.

In this talk, I will show that Rapp and Goldrick's conclusions are not warranted. The particular feedforward models that they examined are overly simple and do not represent the class of feedforward models as a whole. In particular, existing feedforward models such as WEAVER++ (Levelt, Roelofs, & Meyer, 1999; Roelofs, 1992, 1997) exhibit the error biases both production internally and in speech-comprehension based feedback that serves self-monitoring. Furthermore, when both error data and latency data are considered, models like WEAVER++ are well-supported. In contrast, the interactive model of Rapp and Goldrick (2000) fails to account for latency data (see Roelofs, 1997) and therefore falls short of accounting for a major part of the recent literature. I will report the results from WEAVER++ simulations of picture naming showing that the model accounts for relevant latency data such as the effect of mixed distractors (e.g., Damian & Martin, 1999) and I show how the error biases arise production-internally in the model.

Furthermore, the error biases arise during self-monitoring in the model. In WEAVER++, self-monitoring and comprehending the speech of others engage the same mechanisms. Brain imaging studies also suggest that self-monitoring and speech comprehension are served by the same neural structures (e.g., McGuire, Silbersweig, & Frith, 1996). I will report the outcomes of simulations in which the model "monitored" its own verbal performance through comprehension-based feedback. The simulations show that the error biases and the influence of the functional locus of impairment in aphasia also arise during self-monitoring. Finally, I will provide independent support for the proposed type of self-monitoring from a re-analysis that I performed on the picture naming data from 15 aphasic speakers reported by Nickels and Howard (1995).

References

Damian, M. K., & Martin, R. C. (1999). Semantic and phonological codes interact in single word production. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *25*, 345–361.

Levelt, W. J. M., Roelofs, A., & Meyer, A. S. (1999). A theory of lexical access in speech production. *Behavioral and Brain Sciences*, *22*, 1–38.

McGuire, P. K., Silbersweig, D. A., & Frith, C. D. (1996). Functional neuroanatomy of verbal self-monitoring. *Brain*, *119*, 101–111.

Nickels, L., & Howard, D. (1995). Phonological errors in aphasic naming: Comprehension, monitoring, and lexicality. *Cortex*, *31*, 209–237.
Rapp, B., & Goldrick, M. (2000). Discreteness and interactivity in spoken word production. *Psychological Review*, *107*, 460–499.
Roelofs, A. (1992). A spreading-activation theory of lemma retrieval in speaking. *Cognition, 42*, 107–142.
Roelofs, A. (1997). The WEAVER model of word-form encoding in speech production. *Cognition*, *64*, 249–284.

The featural and unitary lexico-semantic space integration hypothesis (FUSS) of conceptual and lexico-semantic representation. An outline and initial test. Gabriella Vigliocco, David P. Vinson, University College of London.

We present a hypothesis, the Featural and Unitary Semantic Space integration hypothesis (FUSS) of conceptual and lexico-semantic representation and use in language production which we initially test against the performance of patients with category specific deficits and with grammatical class specific deficits reported in the literature.

In FUSS, semantic information is conceived as bundles of features of different kinds, bound into lexico-semantic representations that are organized into semantic fields (such as animals, tools, motion verbs) (e.g., Miller & Johnson-Laird, 1976). For concepts grounded in perception and action, the lexico-semantic system binds features from different sensory-motor modalities (e.g., Warrington & Shallice, 1984). Because lexico-syntactic information is largely correlated with lexico-semantic information, we assume that grammatical class distinctions (noun–verb) largely arise from lexico-semantic organization (Bates & MacWhinney, 1982). These lexico-semantic representation are linked to phonological (and orthographic) information.

We modeled FUSS by first collecting speaker-generated features (i.e., asking speakers to define a given word by providing features) for a large set of words (both nouns and verbs from a variety of semantic fields). Collecting speaker-generated features provides us with an empirical indication of the aspects of meaning, shared by different words, that are most salient to speakers (McRae, De Sa, & Scidenberg, 1997). The semantic-field organization of lexico-semantic representations was then simulated using self-organizing maps, a tool that takes advantage of statistical regularities in input patterns) (Kohonen, 1997; Zorzi, Perry, Ziegler, & Coltheart, 1999). In the resulting lexico-semantic space, measures of inter-word distance reflect semantic relatedness.

In FUSS, semantic category specific deficits can arise as a consequence of damage either to the lexico-semantic system or to featural types (sensory or functional). Lesioning studies we performed on the resulting maps and on specific feature types (e.g., visual features) suggest that not only can our hypothesis capture the performance of patients with category specific deficits reported in the literature, but it also allows us to make specific new predictions with respect to the other semantic fields may be most likely to be impaired along with a given one both for lexico-semantic space lesions and for lesions to specific feature-types.

Noun–verb dissociations reported in the literature can also arise within FUSS as a consequence of damage to the lexico-semantic space or to specific feature types, at least when object-nouns are contrasted to action-verbs (as is the case for the vast majority of studies reported in the literature), a prediction supported by our lesion studies. However, and interestingly, we did not observe a semantically based noun–verb distinction when action-nouns were contrasted to action-verbs.

References

Bates, E., & MacWhinney, B. (1982). Functionalist approaches to grammar. In E. Wanner & L. R. Gleitman (Eds.), *Language acquisition: The state of the art* (pp. 173–218). Cambridge: Cambridge University Press.
Kohonen, T. (1997). *Self-organizing maps*. New York: Springer.
McRae, K., de Sa, V., & Seidenberg, M. (1997). On the nature and scope of featural representations of word meaning. *Journal of Experimental Psychology: General*, *126*, 99–130.
Zorzi, M., Perry, C., Ziegler, J., & Coltheart, M. (1999). Category-specific deficits in a self-organizing model of the lexico-semantic system. In D. Heinke, G. W. Humphreys, & A. Olson (Eds.), *Connectionist models in cognitive neuroscience*. London: Springer Verlag.
Warrington, E. K., & Shallice, T. (1984). Category specific semantic impairments. *Brain*, *107*, 829–854.

The coda conflict in fluent aphasia. D.B. den Ouden, Graduate School for Behavioral and Cognitive Neurosciences, University of Groningen, The Netherlands.

Where phonological theory has been applied to clinical data, the concept of markedness has often played a significant role (e.g.. Blumstein, 1973, 1991). Not often taken into account, however, is the fact that the markedness value of linguistic structures may not be the same at all psycholinguistic levels of processing. What is marked at some linguistic level of representation may well be unmarked at another. In combination with currently maintained assumptions about the generation of aphasic (phonological) errors at different psycholinguistic levels (e.g. Kohn, 1988), this allows for interesting and useful comparisons, through which the influence of different types of markedness on literal paraphasias may be related to specific psycholinguistic levels of processing.

Although Levelt, Roelofs, and Meyer's (1999) model of speech production (at the word level) is not a model of impaired speech, it does yield predictions about the amount of phonological structure present or formed at the level of phonological encoding and that of phonetic encoding. Syllabification is a late process in phonological encoding and syllable structure is nonhierarchical in the 1999 proposal.

In this study, the responses of nine fluent and 10 non-fluent aphasics on a Dutch monosyllabic repetition task were analysed with respect to syllable structure. Only deletions were analysed, being true quantitative simplifications of syllable structure, and only syllables that do not violate the sonority slope (barring, for example, "*st*"-onsets). Both fluent and nonfluent aphasics delete the sonorant segment in onset clusters more often than the nonsonorant segment. However, in coda clusters, it is only the nonfluent aphasics who delete the sonorous segment more often than the nonsonorant.

Based on these data, it is proposed that there is indeed a difference between a pre-phonetic level of processing and a phonetic level of processing. The deficit of fluent aphasics can be located at the pre-phonetic level, whereas the non-fluent patients' deficit is at the (cognitive) phonetic level of processing. Syllabic markedness, represented by constraints such as Coda Harmony (codas want to be sonorous) and Onset Harmony (onsets do not want to be sonorous) is only active at the pre-phonetic level. This is in line with Levelt et al.'s (1999) model. Segmental markedness, however, says that all consonants should be as consonantal, i.e., nonsonorous, as possible. This type of markedness is active at both levels of processing, yielding a conflict with syllabic markedness at the pre-phonetic level.

Phonological Optimality Theory (Prince & Smolensky, 1993) provides the model in which this analysis of the 'coda conflict' is represented.

References

Blumstein, S. E. (1973). *A phonological investigation of aphasic speech.* The Hague: Mouton.
Blumstein, S. E. (1991). Phonological aspects of aphasia. In M. T. Sarno (Ed.), *Acquired aphasia.* San Diego: Academic Press.