Angela Friederici

Development and Interaction of Linguistic and Non-Linguistic Cognition in Infants*

The aim of the conference was to work out a state-of-the-art picture of the important progress which has been realized in recent years in our knowledge about infant development in central domains of cognition, like knowledge about objects, space, time, causality, and language. This progress has been largely due to the development of new experimental paradigms like the High Amplitude Sucking Procedure, the Head Turn Preference Procedure, and the Preferential Looking Procedure, of ingenious tasks like the Sequential Touching Task, and of new tools for analyzing infants' preverbal productions (cries, babbling), making possible the collection of behavioral data which allow us to study how the developing knowledge in these cognitive domains enters the child's growing capacity, for example to solve categorization tasks, to understand physical events, and to comprehend and produce language. At the same time, the development of techniques to measure brain activity during the child's exposure to specific types of data opened the way to investigations of the neuropsychological, neurophysiological and neurotopological environment underlying these cognitive processes.

A central issue for our understanding of the ontogenesis and structure of human cognition is the question how and to what extent development in one area of cognition interacts with development in other areas. Important related questions are, first, the extent to which these developmental processes make use of the same or different learning mechanisms, and second, to what extent they involve the same or different brain structures.

By bringing together specialists from different developmental domains, the workshop contributed to this central area of research in cognition, discussing in detail a core issue for our understanding of how the human mind works, namely the problem of the relationship between the development of linguistic and non-linguistic knowledge, an issue crucially related to the question of the modularity of human cognitive orga-

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nization. Central issues discussed at the workshop were the structure and the structural changes in infants' linguistic and non-linguistic representations, including neuropsychological (e.g. memory, attention, temporal structure, automatization of cognitive processes), neurophysiological (e.g. ERP structure, brain development, brain plasticity), and neurotopological (e.g. lateralization) aspects of development.

The discussion focused more particularly on the following issues:
- the strengths and weaknesses of the methods used for data collection and data analysis with respect to the research issues;
- the perception/cognition interface, e.g. the problem of teasing apart perceptual and cognitive processes underlying infant behavior;
- uniformity vs. variability and robustness vs. fragility of development in specific cognitive domains;
- the interrelationship between the development of different cognitive domains, especially the relation between (impaired/unimpaired) linguistic and non-linguistic cognition;
- the question how and to what extent the constraints on cognitive development are innate or the result of experience;
- the issue of a critical period for specific developments;
- the structure of the developmental/learning mechanisms involved (e.g. associative networks, selection processes);
- the structure and development of the initial linguistic, i.e. prosodic, lexical and morphosyntactic, and cognitive, i.e. physical, mathematical, knowledge;
- the development of cerebral specialization in language processing.

The workshop was organized by Jürgen Weisenborn, University of Potsdam and Angela Friederici, Max-Planck-Institute of Cogintive Neuroscience, Leipzig/Wissenschaftskolleg zu Berlin.

The program of the workshop included the following speakers and papers:

P. Jusczyk, John Hopkins University, Baltimore, "Some Cognitive and Perceptual Foundations for Acquiring Language"

A. Christophe and *A. Gout*, CNRS, Paris, "Learning Procedures for the Acquisition of Phonological Properties: Specific or General?"

B. Höhle and *J. Weissenborn*, University of Potsdam, "The Developing Lexicon: The Emergence of Lexical Representations for Functional Elements"

D. Swingley, Max-Planck-Institute for Psycholinguistics, Nijmegen, "Two Kinds of Robustness in Early Language Recognition"

K. Plunkett, University of Oxford, "Analyzing Lexical Knowledge in Infants"
L. Bosch, University of Barcelona, "The Impact of Bilingual Exposure on Early Speech Perception: The Discrimination of Vowel Contrasts"
K. Oller, University of Maine, Orono, "The Natural Logic of Emergent Communication Systems: Development and Evolution"
Z. Penner, University of Konstanz, "Continuity in Early Phonology: The Prosody of Canonical Babbling"
K. Wermke, Humboldt University, Berlin, "Developmental Changes of Infant Cries During the First Months of Life: the Evolution of Complex Vocalizations"
A. Benasich, Center of Molecular and Behavioral Neuroscience, Rutgers, The State University of New Jersey, "The Implications of Early Perceptual Processing for Language Development"
M. Cheour, University of Helsinki, "Mismatch Negativity (MMN) and Late Discriminative Negativity (LDN) as Tools for Investigating Speech Perception and Learning in Children and Infants"
E. Plante, The University of Arizona, Tucson, "How the Brain Informs the Study of Specific Language Impairment"
S. Pauen, University of Magdeburg, "How Global and Basic Level Terms Influence Infants' Categorization Performance"
R. Baillargeon, University of Illinois, Champaign, "Infants' Physical Knowledge"
M. Kavsek, University of Frankfurt/Main, "Object Unity in German Babies"
W. Mack and M. Knopf, University of Frankfurt/Main, "Do Infants Count?"
B. Sodian, University of Würzburg, "Infants' Understanding of Communicative Gestures"

The participants were unanimous in considering that the workshop had very successfully contributed to establishing new bridges between the disciplines involved and that it had opened important new perspectives on the earliest phases of the development of human cognition.