

Cognitive Research



At the National Institute of Mental Health

FACT SHEET

Office of Communications and Public Liaison
6001 Executive Blvd.,
Room 8184, MSC 9663
Bethesda, MD 20892-9663
Phone: 301-443-4513
TTY: 301-443-8431
FAX: 301-443-4279
E-mail: nimhinfo@nih.gov
Website: www.nimh.nih.gov

September 2000

Perception, attention, learning, memory, thought, and communication—these are processes that are basic to much of our mental life and behavior, and they are all encompassed under the term cognition. The National Institute of Mental Health (NIMH) supports research on many facets of cognition, seeking to identify their underlying mechanisms and discover how they relate to mental disorders. Several scientific disciplines, foremost among them psychology, neuroscience, and computer science, are contributing to this cognitive research. Interdisciplinary studies involving all three of these fields permit researchers to develop sophisticated models of cognition and make detailed predictions of the outcome of cognitive processes. Most of these studies involve normal human subjects or animals, but all are ultimately relevant to the problem of mental disorders.

Among the areas being actively investigated with NIMH and other National Institutes of Health support are:

- **The physical basis of memory and learning.** Research in the past decade has finally begun to reveal the physical basis for the storage of memories. There is increasingly strong evidence that physical changes in the structures called synapses, which allow communication between neurons in the brain, and the functional consequence of those changes, called long-term potentiation, are the physical basis of important forms of learning and memory.

- **Neuroimaging in cognitive research.** Neuroimaging techniques that allow scientists to peer inside the living, functioning human brain are immensely powerful tools for cognitive research. One particularly valuable technique, functional

An NIMH Snapshot

The National Institute of Mental Health (NIMH) is one of 25 components of the National Institutes of Health (NIH), the Government's principal biomedical and behavioral research agency. NIH is part of the U.S. Department of Health and Human Services. The actual total fiscal year 1999 NIMH budget was \$859 million.

■ ■ ■

NIMH Mission

To reduce the burden of mental illness through research on mind, brain, and behavior.

■ ■ ■

How Does the Institute Carry Out Its Mission?

- NIMH conducts research on mental disorders and the underlying basic science of brain and behavior.
- NIMH supports research on these topics at universities and hospitals around the United States.
- NIMH collects, analyzes, and disseminates information on the causes, occurrence, and treatment of mental illnesses.
- NIMH supports the training of more than 1,000 scientists to carry out basic and clinical research.
- NIMH communicates information to scientists, the public, the news media, and primary care and mental health professionals about mental illnesses, the brain, mental health, and research in these areas.

COGNITION

magnetic resonance imaging, or fMRI, promises to make it possible for researchers to discover which brain circuits are responsible for specific cognitive processes.

- **The effect of hormones on learning and memory.**

Estrogens, the female sex hormones that are so important in menstruation and other bodily functions, may also modulate cognitive processes such as memory. There is preliminary evidence that estrogen maintenance therapy enhances memory in post-menopausal women and delays memory loss related to Alzheimer's disease.

- **Generation of new nerve cells in the adult brain.**

For many years it was believed that the brain, once formed, could not produce new nerve cells. But adult generation of new nerve cells, found first in birds, then in rats, then in monkeys, has now been found in humans as well. The nerve cell regeneration occurs in the hippocampus, a portion of the brain essential to the formation of memories. NIMH-supported scientists are attempting to learn what role nerve cell regeneration plays in the normal memory function of the hippocampus.

- **Role of stress in nerve cell regeneration.**

Recently, work with animals has shown that nerve cell generation is affected by stress: stress appears to decrease the capacity for generation of new nerve cells. Scientists supported in part by NIMH funds are working intensively to understand the factors linking stress and decreases in nerve cell regeneration. Understanding these effects is critical because stress can be such a major factor in life events and because the brain areas affected play an important role in basic memory functions.

- **Role of emotion in cognition.** Emotion plays a major role in determining how memories are stored. Strong emotion, such as fear, can mark a memory so that it retains its vividness in a very persistent way, as in post-traumatic stress disorder. NIMH-supported scientists are studying how such memories are formed, stored, and retrieved, in the hope of obtaining information that can be used in the development of new treatments for memory-related disorders.

- **Extension of cognitive research to depression and anxiety disorders.**

Research in this area is expanding rapidly. For example, NIMH-supported researchers have found that a depressive mental "schema"—a tendency to "view the glass as half empty rather than half full" even when in a normal mood—predisposes a person to depression and plays a role in the active illness.

- **Cognition in schizophrenia.** NIMH-supported research has contributed to the development of an influential model of the cognitive problems that are a prominent feature of schizophrenia. The model says that people with schizophrenia have difficulty taking account of the context of events and information and making an appropriate response. The neurotransmitter dopamine is thought to play a role in this problem.

- **Infants.** The process by which infants acquire language has long been of interest to scientists and parents alike. NIMH-supported researchers have now shown that infants 3 to 4 months old have greater ability to comprehend speech than previously thought. Other studies focus on infants of depressed mothers. These

COGNITION

children, who are at risk for depression later in life, may be affected by their mothers' speech patterns: the researchers have shown that depressed mothers of infants use flat, unanimated tones in speaking to their babies. This research suggests that intervention to treat depression in mothers of infants, and to improve their interaction with their babies, may pay off in reduced rates of depression as the children grow up.

- **Decision-making.** The process by which people choose between different options has long been of interest to cognitive psychologists. In addition, decision-making is often impaired in mental illness. With NIMH support, these studies are now going beyond tightly controlled laboratory experiments into the "real world." Researchers will study the mental processes that underlie decision-making.

- **Conditioning in animals.** NIMH-supported investigators are learning more about the perceptual, memory, and attentional mechanisms underlying classical conditioning (the process by which an animal learns to associate two stimuli, such as a light and a shock) and operant conditioning (the process by which an animal learns to relate certain external events to its own behavior, such as gaining a food reward by pressing a lever). The researchers are developing cognitive models to explain these phenomena. This work will have applications for understanding phobias and for the development of treatments.

- **Plasticity: the integration of "nature" and "nurture."** The physical changes in the brain resulting from new memories, the addition of new neurons, changes in hormones, and stress and trauma all point

to constant remodeling of the brain itself. Through this plasticity, experience is constantly changing the brain. Neuroscientists are beginning to glimpse how the mind might alter its substrate, the brain.

For More Information About NIMH

- The Office of Communication and Public Liaison carries out educational activities and publishes and distributes research reports, press releases, fact sheets, and publications intended for researchers, health care providers, and the general public. A publications list may be obtained on the web at <http://www.nimh.nih.gov/publist/puborder.cfm> or by contacting:

Office of Communications and Public Liaison, NIMH
Information Resources and Inquiries Branch
6001 Executive Blvd., Room 8184,
MSC 9663
Bethesda, MD 20892-9663
Phone: 301-443-4513
FAX: 301-443-4279
Mental Health FAX 4U: 301-443-5158
E-mail: nimhinfo@nih.gov
NIMH home page address:
<http://www.nimh.nih.gov>

- Information about research opportunities at the NIMH Intramural Research Program may be obtained from:

Office of the Scientific Director, NIMH
9000 Rockville Pike
Building 10, Room 4N224, MSC 1381
Bethesda, MD 20892-1831
Phone: 301-496-3501
Fax: 301-480-8348

COGNITION

- Information for scientists on NIMH grants and contracts programs, including grant application and review, Requests for Applications, Requests for Proposals, program announcements, research training and career development, small business programs, program analyses of NIMH extramural research grants and applications, access to NIH Grants policy, and other material may be obtained from the NIMH home page:
<http://www.nimh.nih.gov>.



This is the electronic version of a National Institute of Mental Health (NIMH) publication, available from <http://www.nimh.nih.gov/publicat/index.cfm>. To order a print copy, call the NIMH Information Center at 301-443-4513 or 1-866-615-6464 (toll-free). Visit the NIMH Web site (<http://www.nimh.nih.gov>) for information that supplements this publication.

To learn more about NIMH programs and publications, contact the following:

Web address:

<http://www.nimh.nih.gov>

E-mail:

nimhinfo@nih.gov

Phone numbers:

301-443-4513 (local)

1-866-615-6464 (toll-free)

301-443-3431 (TTY)

Fax numbers:

301-443-4279

301-443-5158 (FAX 4U)

Street address:

National Institute of Mental Health

Office of Communications

Room 8184, MSC 9663

6001 Executive Boulevard

Bethesda, Maryland 20892-9663 USA

This information is in the public domain and can be copied or reproduced without permission from NIMH. To reference this material, we suggest the following format:

National Institute of Mental Health. Title. Bethesda (MD): National Institute of Mental Health, National Institutes of Health, US Department of Health and Human Services; Year of Publication/Printing [Date of Update/Revision; Date of Citation]. Extent. (NIH Publication No XXX XXXX). Availability.

A specific example is:

National Institute of Mental Health. Childhood-Onset Schizophrenia: An Update from the National Institute of Mental Health. Bethesda (MD): National Institute of Mental Health, National Institutes of Health, US Department of Health and Human Services; 2003 [cited 2004 February 24]. (NIH Publication Number: NIH 5124). 4 pages. Available from: <http://www.nimh.nih.gov/publicat/schizkids.cfm>