



ELSEVIER

Acta Psychologica 107 (2001) 155–181

---

---

**acta  
psychologica**

---

---

www.elsevier.com/locate/actpsy

## Integrating cognitive psychology, neurology and neuroimaging

Lawrence M. Parsons \*

*Research Imaging Center, University of Texas Health Science Center at San Antonio,  
7703 Floyd Curl Drive, San Antonio, TX 78284-6240, USA*

Received 28 July 2000; received in revised form 14 December 2000; accepted 17 December 2000

---

### Abstract

In the last decade, there has been a dramatic increase in research effectively integrating cognitive psychology, functional neuroimaging, and behavioral neurology. This new work is typically conducting basic research into aspects of the human mind and brain. The present review features as examples of such integrations two series of studies by the author and his colleagues. One series, employing object recognition, mental motor imagery, and mental rotation paradigms, clarifies the nature of a cognitive process, imagined spatial transformations used in shape recognition. Among other implications, it suggests that when recognizing a hand's handedness, imagining one's body movement depends on cerebrally lateralized sensory-motor structures and deciding upon handedness depends on exact match shape confirmation. The other series, using cutaneous, tactile, and auditory pitch discrimination paradigms, elucidates the function of a brain structure, the cerebellum. It suggests that the cerebellum has non-motor sensory support functions upon which optimally fine sensory discriminations depend. In addition, six key issues for this integrative approach are reviewed. These include arguments for the value and greater use of: rigorous quantitative meta-analyses of neuroimaging studies; stereotactic coordinate-based data, as opposed to surface landmark-based data; standardized vocabularies capturing the elementary component operations of cognitive and behavioral tasks; functional hypotheses about brain areas that are consistent with underlying microcircuitry; an awareness that not all brain areas implicated by neuroimaging or neurology are necessarily directly involved in the associated cognitive or behavioral task; and systematic approaches to integrations of this kind. © 2001 Elsevier Science B.V. All rights reserved.

---

\* Tel.: +1-210-567-8189; fax: +1-210-567-8152.

*E-mail address:* parsons@uthscsa.edu (L.M. Parsons).

*PsycINFO classification:* 2520; 2330; 2323; 2326; 2320

*Keywords:* Cognitive neuroscience; Mental imagery; Cerebellum; Perceptual discrimination

---

## **1. Introduction**

In 1990, comparatively few researchers were directly concerned with the relationships among cognitive psychology, behavioral neurology, and functional neuroimaging research. Ten years later there is now a striking expansion of attention to those interrelationships. The number of researchers with expert knowledge in, and contributions to, methodologies, data, and theory in all three domains are also steadily growing. Such researchers often identify themselves as cognitive neuroscientists (e.g., Gazzaniga, 2000).

Cognitive psychology, functional neuroimaging, and behavioral neurology each have widely accepted general characteristics that bear on their combination or integration, even if details vary in particular cases (e.g., Adams, Victor, & Ropper, 1997; Anderson, 1999; Boller & Grafman, 1997; Feinberg & Farah, 1996; Shallice, 1988; Toga, Mazziotta, & Frackowiak, 2000). Cognitive psychology experiments are useful in revealing behavioral variables, their inter-relationships, and methods of controlling cognitive, perceptual, and motor processes. They can also expose the components of task performance (i.e., the elementary operations) and reveal dissociations among behavioral processes (e.g., via experimental manipulations involving interference, priming, or load). Functional neuroimaging can reveal which areas of a healthy or injured brain are specifically activated by particular cognitive or behavioral tasks. Neurological studies can evaluate how damage to a brain area affects cognitive or behavioral processes and whether a cognitive or behavioral process requires the support of a specific brain area. Neurology and neuroimaging can show single and double dissociations between tasks, operations, and brain regions. Combined or integrated effectively, cognitive psychology, functional neuroimaging, and behavioral neurology can map elementary information processing operations onto specific brain areas and map sets of those operations/areas onto system-level models of specific psychological tasks.

The present review highlights research performed over the last decade which integrates experimental psychology, neurology, and neuroimaging. Each series of studies was designed to elucidate either the nature of a psychological process or the function of a brain structure. The first example of this approach illustrates its use in understanding the role of imagined spatial transformations in shape recognition. The second example illustrates the approach for the investigation of the function of the cerebellum. The studies discussed focus on object recognition, motor mental imagery, mental rotation and the perception of cutaneous, tactile, and auditory information. This research is principally that the author and his colleagues; space does not permit a full view of the relevant research areas, in which many others have made

متن کامل مقاله

دریافت فوری ←

**ISI**Articles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات