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Biological Psychology 64 (2003) 217–253
BIOLOGICAL PSYCHOLOGY
www.elsevier.com/locate/biopsycho

The deceptive response: effects of response conflict and strategic monitoring on the late positive component and episodic memory-related brain activity

Ray Johnson, Jr.*, Jack Barnhardt, John Zhu

Department of Psychology, Queens College/CUNY, 65-30 Kissena Blvd., Flushing, NY 11367, USA

Received 3 June 2002; accepted 26 July 2003

Abstract

The cognitive processes and neural mechanisms underlying deceptive responses were studied using behavioral responses (RT) and event-related brain potentials (ERPs) while participants made truthful and deceptive responses about perceived and remembered stimuli. Memorized words were presented in a recognition paradigm under three instructional conditions: Consistent Truthful, Consistent Deceptive, Random Deceptive. Responses that conflicted with the truth about both perceived and remembered items produced the same pattern of slower RTs and decreased LPC amplitudes. When long-term response patterns were monitored, RTs became much slower and LPC amplitudes decreased greatly. The different behavioral and ERP changes in the two deception conditions suggested that two dissociable executive control processes, each requiring additional processing resources, can contribute to deceptive responses. The parietal episodic memory (EM) effect, thought to reflect recollection, was unaffected by whether participants responded truthfully or deceptively suggesting that it provides a measure of guilty knowledge.

Keywords: Deception; ERPs; LPC; Response conflict; Performance monitoring

1. Introduction

In the past 10 years, investigators have attempted to demonstrate that event-related brain potentials (ERP) can be used to detect concealed information in humans (for reviews, see

* Corresponding author. Tel.: +1-718-997-3241; fax: +1-718-997-3257.
E-mail address: ray_johnson@qc.edu (R. Johnson Jr.).

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doi:10.1016/j.biopsycho.2003.07.006

Bashore and Rapp, 1993; Rosenfeld, 1995). These efforts can be characterized as falling into two general categories, those aimed at detecting the presence of guilty knowledge and those aimed at detecting when persons are feigning memory loss (i.e., malingering). The guilty knowledge studies have demonstrated that the late positive component (LPC, also known as the P300) of the ERP can provide a useful index of the presence of concealed memories (e.g., Allen and Iacono, 1997; Farwell and Donchin, 1991; Johnson and Rosenfeld, 1992). Similarly, because persons feigning amnesia are attempting to conceal particular memories, the LPC also reveals the true memory status of items in such persons (e.g., Allen, 2002; Allen et al., 1992; Allen and Movius, 2000; Rosenfeld et al., 1996, 1998, 1999).

All these studies focused on the LPC because the stimuli were presented in an "Oddball" paradigm in order to take advantage of the inverse relation between LPC amplitude and stimulus probability. That is, the items of interest (i.e., the "guilty knowledge" items) are presented infrequently and randomly with two other categories of control stimuli, one that is presented infrequently and the other frequently. If the person has guilty knowledge of the items of interest, the infrequent nature of these items will cause them to elicit a LPC like that for the infrequent control stimuli. However, if the person has no knowledge of the items, they will be perceived as belonging to the frequent stimulus set and thus elicit a LPC like that for the frequent control stimuli. Hence, all these studies are best characterized as "applied" because they took previously known aspects of the ERP and used them, albeit creatively, to devise methods to detect the presence of concealed information in "real-world" situations.

Despite this interest in detecting guilty knowledge, no "basic" ERP studies have been done to determine the nature of the cognitive processes involved when persons are deceptive. This is surprising given that the ERP technique has been used to investigate the neural basis of many aspects of cognition. To address this lack of knowledge, we conducted a series of experiments designed to identify the cognitive processes used during deceptive responding. Determining which cognitive processes are used during a behavior as complex and multi-faceted as deception is hampered by a number of factors. One initial problem is that there are many types of deception that vary considerably in nature and complexity (Vrij, 2001). This may account for another impediment for designing empirical studies of deception, that there appears to be no widely accepted definition of deception (for reviews, see Mitchell, 1986; Vrij, 2001). A further complication is the likelihood that the cognitive operations that different people use for any given type of deception will vary as a function of a variety of factors, including their personality and personal habits (e.g., how often they lie), and the circumstances surrounding the deception. In addition, non-cognitive processes, such as those related to processing of any emotional components of a deception, are also likely to be involved.

To create a conceptual framework for studying the cognition of deception, we attempted to categorize the general types of processes that might be used by a deceptive person. Although there is, to the best of our knowledge, no definition of deception that specifies the cognitive processes involved, it seemed to us that at least some definitions can be seen as implicitly or explicitly dividing deception operations into two broad categories: (1) the cognitive/emotional processes used to formulate such factors as, for example, the rationale, intent and strategies relevant to a deception, and (2) those used in the act of deception (cf., Furedy et al., 1988). Further, we hypothesized that, rather than being a unique process, both the intent and action components of deception likely draw on general purpose