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P300 correlates of simulated malingered amnesia in a matching-to-sample task: topographic analyses of deception versus truthtelling responses

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Abstract

Two experiments using a P300-enhanced Forced Choice Procedure (P3FCP) investigated simulated amnesia in a matching-to-sample task. In Experiment 1, successful manipulation of subjects towards different behavioral hit rates (75–80% vs. 85–90%) did not adversely affect the diagnostic sensitivity of match-mismatch Pz-P300 amplitude analyses, allowing detection of 69% of simulators. P300 amplitudes of simulators (Malinger group) were as large as those of truth-tellers (truth group, a control), indicating no dual task-related (Malingering) reduction across different behavioral hit rates. Experiment 2 found no main effect of oddball type, match vs. mismatch, on P300 (P3) amplitude with a mismatch-rare variant of the P3FCP. This study also revealed larger Pz-P3s in the Malingering (vs. Truth-telling) condition. Subsequent topographic analyses suggested different Truth and Malinger scaled P3 amplitude topographies in both these sets of P3FCP data and in those from a previous autobiographical memory paradigm. Further analysis yielded preliminary evidence for a common deception-related P3 amplitude topography across different paradigms/conditions. © 1998 Elsevier Science B.V.

Keywords: Event-related potential; P300; Malingered amnesia; Scalp topography analysis

1. Introduction

Claims of amnesia are frequently raised in a variety of legal situations. The legal community agrees that amnesia is easily feigned and difficult, if not impossible, to identify (Wiggins and Brandt, 1988). Guilmette et al. (1994) noted that neuropsychologists are often required to attempt diagnosis and provide expert testimony in personal injury litigation cases involving such claims and that a vital concern is the ability to distinguish

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between actual and exaggerated impairment. Rogers et al. (1993) also emphasized the importance of correct assessment of feigned cognitive deficits, especially in light of the motivation (e.g. monetary) to malinger. However, as Rogers et al. further observed, the capability of skilled clinicians to detect feigned impairment has been questioned and documented in some cases to be substantially below chance.

Guilmette et al. (1994) observed that some researchers have developed a more proactive approach. Rather than attempting to construct a 'Malingering profile' from existing neuropsychological tests, quasi-tests are constructed in which experimental amnesia simulators and suspected malingerers, but not actually injured persons or normals, perform poorly. The Hiscock Forced Choice Procedure (FCP) is such a quasi-test, developed by Hiscock and Hiscock (1989), which is used in many cases to assess suspected malingering of amnesia. This procedure (detailed in the present Methods section) is a simple delayed matching-to-sample task using multidigit numbers. An increasingly long interval between sample and test numbers may make the test appear difficult, but recognition of the first digit alone is sufficient for correct response (Nies and Sweet, 1994). Normals and non-litigating patients with mild to moderate head injury perform at a rate of 100% correct, typically, on this easy 'test.'

Nies and Sweet (1994), in reviewing use of the FCP in malingered amnesia detection, concluded that requiring below-chance performance for forced choice tests as a diagnostic criterion may not allow detection of sophisticated malingerers. This review also pointed out that since Guilmette et al. (1994) found that a cutoff score at the 90% correct level, correctly classified 90% of truly impaired (major depressive, brain-damaged), normal and malingering individuals, therefore, a cutoff at the 90% level was appropriate to detect malingering. However, as Rosenfeld et al. (1996) observed, there is still the chance of a false positive error. Therefore, although a given score (at or slightly greater than chance) may be highly suggestive of malingering, it would be prudent to have an adjunct involuntary index which could validate or invalidate the behavioral indication. This agrees with the Rogers et al. (1993) suggestion that clinicians' seeming lack of diagnostic ability may reflect methodological constraints, i.e. an absence of specialized procedures for the evaluation of feigning itself.

Using a P3-enhanced FCP test (P3FCP), Rosenfeld et al. (1996) have shown that in subjects instructed to simulate memory loss, a larger P3 is still evoked in response to oddball match stimuli than in response to comparatively frequent mismatches, regardless of overt verbal response. This test was based on the assumption that in an oddball-like paradigm where the probability of probes matching samples was low (17%), the match stimuli, being infrequent and meaningful, would elicit a larger P3 response (Johnson, 1988). Such psychophysiological data can serve as evidence of an intact ability to discriminate matches and mismatches in a given simulator and thus, as an indication of feigning. With this diagnostic procedure Rosenfeld et al. (1996) correctly identified about 70% of simulators. In a recent modification of this procedure, Ellwanger et al. (1996a,b) identified about 86% of the simulators.

In the present study, two experiments using this enhanced P3FCP attempted to further characterize how simulated malingering affects P3 amplitude. First, we manipulated the behavioral hit rate (percentage of overt correct responses), since not all malingering individuals will perform at the near or less than chance (50%) rate that makes them obviously suspect. We questioned whether normal individuals could be manipulated to exhibit varying behavioral hit rates and if this manipulation would affect the ability of the P3 index to detect intact match-mismatch discrimination ability.

According to the Triarchic Model of P300 amplitude (Johnson, 1986, 1988, 1993), P3 amplitude in response to any given stimulus is a function of three main experimental variables: information transmission (T), stimulus probability (P), and stimulus meaning (M):

$$P3 \text{ amplitude} = F\ [\mathrm{T} \times (1/P + M)]$$