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# Possible Memory-Enhancing Properties of Vinpocetine

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## ABSTRACT

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Critical flicker fusion threshold, choice reaction time, total reaction time, and Sternberg-type memory tasks of digits/words were measured in twelve volunteers after having received vinpocetine or placebo for two days. A significant improvement was recorded in the short-term memory test following 40 mg of the drug when compared to placebo.

**Key words: CFFT, reaction time, memory scanning**

## INTRODUCTION

Vinpocetine (ethyl apovincaminate) is a vincamine derivative used in the treatment of disorders arising from cerebrovascular and cerebral degenerative diseases. Previous in vivo and in vitro studies have shown the compound to increase cerebral blood flow significantly [Benscáth et al., 1976; Kárpáti and Szporny, 1976] and to facilitate neurotransmitter turnover, particularly 5-Hydroxyindoleacetic acid 5-HIAA and serotonin (5-HT) [Rosdy et al., 1976]. Human studies have provided additional evidence of improved circulation after administration of vinpocetine, particularly in patients with damaged vascularisation [Fényes and Földes, 1976; Orosz et al., 1976]. The effects of vinpocetine on cognitive symptoms of cerebrovascular diseases, however, have not been fully investigated. Current research has, therefore, focused on the psychopharmacologic aspects of the compound.

## METHODS AND RESULTS

Critical Flicker Fusion Threshold (CFFT) measures the ability to distinguish discrete sensory data and is taken as an index of overall central nervous system (CNS) activity. The

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subject is required to discriminate flicker in a set of four light-emitting diodes held in foveal fixation at 1 m. The psychophysical method of limits is employed to determine the perceived flicker threshold using three ascending and three descending scales. The subject's flicker fusion threshold is raised with increased alertness; if the subject is sedated, the threshold is reduced. These effects are reliable and have been widely validated, establishing CFFT as a measure of general levels of arousal within the CNS [Hindmarch, 1980].

Choice Reaction Time (CRT) measures the speed of response to a critical stimulus. The subject extinguishes one of six red lights, illuminated at random, by touching the appropriate response button. Total reaction time (TRT) is taken as the mean of 20 stimulus presentations; TRT can be separated into recognition and motor reaction time components by subtracting movement time from TRT. This measure reflects sensorimotor performance and correlates with other measures of CNS activity as indicated by the CFFT [Hindmarch, 1980].

The line analogue ratings scale (LARS) measures subjective ratings of drug effects from a set of 10-cm line analogue scales. The mean of ratings for "tiredness," "drowsiness," and "alertness" (included among several distractor scales) represents perceived sedation [Hindmarch and Gudgeon, 1980].

The Sternberg-type tasks measure high-speed scanning ability and retrieval from short-term memory [Sternberg, 1969, 1975]. Two tests are involved, one using digits and the other using words. Reaction time is recorded as the interval during which the subject judges whether a test digit/word was contained within a short memorised list of digits/words. Improvement is indicated by a reduced reaction time to the test digit/word, whilst sedation increases the subject's reaction time.

Vinpocetine has been studied in a series of investigations. The first study investigated the influence of a range of oral doses of vinpocetine on cognitive function and information processing in normal volunteer subjects [Subhan and Hindmarch, 1985]. Twelve healthy female volunteers (25–40 years; mean age 32 years) received vinpocetine (10, 20, 40 mg) and placebo for two days (t.i.d.) according to a randomised, double-blind crossover design. On the third day, 1 hr after a morning dosage, performance was measured by CFFT, CRT, LARS, and the Sternberg-type task. For all dosages, no statistically significant differences were observed in CFFT, CRT, and LARS between vinpocetine and placebo. However, a highly significant improvement ($P < 0.0001$) was recorded for short-term memory following treatment with 40 mg vinpocetine when compared with placebo, revealing a localised effect on memory processes.

The second study investigated specific impairment of cognitive function and information processing by the 1,4-benzodiazepine flunitrazepam and the possible reduction of this impairment by vinpocetine [Bhatti and Hindmarch, 1987]. Eight healthy female volunteers (25–40 years; mean age 31 years) received 40 mg vinpocetine and placebo for two days (t.i.d.), with a single morning dose administered on the third day, according to a randomised, double-blind crossover design. Flunitrazepam, 1 mg, or placebo was administered on the evening of day 2. Assessment included CFFT, LARS, and the Sternberg-type task 1 hr after evening medication on day 2 and 1 hr after morning medication on day 3. The flunitrazepam did not have the detrimental effects predicted, possibly because of considerable intersubject variation in responses to the benzodiazepine (as noted when the raw data was closely inspected). A statistically significant improvement ($P < 0.05$) with 40 mg vinpocetine when compared with placebo was observed for the Sternberg-type task. This result, again, indicates that vinpocetine affects short-term memory processes specifically. No statistically significant results were observed for CFFT, suggesting that more general levels of arousal were not affected.

## COMMENTS

Vinpocetine (40 mg t.i.d. × two days) improved speed of reaction in short-term memory, an effect that is possibly linked to an improvement in cerebral circulation and

enhanced neurotransmitter turnover. Lower doses of vinpocetine, however, were not effective in young, healthy subjects.

From the results obtained, it would seem that performance on CFFT and CRT is unaffected by vinpocetine, although these tests also involve aspects of speed of processing and reaction. Also, "memory performance" is not unrelated to arousal; so, again, it is unclear why vinpocetine would seem to affect performance on the memory tasks but not on the CFFT or CRT.

The mechanism or mechanisms by which vinpocetine affects cognitive function and information processing are presently uncertain.

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