

## MODAFINIL EFFECTS ON SPATIAL COGNITION DURING 60 HOURS OF SLEEP DEPRIVATION

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### SUMMARY

Modafinil is currently being investigated in the context of sustained military operations as a potential countermeasure to the effects of extensive sleep deprivation (SD) on human cognitive performance. The aim of this present study is to analyze SD and dose-related effects of Modafinil on spatial cognition according to information processing patterns. Six normal healthy French military personnel participated for 4 one-week testing sessions involving double-blind, placebo-controlled manipulation of three doses of Modafinil (50, 150 and 300 mg/24hrs) during 60 hours of SD. Cognitive tasks investigated spatial abilities.

Information processing data analysis indicates that Modafinil effectiveness is to be qualified based on the dose of Modafinil and psychological processes. Thus, Modafinil has more important beneficial effects on the serial processes which govern the speed of attentive spotlight scanning of the visual field, but a lower effect on the decision making processes involved in the same task. Regarding sensory interactions between vestibular system and vision, low doses (50 et 150 mg/24hrs) of Modafinil have beneficial effects, while a dose of 300 mg/24hrs produces effects which are similar to those observed with a placebo. Lastly, Modafinil have beneficial effects on mental imagery processes, however its effectiveness on mental image accuracy seems to be restricted to 48 hours of SD while vigilance is still well-preserved. This experiment suggest that sensorial integration processes, working memory and control operators are the preference target site for SD and Modafinil.

### INTRODUCTION

Though Modafinil's originality and pharmacological properties justify the part it now plays in the treatment of vigilance diseases (3, 4, 6), the interest its use generates in non-therapeutic applications raises many questions. Our field of interest is the operational field where prolonged wakefulness no longer meets the necessary requirement of safety - as was the case when there was a risk of major confrontation in Central Europe between the East and the West - but that of military technology and state of the art where continuous operations has a strategic dimension.

Under such conditions, research dealing with the use of such a psychostimulant substance - or any other substance for that matter - should under no circumstances be modeled on the conventional pharmacological approach aimed at treating a disease, i.e. reducing or even eliminating the pathological symptoms which burden the life of a patient while incurring minimum risk and side

effects. Indeed, the military's approach is to meet other requirements which are much more demanding in the area of accurate knowledge of the action of the compounds.

It is within this prospect that we have developed an original psychopharmacological method which relies on cognitive psychology whose purpose differs from that of conventional behavioral psychology currently used in psychopharmacology. The latter focuses on the link between the stimulus and the response in a given situation thus likening the brain to a black box whose operation is deliberately ignored. The point of interest is performance and only performance as a function of possible variations under differing conditions whether it be in terms of attention, memory or decision options for instance.

With cognitive psychology, the focus is mainly on identifying and understanding the functional structure of the psychological processes occurring between data input from sensory organs and the output behavioral reactions. The cognitive approach to mental functions is based on an overall theoretical model, that of the Information Processing System (IPS, Fig. 1), involving several stages - between sensory encoding and system response - common to all activities which the subject may have (9). Therefore, whether it be memorization, logical reasoning or sensory-motor pointing task, all of these tasks do include : sensory encoding, perception, representation, mental operations in their widest acception, decision making and behavioral response. This is all in interaction with management and control operators as well as with working memory and long-term memory.

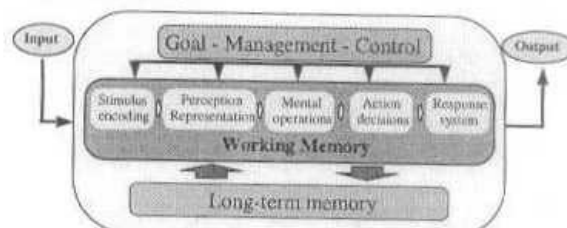


Figure 1 : Information processing system (IPS)

The purpose of our research was to compare three Modafinil dosages - 50, 150 and 300 mg/24 taken three times a day every 8 hours - over a period of 60 hours of Sleep Deprivation (SD) using cognitive analyses to study psychological effects

### METHOD

Modafinil was studied in a double-blind, placebo-controlled manipulation on subjective fatigue, alertness, cognitive performance and physiological recordings in normal healthy adults.