

## Acute effects of caffeine on selective attention and visual search processes

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### Abstract

The influence of a single dose of caffeine was evaluated in focused and divided attention conditions of a visual selective search task in which subjects had to perform controlled search processes to locate a target item. Search processes were manipulated by varying display load. A dose of 3 mg/kg body weight caffeine or lactose, dissolved in a cup of decaffeinated coffee, was administered double blindly and deceptively to overnight abstinent coffee drinkers. Behavioral measures were supplemented by event-related potentials (ERPs). Subjects reacted faster in the caffeine condition. The P3b peak latency decreased after caffeine in the low display load condition and in the focused attention condition, indicating that the effects of caffeine are dependent on the number of relevant display items, not on the total number of display items presented. Search processes, as reflected in a negative ERP deflection, were not affected by caffeine.

**Descriptors:** Caffeine, Focused attention, Divided attention, Display load, Visual event-related potentials

In situations such as driving a car, there are many sources of information in the environment that have to be attended to to drive safely. In the optimal situation, subjects are able to pay attention to all information at the same time. However, the human information processing system is limited in its processing capacity and can only process a restricted amount of information at the same time. Therefore, one has to select relevant cues in the environment to attend to at appropriate times to perform optimally. Performance failures can be made easily if attention is distracted by irrelevant information.

Two types of selective attention can be discerned. In a *focused attention* condition, subjects have to concentrate on one source of information; for example, a conversation in which one is involved. The *divided attention* condition is defined as a situation in which attention has to be divided over a number of stimuli. An example of the latter situation is the automobile driver who has to attend to the road signs while maintaining control of the car.

Experimental evidence indicates that increases in arousal tend to restrict the focus of attention (Humphreys & Revelle, 1984; Posner & Raichle, 1994) and thus might prevent people from being distracted by irrelevant information. In accordance with this, Lorist and colleagues (Lorist, Snel, Kok, & Mulder, 1994; Lorist, Snel, Mulder, & Kok, 1995) found that subjects seemed

to be less distracted by irrelevant information after they used caffeine, which is regarded as a stimulant. They used a focused attention version of a selective search task (Okita, Wijers, Mulder, & Mulder, 1985; Shiffrin & Schneider, 1977; Schneider & Shiffrin, 1977; Wijers et al., 1987) in which subjects had to detect the possible occurrence of a memory set item presented on relevant diagonal positions of the display and to ignore stimuli appearing at the irrelevant diagonal. Different computational processes are involved in the task. First, subjects have to discriminate between relevant and irrelevant information, followed by a comparison of the selected information to internal representations. Thereafter, a response decision should be made, and, subsequently, this response has to be selected, programmed, and executed (see also Mulder, Wijers, Lange, Smid, & Gunter, 1993). Information transformations related to the encoding of incoming information, that is, to the identification of incoming information, are supposed to be input-related processes. Memory search and response decision are regarded as central processes involved in the further processing of information. The preparation, activation, and execution of responses are assumed to represent output mechanisms associated with the organization of motor-related activities.

These different mental operations are assumed to be reflected in various components of the event-related brain potential (ERP). The selection between relevant and irrelevant information can be observed by superimposing the ERPs elicited by attended and unattended stimuli. Previous studies have indicated that these two waveforms start to diverge at 260 ms, with a maximum at frontocentral scalp positions, independent of whether subjects had caffeine or placebo. However, the amplitude of this

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# Effects Of Caffeine On Visual Attention

**Eric Nofzinger, Pierre Maquet, Michael  
J. Thorpy**



## **Effects Of Caffeine On Visual Attention:**

Effects of Caffeine on Visual Attention Judith Ruijter, 2000

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## **The Psychopharmacology of Herbal Medicine** Marcello

Spinella, 2001-06-08 A compilation of current scientific knowledge about psychoactive herbal drugs Virtually all cultures consume drugs from psychoactive plants Caffeine for example is probably the most common stimulant in the world and many modern medicines such as morphine and codeine are derived from plant sources In these cases scientific research has revealed the composition of the plants and how they interact with the nervous system There are also many herbal medications with reputed therapeutic value that have not yet gained acceptance into mainstream medicine partly because there has not been enough research to support their usefulness Instead they are regarded as alternative medicines This is an active research area however and many current studies are focusing on identifying the active components pharmacological properties physiological effects and clinical efficacy of herbal medicines This book compiles and integrates the most up to date information on the major psychoactive herbal medicines that is herbal medicines that alter mind brain and behavior It focuses particularly on the effects on various areas of cognition including attention learning and memory The book covers all major classes of psychoactive drugs including stimulants cognitive enhancers sedatives and anxiolytics psychotherapeutic herbs analgesics and anesthetic plants hallucinogens and cannabis

*Nicotine, Caffeine and Social Drinking: Behaviour and Brain Function* Monique Lorist, Jan Snel, 2013-12-19 Often people use nicotine caffeine and some level of alcohol in varying combinations at different times of the day in order to optimize their functioning and feelings of well being whether at work in leisure time or in a social context However until now studies on the effects of this everyday practice have been diverse widespread and insufficiently summarized Recently developed methods to study the effects in more detail have received little attention especially among a nonscientific readership *Nicotine Caffeine and Social Drinking* focuses readers attention on the effects of normal socially accepted psychoactive substances on cognitive performance and on the brain Divided into three sections this book studies each substance individually before examining the effects of their combined usage

*Attention,*

*Arousal and the Orientation Reaction* R. Lynn, 2013-09-11 Attention Arousal and the Orientation Reaction aims to present in a volume the works of Pavlov an eminent Russian physiologist known for his contributions specifically the classical conditioning This book contains the interpretations and theories in physiological terms and elaborates on the neurological models of significant interest The orientation reaction is described and the Sokolov's model which is claimed to be the most comprehensive model for the orientation reaction is then illustrated This text also explains the phenomenon of habituation wherein facts involved are summarized in a chapter A discussion on the numerous neurological models of the habituation process is then given This text notes that the models are divided into one stage models and two stage models Other topics presented are the effects of transforming a neutral stimulus into a conditioned stimulus the orientation reaction in ontogenetic and phylogenetic development and the orientation reaction in the measurement of individual differences This book will be beneficial to those fascinated with the works of Pavlov especially the psychology students and practitioners

**Caffeine and Behavior: Current Views & Research Trends** B.S. Gupta, Uma Gupta, 2020-03-05 The psychobehavioral effects of caffeine on humans is analyzed in this book from an experimental approach Caffeine and Behavior Current Views and Research Trends is unique in its emphasis on empirical research and its inclusion of articles concerning the addictive potential of caffeine Topics covered include addiction neurotransmission

**Hemispheric Bases for Emotion and Memory** Tad T. Brunye, Sarah R. Cavanagh, Ruth E. Propper, 2015-06-01 It has become clear that the two halves of the cortex differ in their contributions to both affective and memory processes Still the exact nature of the interrelationships among hemispheric function emotion and memory remains elusive For example controversy remains regarding differential hemispheric involvement in emotion motivation and affective style Regarding memory although evidence suggests differences in the manner in which the hemispheres interact may be related to memory retrieval it is still not certain which factors involved in retrieval encourage or inhibit hemispheric communication The goal of this Research Topic was to bring together diverse scientific perspectives on lateralized brain mechanisms underlying emotion motivation and memory A range of international experts with diverse backgrounds theoretical perspectives and experimental methods contributed to the Topic These contributions inform our understanding of lateralized affective and cognitive processes by providing thorough reviews of our current state of knowledge based on previous literature by sharing intriguing new empirical findings and by proposing theoretical models with testable frameworks to stimulate future research

Diet, Brain, Behavior Robin B. Kanarek, Harris R. Lieberman, 2011-10-06 As the field of nutritional neuroscience has grown both the scientific community and the general population have expressed a heightened interest in the effect of nutrients on behavior Diet Brain Behavior Practical Implications presents the work of a diverse group of scientists who collectively explore the broad scope of research in the field

*Tea in Health and Disease Prevention* Victor R Preedy, Vinood Patel, 2024-09-14 While there is a nearly universal agreement that drinking tea can benefit health information on the benefits or adverse effects of drinking tea is

scattered leaving definitive answers difficult to ascertain Tea in Health and Disease Prevention Second Edition once again addresses this problem bringing together all the latest and most relevant information on tea and its health effects into one comprehensive resource This book covers compounds in black green and white teas and explores their health implications first more generally then in terms of specific organ systems and diseases With over 75% brand new content this fully reorganized updated edition covers a wider range of tea varieties and beneficial compounds found in tea such as epigallocatechin gallate and antioxidants Tea in Health and Disease Prevention Second Edition is an organized efficient resource that will help readers find quick answers to questions and will help inspire further studies for those interested in tea research This is a must have reference for researchers in food science and nutrition as well as nutritionists and dieticians Covers and compares features benefits and potential negative effects of the most important types of tea including green black and white Identifies therapeutic benefits of teas for new product development Offers a one stop shop for research in this area compiling both foundational and cutting edge topics into one resource Includes a dictionary of key terms other health effects of tea or extracts and a summary point section within each chapter for a quick reference

**Neuroimaging of Sleep and Sleep Disorders** Eric Nofzinger, Pierre Maquet, Michael J. Thorpy, 2013-03-07 This up to date superbly illustrated book is a practical guide to the effective use of neuroimaging in the patient with sleep disorders There are detailed reviews of new neuroimaging techniques including CT MRI advanced MR techniques SPECT and PET as well as image analysis methods their roles and pitfalls Neuroimaging of normal sleep and wake states is covered plus the role of neuroimaging in conjunction with tests of memory and how sleep influences memory consolidation Each chapter carefully presents and analyzes the key findings in patients with sleep disorders indicating the clinical and imaging features of the various sleep disorders from clinical presentation to neuroimaging aiding in establishing an accurate diagnosis Written by neuroimaging experts from around the world Neuroimaging of Sleep and Sleep Disorders is an invaluable resource for both researchers and clinicians including sleep specialists neurologists radiologists psychiatrists psychologists

Placebo and Nocebo Effects in Psychiatry and Beyond Paul Enck, Katja Weimer, Luana Colloca, Seetal Dodd, 2020-10-08 This eBook is a collection of articles from a Frontiers Research Topic Frontiers Research Topics are very popular trademarks of the Frontiers Journals Series they are collections of at least ten articles all centered on a particular subject With their unique mix of varied contributions from Original Research to Review Articles Frontiers Research Topics unify the most influential researchers the latest key findings and historical advances in a hot research area Find out more on how to host your own Frontiers Research Topic or contribute to one as an author by contacting the Frontiers Editorial Office frontiersin.org/about/contact

*Nutrigenetics* Dolores Corella, 2018-07-10 This book is a printed edition of the Special Issue Nutrigenetics that was published in *Nutrients*

**Cumulated Index Medicus**, 1996

**Using Substances to Enhance Performance: A Psychology of Neuroenhancement** Ralf Brand, 2017-01-18 Neuroenhancement NE is a behavior conceptualized as the use

of a potentially psychoactive substance to enhance ones already proficient cognitive capacities Depending on the specific definitions used prevalence estimates vary greatly between very low 0.3% for illicit substances to astonishingly high 89% for freely available lifestyle substances These variations indicate that further research and more conceptual and theoretical clarification of the NE construct is dearly needed The contributions of this research topic aim to do just that Specific questions addressed are How prevalent is NE behavior How can NE research profit from the already more evolved field of social science research on doping in sports How is NE perceived by the public What psychological processes and variables play a role in the decision to neuroenhance A wide array of methodological approaches is used to investigate these questions The topics contributions range from theoretical to experimental accounts on NE and they utilize a diverse set of methods ranging from qualitative to neuroscientific approaches The research presented here represents a first step towards what we have labeled a psychological approach to NE By addressing the questions above this research topic hopefully advances our understanding of NE behavior As with every new field of research new answers always prompt new questions In light of what we know now about NE we hope that the findings presented here will be pursued by other researchers in the future Clearly the endeavor to understand NE behavior has only just begun *Coffee, Tea, Chocolate, and the Brain* Astrid

Nehlig, 2004-04-27 Coffee tea and chocolate are among the most frequently consumed products in the world The pleasure that many experience from these edibles is accompanied by a range of favorable and adverse effects on the brain that have been the focus of a wealth of recent research *Coffee Tea Chocolate and the Brain* presents new information on the **Index Medicus**, 2004 Vols for 1963 include as pt 2 of the Jan issue Medical subject headings Coffee and Caffeine Consumption for Human Health Juan Del Coso, 2020-04-15 The year 2019 has been prolific in terms of new evidence regarding the effects of coffee and caffeine consumption on diverse aspects of human functioning This book collects 20 high quality manuscripts published in *Nutrients* that include original investigation or systematic review studies of the effects of caffeine intake on human performance and health The diversity of the articles published in this Special Issue highlights the extent of the effects of coffee and caffeine on human functioning while underpinning the positive nature of most of these effects This book will help with understanding why the natural sources of caffeine are so widely present in the nutrition behaviors of modern society *Human Sleep and Cognition* G. A. Kerkhof, Hans P. A. Van Dongen, 2010 The Attentive Brain Raja Parasuraman, 2000 Of the myriad tasks that the brain has to perform perhaps none is as crucial to the performance of other tasks as attention A central thesis of this book on the cognitive neuroscience of attention is that attention is not a single entity but a finite set of brain processes that interact mutually and with other brain processes in the performance of perceptual cognitive and motor skills After an introductory part I the book consists of three parts Part II Methods describes the major neuroscience methods including techniques used only with animals anatomical tract tracing single unit electrophysiology neurochemical manipulations noninvasive human brain imaging techniques ERPs positron emission

tomography and functional magnetic resonance imaging and studies with brain damaged individuals This part also includes a chapter on the computational modeling of attention Part III Varieties of Attention looks at three major components of attention from the cognitive neuroscience perspective selection vigilance and control It also discusses links to memory and language Finally part IV Development and Pathologies discusses the application of findings from the previous sections to the analysis of normal and abnormal development and to pathologies of attention such as schizophrenia and attention deficit disorders Contributors Edward Awh Gordon C Baylis Jochen Braun Dennis Cantwell Vincent P Clark Maurizio Corbetta Susan M Courtney Francis Crinella Matthew C Davidson Gregory J DiGirolamo Jon Driver Jane Emerson Pauline Filipek Ira Fischler Massimo Girelli Pamela M Greenwood James V Haxby Mark H Johnson John Jonides Julian S Joseph Robert T Knight Christof Koch Steven J Luck Richard T Marrocco Brad C Motter Ken Nakayama Orhan Nalcioglu Paul G Nestor Ernst Niebur Brian F O'Donnell Raja Parasuraman Michael I Posner Robert D Rafal Trevor W Robbins Lynn C Robertson Judi E See James Swanson Diane Swick Don Tucker Leslie G Ungerleider Joel S Warm Maree J Webster Sharon Wigal

**Encyclopedia of Human Memory** Annette Kujawski Taylor Ph.D., 2013-10-29 Providing clear comprehensible information for general readers this three volume A Z encyclopedia covers the major theories and findings associated with our understanding of human memory and some of the crippling disorders associated with memory malfunction This encyclopedia comprehensively addresses one of the most critical components of human intelligence memory Comprising approximately 500 A Z entries written by experts who have studied memory and its impacts the work defines complex terminology for lay readers and includes answers to the most common questions regarding human memory Readers will gain an understanding of the various psychological and physiological systems of memory such as short term or procedural memory comprehend the principles that underlie effective encoding storage and construction of memories and learn the truth about often misconceptualized conditions like amnesia or how our memories are stored in bits and pieces rather than linearly like a recorded tape or video This set is ideal for high school students writing term papers or studying for advanced examinations such as Advanced Placement AP in psychology The volumes also provide a breadth of information invaluable to family members friends and caretakers of individuals who suffer from various memory disorders including descriptions of major disorders explanations of specific memory deficits strategies for memory improvement and information on the parts of the brain that access and store memory as well as the types of tests used to assess memory loss Also included are biographies of key contributors to the field of cognitive psychology and to the area of memory in particular

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