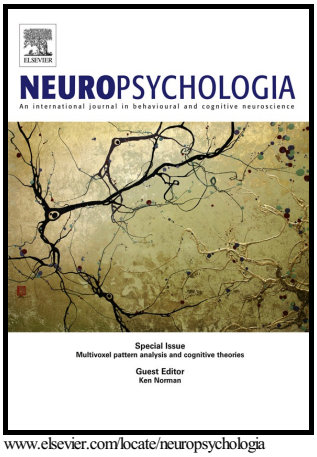

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EEG measures of brain activity reveal that smoking-related images capture the attention of smokers outside of awareness

Joseph A. Harris[a,b*], Sarah E. Donohue[a,b], Arne Ilse[b], M. Ariel Schoenfeld[a,b,c], Hans-Jochen Heinze[a,b], Marty G. Woldorff[a,b,d]

[a]Leibniz Institute for Neurobiology, Magdeburg, Germany
[b]Department of Neurology, Otto-von-Guericke University Magdeburg, Magdeburg, Germany
[c]Klinikum Schmieder Heidelberg, Heidelberg, Germany
[d]Center for Cognitive Neuroscience, Duke University, Durham, NC, USA

[*]**Corresponding author:** Joseph A. Harris. **Address:** Leibniz Institute for Neurobiology, Brenneckestraße 6 39118 Magdeburg, Germany. **email:** joseph.allen.harris@gmail.com

Abstract

The capture of attention by substance-related stimuli in dependent users is a major factor in the maintenance and/or cessation of substance use. The present study examined the automaticity of this process in smokers, as well as the effects of craving. Event-related potential (ERP) measures of spatial-attention allocation (N2pc) and extended target processing (SPCN) were isolated during an object-substitution masking (OSM) task that disrupted the perceptual visibility of smoking-related and office-related targets. Each participant completed two experimental sessions: one in which they were deprived of nicotine for a period of several hours prior to the session (craving), and one before which they were allowed to smoke (non-craving). Results were consistent with an account of automatic attentional capture by smoking-related images, with masked trials yielding a selective enhancement of the attention-sensitive N2pc in response to these images, but in the absence of a corresponding behavioral enhancement on those trials. Finally, the manipulation of craving appeared to increase the overall task demand, yielding an enhancement of the SPCN component across target type and masking conditions. Together, these results suggest that smoking-related images capture the attention of smokers under circumstances of reduced visibility, in what is likely an automatic process.

Keywords

ERP, substitution masking, smoking, attention, craving

1 Introduction

1.1 Substance-related stimuli influence visual attention

The capture of visual attention by substance-related images in dependent users is an example of a broader phenomenon wherein behaviorally relevant stimuli affect attention. The way in which substance-related images bias attention has been examined using both behavioral and neural measures. These studies reported some mixed results, suggesting attentional capture by substance-related images in some cases, and repulsion in others. For example, attention to substance-related cues has been probed using the addiction Stroop task, wherein participants tend to be slower to report the font color of a substance-related word relative to that of a neutral word, presumably due to the capture of attention by the semantic content of the addiction-related word (Cox, Fadardi, & Pothos, 2006; Munafo, Mogg, Roberts, Bradley, & Murphy, 2003). Similarly, alcohol-related images embedded in an attentional blink task have been shown to capture the attention of alcoholics, with alcohol-related images being less susceptible to the effects