FUL, HARMFUL OR NEUTRAL IN RECOVERY OF FUNCTION? Timothy Schallert. Department of Psychology and Institute for Neuroscience, University of Texas at Austin.

The research to be described is concerned with mechanisms of recovery of function after focal brain damage. Novel treatment strategies for affecting anatomical events and influencing the rate of recovery are being developed based on this research. For example, after cortical damage rats were treated with Cl^- ion channel blockers, glutamatergic (NMDA) antagonists or drugs which tend to open Cl^- ion channels. The first two classes of drugs facilitate recovery of function, but by different mechanisms. The latter class, including certain anticonvulsant and antianxiety drugs that currently are being administered to many brain damage patients, can severely and chronically disrupt recovery of function. Depending on the timing of drug administration, remote degeneration secondary to the brain damage may be exaggerated or attenuated. However, it will be demonstrated that only careful behavioral assessment coupled with a comprehensive anatomical analysis permits one to evaluate the potential functional significance of a given manipulation.

YOUNG PSYCHOPHARMACOLOGIST AWARD AND INVITED ADDRESS

Chair: *Larry Byrd,* Yerkes Regional Primate Research Center, Emory University, Atlanta, GA.
Awardee: Robert S. Mansbach, Medical College of Virginia.
"A Startle Response Model of Sensorimotor Gating Deficits in Schizophrenia."

SYMPOSIUM

Commonalities in Stimulus Equivalence and Drug Discrimination Research
Chair: *Warren K. Bickel,* University of Vermont, Burlington, VT.
Discussant: *Chris-Ellyn Johanson,* Uniformed Services University of the Health Sciences, Bethesda, MD.

FUNCTIONAL ANALYSIS OF CONTEXTUAL STIMULUS CONTROL. Richard W. Serna and Gina Green. E. K. Shriver Center for Mental Retardation, Inc.

Behaviors are determined in part by the contexts in which they are emitted. A complete understanding of contextual control requires careful experimental analysis, which in turn requires defining the possible controlling events operationally and manipulating them systematically. Some recent analyses of contextual control of discriminated performances—namely conditional discriminations that may give rise to stimulus equivalence—have raised an important question about the definition and function of contextual stimuli: Are they discrete events that exert conditional control over conditional discriminations, or are they elements of compound stimuli that exert simpler discriminative control? In this paper we discuss the practical and theoretical significance of this question, suggest methodology for investigating these two types of contextual stimulus control, and summarize data from our attempts to address this question experimentally.

CURRENT ISSUES IN STIMULUS CLASS RESEARCH. K. J. Saunders, R. R. Saunders and J. E. Spradlin. University of Kansas.

Accounting for stimulus-stimulus and stimulus-response relations that have not been trained directly provides an important challenge for the science of behavior. The recent explosion of research on stimulus classes has uncovered a range of empirical and theoretical issues that are only beginning to be systemized. The present discussion outlines these issues, with the goal of identifying potentially fruitful areas for future research. Much research is currently being done on stimulus equivalence classes. One reason is an apparent relation with language; the thorough explication of this relation is an important issue for future research. Also at issue is the relationship between stimulus equivalence classes (which involve stimulus-stimulus relations) and functional stimulus classes (which involve stimulus-response relations). Both of these issues may find some resolution in the study of stimulus classes in nonhuman primates and in verbally limited humans. This strategy may also uncover the critical prerequisites for equivalence class formation, the most fundamental unresolved issue.

FUNCTIONALLY EQUIVALENT STIMULUS CONTROL OVER RESPONDING BY INTEROCEPTIVE AND EXTEROCEPTIVE STIMULI. R. J. DeGrandpre, W. K. Bickel, S. T. Higgins and J. R. Hughes. University of Vermont.

Conditional relations between drug (interoceptive) stimuli and visual (exteroceptive) stimuli were taught to 4 normal humans. Following this training, a stimulus equivalence procedure was used to test whether emergent relations between these two types of stimuli would develop. The drug stimulus effects were produced by 0.32 mg/70 kg triazolam and placebo (lactose filled capsules). The emergence of equivalence classes that contained interoceptive and exteroceptive stimuli occurred in all four subjects. Responding was 100 percent correct for three of the four subjects. This experiment provides the first demonstration that interoceptive and exteroceptive stimuli can achieve, without explicit training, equivalent discriminative-stimulus control over behavior. Theoretical and clinical implications are discussed.

FUNCTIONALLY EQUIVALENT STIMULUS CONTROL OVER RESPONDING BY EXTEROCEPTIVE STIMULI AND INTEROCEPTIVE STIMULI FROM STIMULANT AND SEDATIVE DRUG CLASSES. W. K. Bickel, R. J. DeGrandpre, S. T. Higgins and J. R. Hughes. University of Vermont.

In this study, conditional relations between drug (interoceptive) stimuli and visual (exteroceptive) stimuli were taught to normal humans. The drug stimulus effects were those produced by 110–560 mg/70 kg caffeine, 0.10–0.56 mg/70 kg triazolam, and placebo (lactose filled capsules). Following this training, a stimulus equivalence procedure was used to merge the drug effects produced by caffeine with the stimulus effects produced by triazolam via a common visual stimulus. This test assessed whether topographically distinct interoceptive stimuli can gain joint membership with visual stimuli and thus exert functionally equivalent stimulus control over behavior. The implications of such findings are relevant to drug-discrimination research in behavioral pharmacology and more generally to the study of drug-taking.

SYMPOSIUM

Future Directions in the Treatment of Nicotine Addiction
Chair: *Dorothy K. Hatsukami,* University of Minnesota, Minneapolis, MN.
Discussant: *Neil Grunberg,* Uniformed Services University of the Health Sciences, Bethesda, MD.

IS NICOTINE MORE ADDICTIVE THAN HEROIN OR COCAINE? Jack Henningfield, Caroline Cohen, John Slade and Stephen Goldberg. NIDA Addiction Research Center, Baltimore, MD.

It has become increasingly in vogue to state that nicotine is more addictive than heroin, cocaine and other prototypic drugs of abuse. Often used to support the claim are data such as those showing the extraordinarily high likelihood of progression to daily tobacco use following experimentation with a few cigarettes as well as the high percentage of cigarette smokers who appear addicted when compared to users of other addictive drugs. In the context of criteria for addiction or dependence presented by the World Health Organization, the American Psychiatric Association, and the U.S. Surgeon General, we present a review of several lines of evidence including patterns of use, mortality, physical dependence potential, and pharmacologic addiction liability measures. Comparative data from studies in which human and animal subjects have been permitted to self-administer either nicotine, cocaine or heroin are also reviewed. These sets of data provide a rational framework for comparing nicotine to opioids and psychomotor stimulants, and to a lesser extent, to alcohol. We conclude that nicotine is not more addicting than cocaine or heroin. We suggest that these are all highly addicting drugs for which factors such as availability, price, social pressures, regulations, and certain pharmacologic characteristics, strongly influence patterns of use, the development of dependence, and other problems.

BEHAVIORAL TREATMENT OF NICOTINE ADDICTION. Maxine Stitzer, The Johns Hopkins School of Medicine, Baltimore, MD. (Abstract not available)

CLINICAL TRIALS WITH NICOTINE REPLACEMENT THERAPIES. Dorothy Hatsukami. University of Minnesota, Minneapolis, MN.

Several studies have been conducted examining the efficacy of nicotine gum on smoking cessation treatment outcome. In general, the results show that nicotine gum is an effective treatment agent; however, the efficacy diminishes over time. Further, in physician-based trials, the results are not very promising. Treatment efficacy may be maximized by varying the dose, duration and/or route of nicotine replacement. However, only a small number of studies have been conducted examining whether these factors may improve success. Further, very limited research has been conducted examining the effects of nicotine replacement on other tobacco dependence disorders such as smokeless tobacco. This paper will discuss current and new studies examining the effects of dose and duration of nicotine replacement on treatment outcome. In addition, the results from a multicenter trial which found significant effects of a transdermal nicotine system on nicotine withdrawal signs and symptoms and treatment outcome will be covered. Finally, research on the effects of nicotine gum on smokeless tobacco withdrawal symptoms and treatment outcome will be presented.

PRIMARY REINFORCEMENT IN THE MAINTENANCE OF CIGARETTE SMOKING. Jed E. Rose and Edward D. Levin. VA Medical Center, Durham, NC.

Research on smoking cessation has increasingly focussed on pharmacological aspects of nicotine and nicotine withdrawal. However, cigarette smoking also provides a characteristic set of sensory cues. These sensory aspects of smoking are important to address in that they may be potent conditioned reinforcing stimuli linked to the actions of nicotine. The repetition of the smoking act thousands of times per year by a moderately heavy smoker leads to a strong conditioned association between the sensory aspects of smoking (the putative CS) and the pharmacological effects of nicotine (the putative UCS). Strategies for disrupting CS-UCS associations may be useful in developing more effective smoking cessation treatments. These include: counterconditioning of the CS; presenting the CS alone; presenting the CS with the UCS but pharmacologically blocking the UCS; and presenting the CS and UCS in an unconnected fashion. The role of sensory cues in alleviating craving for cigarettes is discussed, and specific techniques for duplicating relevant sensory aspects of smoking without delivering significant doses of nicotine are described. The combination of nicotine and nicotinic antagonists to block primary reinforcement and hasten extinction of conditioned reinforcement is also considered.

NICOTINE AS A TREATMENT FOR MEDICAL AND PSYCHIATRIC DISORDERS. John R. Hughes and Paul A. Newhouse. University of Vermont, Burlington, VT.

Nicotine is one of the major neurotransmitters; thus it is likely to have effects on medical and psychiatric diseases independent of its role in smoking dependence. This presentation reviews several possible therapeutic roles for nicotine therapy. Parkinson's disease is less prevalent in smokers and some positive therapeutic effects of nicotine in Parkinsonism have been reported. Nicotine also may improve motor tics and Tourettes syndrome. Patients with Alzheimer's disease have fewer nicotinic receptors and nicotine appears to produce at least short-term benefit in Alzheimer's. Ulcerative colitis, but not granulomatous colitis, is less prevalent in smokers and patients with ulcerative colitis describe worsening of the disease with smoking cessation and improvement with relapse. The single nicotine therapy trial was negative. Depressed patients are more likely to smoke and smoking cessation may precipitate depression in subjects with a past history of depression. Whether nicotine could be used as a treatment for depression in such patients is unclear. The above-cited information on nicotine therapy is based almost exclusively on case reports; thus results are quite tentative at this time. Before scientific tests of nicotine therapy are indicated, studies of nicotine tolerance, abuse, dependence and safety in nonsmokers and ex-smokers using acute and then chronic dosing are needed.

SYMPOSIUM

Dependence Potential of Caffeine in Humans

Chair: *Stephen J. Heishman,* NIDA Addiction Research Center, Baltimore, MD.

Discussant: *Jack E. Henningfield,* NIDA Addiction Research Center, Baltimore, MD.

CAFFEINE-NICOTINE INTERACTIONS DURING NICOTINE WITHDRAWAL. David Sachs, Palo Alto Center for Pulmonary Disease Prevention, Palo Alto, CA. (Abstract not available)

SUBJECTIVE AND DISCRIMINATIVE STIMULUS EFFECTS OF CAFFEINE. Larry D. Chait. University of Chicago, Chicago, IL.

Studies of the subjective and discriminative stimulus effects of caffeine will be reviewed. Drug discrimination studies with laboratory animals indicate that the stimulus effects of caffeine show at least some drug-class specificity—in most studies theophylline, another methylxanthine, fully substitutes for caffeine, whereas stimulants from other pharmacological classes (e.g.,