conclusively, particularly with regard to systematic observations (rather than ratings) of aggressive acts. Second, whereas stimulant medication leads to increases in social compliance, the question of its effects on explicitly prosocial behavior (e.g., social initiation or leadership) is indeterminate. To help resolve such questions, we recently investigated stimulant effects on (a) compliant vs. prosocial behaviors and (b) disruptive vs. aggressive behaviors in a naturalistic summer research program for boys with ADD. The 25 participants, aged 6–12, were placed on a double-blind trial of placebo, 0.3 mg/kg or 0.6 mg/kg methylphenidate hydrochloride over a 3-week period, in a within subjects/crossover fashion, with each dosage lasting for one week. Scan-sampling procedures were used to record ongoing social behavior in naturalistic classroom and playground settings, and reliable observations of the distinct social behaviors in question were made. Clear medication effects on aggression were found. An overall main effect was clearly significant, and individual response patterns showed that all subjects clinically appraised as both hyperactive and aggressive showed at least a 50% reduction of aggression on medication. Interestingly, for only several subjects did the 0.6 mg/kg dosage provide any greater benefit than did the low (0.3 mg/kg) dose. Effects on prosocial behavior were less striking, although for certain older (ages 9–12) boys who had presumably learned basic prosocial skills previously, medication effects were dramatic. The clinical and methodological significance of these findings include the importance of analysis of individual response patterns in addition to group means.

METHYLPHENIDATE AND ADD CHILDREN'S SOCIAL BEHAVIOR: INDIVIDUAL DIFFERENCES, DOSE RESPONSE. William E. Pelham, Jr. Western Psychiatric Institute and Clinic, University of Pittsburgh School of Medicine, Pittsburgh, PA.

A number of studies have evaluated the dose effects of psychostimulants on ecologically valid measures of functioning in Attention Deficit Disorder (ADD) children. Typical studies have included evaluations of doses ranging from 0.15 to 0.75 mg/kg methylphenidate (MPH) or equivalent, and they have focused on a variety of dependent measures, tapping both social and cognitive spheres. Despite relatively similar dose ranges and dependent measures, however, these studies have yielded somewhat inconsistent results. For example, some report only linear effects of stimulants on measures of cognitive functioning, while others report that beneficial stimulant effects peak at relatively low doses. Similarly, some studies report beneficial stimulant effects on ADD children's social behaviors, both prosocial and antisocial, but other studies have failed to support these findings. It is the thesis of this paper that the discrepancies result from individual differences in drug effects, both across children within response domains and across dependent measures within children. Data to support this argument are reported for 17 ADD children who underwent a within-subject evaluation of placebo, 0.3 and 0.6 mg/kg MPH, with dose randomized over days. Dependent measures were gathered over 5 to 9 days per condition, and included observations of classroom and playground behavior, measures of classroom seat work, mathematics and reading performance (completion rate and accuracy), and frequency counts of positive peer interactions, negative verbalizations, conduct problems, rule-following behavior and noncompliance to adult requests. Analyses of group data consistently revealed linear effects of MPH, within the dose range evaluated, across most dependent measures. However, very few children exhibited the linear trends that characterized the group data. On some dependent measures, not a single child's data were reflected in the group mean. Furthermore, the shapes of the dose-response curves across the dependent measures consistently varied within children. The results have implications for psychopharmacology with ADD children, particularly regarding the notion of a "medication responder."

INVITED ADDRESS

Substance Abuse Treatment and Policy: Contributions of Behavioral Pharmacology

Thomas J. Crowley, University of Colorado Health Sciences Center, Denver, CO

Chair: *John Grabowski,* University of Texas Health Sciences Center, Houston, TX

SYMPOSIUM

Progress in Understanding the Behavioral and Neurobiological Effects of Cocaine

Chair: *Steven I. Dworkin,* Louisiana State University School of Medicine, Shreveport, LA

Discussant: *John Grabowski,* University of Texas Health Sciences Center, Houston, TX

LONG-TERM EXPOSURE TO COCAINE: OVERVIEW AND SOME CURRENT DATA. William L. Woolverton. University of Chicago, Chicago, IL.

(Abstract not available)

REPEATED COCAINE ADMINISTRATION AND SCHEDULE-CONTROLLED BEHAVIOR. Marc N. Branch. University of Florida, Gainesville, FL.

Recent research has shown that effects of repeated cocaine administration can be altered by behavioral variables. Among the recently discovered important factors are the parameters of schedules of positive reinforcement. Tolerance to effects of repeated cocaine administration has been found to depend strongly on the parameter value of fixed-ratio schedules, but not at all on the parameter value of fixed-interval schedules. Variable-ratio and variable-interval schedules have produced intermediate effects, i.e., for some subjects, tolerance has been schedule-parameter dependent, whereas for others, it has not.

REINFORCING AND CARDIOVASCULAR EFFECTS OF COCAINE IN MONKEYS AND HUMANS. Charles W. Schindler, Jonathan R. Katz, Steven R. Goldberg, Ro Nemeth-Coslett and Jack E. Henningfield. National Institute on Drug Abuse Addiction Research Center, Baltimore, MD.

The effects of IV cocaine administration were determined in both squirrel monkeys and human volunteers. In monkeys, the ability of cocaine to maintain self-administration behavior and the cardiovascular effects of cocaine were determined in separate groups. In humans, self-administration and cardiovascular measures were taken concurrently. In monkeys, where higher doses could be administered, cocaine produced significant increases in blood pressure at

doses above 0.3 mg/kg and tended to decrease heart rate. In both humans and monkeys, there were doses of cocaine which maintained self-administration and which had negligible effects on cardiovascular function. Nevertheless, significant cardiovascular effects were seen within the range of doses which maintained self-administration.

THE EFFECTS OF CHRONIC COCAINE ADMINISTRATION ON BRAIN NEUROTRANSMITTER RECEPTORS. Nick E. Goeders. Louisiana State University School of Medicine, Shreveport, LA.

Experiments were designed to investigate the neurobiological consequences of chronic cocaine administration using a multidisciplinary approach involving behavioral pharmacology, neurochemistry and neuroanatomy. The marriage of these traditionally independent fields of study results in a better understanding of the neuropathology of chronic cocaine intoxication. Twenty-four rats were trained to respond on a variable-interval 90 sec (VI90) schedule of food reinforcement, and dose-response curves for acute cocaine administration were determined in each animal. The rats were then randomly divided into four treatment conditions: (1) cocaine before; (2) cocaine after; (3) saline before; or (4) saline after. During the next six weeks, the animals received daily injections of cocaine (10 mg/kg, IP) or saline (1 ml/kg, IP) five days per week immediately before or after the behavioral session. Cocaine dose-response curves were again determined in each rat over an additional six weeks on Tuesdays and Fridays while the animals remained on their chronic dosing schedules. Chronic injections of saline both before and after the behavioral session or cocaine after the session did not alter the effects of cocaine on rates of responding on the VI90 schedule of food reinforcement. However, the effects of cocaine on response rates were significantly increased in all six animals that received chronic injections of the drug immediately prior to the behavioral session. Light microscopic quantitative autoradiography was used to visualize various receptor binding sites in serial sections through the brain of each rat for the precise localization of discrete changes in receptor number and densities that may have resulted from the different treatment conditions. The contingencies described in these experiments permit direct comparisons between animals that exhibit disparate behavioral effects following an identical number of chronic cocaine injections and may, therefore, identify specific brain loci and receptor systems sensitive to the complex behavioral effects of cocaine. (Supported in part by USPHS Grant DA 04293.)

POSTER SESSION

Drugs and Behavior

Co-Chairs: *Leonard L. Howell,* Yerkes Regional Primate Research Center, Emory University, Atlanta, GA; and *Charles P. France,* University of Michigan School of Medicine, Ann Arbor, MI

DRINKING RESTRAINT AND DIFFERENTIAL RESPONSIVENESS TO BEER TASTE CUES. Lillian S. Bensley. University of Washington, Seattle, WA.

This study examined the possible role of heightened external responsiveness in restrained drinking, a style of social drinking control which is characterized by considerable effortful self-restraint, alternating with overconsumption. Fifty-nine social drinkers, classified on the basis of a pretest as restrained or unrestrained and as heavy or light drinkers, were given access to three brands of beer which had been previously identified as that individual's most preferred, least preferred and moderately preferred beer. The most preferred beer yielded the only difference, and restrained drinkers drank significantly more than unrestrained drinkers, providing evidence that heightened responsiveness to external cues (taste) may be related to a problematic style of social drinking control.

THE EFFECT OF SUCCESSFUL DRINKING RESTRAINT ON SUBSEQUENT ALCOHOL CONSUMPTION. Lillian S. Bensley. University of Washington, Seattle. WA.

A period of successful self-restraint of drinking behavior may predispose some individuals to subsequent overconsumption. Habitually light and heavy drinkers were randomly assigned to a two-week period of either abstinence from all alcoholic beverages or normal drinking. Following abstinence, heavy-drinking males (for whom, presumably, achieving abstinence required considerable effortful restraint) showed heightened alcohol consumption compared to otherwise similar individuals who were assigned to normal drinking. There was no such effect among light drinkers. The results suggest that a period of circumstantially initiated drinking reduction may lead to heightened subsequent alcohol consumption, providing evidence for a restraint model of problematic drinking control.

COGNITIVE FUNCTIONING AND THE INHERITED RISK FOR ALCOHOLISM. Jordan B. Peterson, Robert O. Pihl and Peter R. Finn. McGill University, Montreal, Quebec, Canada.

A battery of neuropsychological tests designed to assess cognitive impairment was administered to 11 sober and 11 alcohol-intoxicated multigenerational sons of alcoholics and to 2 groups of 11 demographically-matched controls. Analysis of the results of the test battery demonstrated that multigenerational sons of alcoholics manifested deficits in those cognitive functions associated with the prefrontal cortex. Eighteen of the high-risk subjects had previously participated in a study that demonstrated their cardiac hyperreactivity to stimulation. Post hoc analysis of the combined results of these two studies indicated a highly significant relationship between cognitive impairment and cardiac hyperreactivity. The data have theoretical and practical implications for inheritance of risk for alcoholism.

THE RELATIONSHIP BETWEEN ADULT ALCOHOL CONSUMPTION AND DEVIANT CHILD BEHAVIOR. William E. Pelham, Jr. Western Psychiatric Institute and Clinic, University of Pittsburgh School of Medicine, Pittsburgh, PA; Alan R. Lang. Florida State University, Tallahassee, FL; Debra A. Murphy. Western Psychiatric Institute and Clinic, University of Pittsburgh School of Medicine; and Beverly Atkeson. Florida State University, Tallahassee, FL.

Ninety-six adult subjects who were parents of attention deficit disordered/conduct disordered (ADD/CD) children were recruited to participate in a study in which the effects of