nicotine gum. By the time of the August 1989 APA meeting, over 2000 Lung Health study participants who began a nicotine gum smoking cessation program will have completed their one-year follow-up. Extended gum use data will be presented on these subjects.

GENDER AND AGE DIFFERENCES IN LONG-TERM USE OF NICOTINE GUM. Peggy Russell. Western Psychiatric Institute and Clinic, University of Pittsburgh School of Medicine, Pittsburgh, PA.

Nicotine chewing gum (nicotine polacrilex) has been demonstrated as an effective aid in the treatment of smoking. The advantages of nicotine chewing gum include its use in minimizing the withdrawal discomfort of quitting smoking and replacing the effects of nicotine from smoking. One advantage that should be of particular salience to women smokers is that proper use of the gum tends to reduce weight gain after stopping smoking. While there is substantial literature to demonstrate the effectiveness of gum in smoking cessation, there are questions which remain regarding which smokers' nicotine gum is best suited for and which smokers are most likely to continue using the gum long-term. Smokers differ in their smoking and quitting habits by gender and age. Women who smoke differ in the number of cigarettes per day and the type of cigarettes they smoke. Male smokers in older age groups tend to smoke more cigarettes per day and experience differences in discomfort levels from younger male smokers when they quit smoking. When male smokers are compared to females they differ according to age group as well. In this paper, data will be presented on gender and age differences in extended nicotine gum use in smokers enrolled in the Lung Health Study, a clinical trial designed to intervene early in smokers identified at risk for Chronic Obstructive Pulmonary Disease. When randomization is complete, 4,000 men and women smokers who have been screened for minimal lung dysfunction as shown by spirometry tests will participate in a special intervention program. Over 50% of the Lung Health Study participants were still using nicotine chewing gum at the time of their first 4-month follow-up. Initial acceptance rates and gum dose for the first 4 months of the trial show that more females than males used nicotine chewing gum at the end of 4 months. Of those who remained abstinent for the 4-month period, there were greater numbers of females who used gum than males. A current concern with long-term users of Nicorette is the potential for developing dependency on the gum. When smoking and quitting status is measured along with the number of pieces of nicotine gum used daily by 400 Lung Health Study participants, the data show that women who quit smoking used more nicotine gum at one year than men who quit smoking except for quitters classified as intermittent quitters. The role of extended nicotine gum use for women as a palliative stress management technique and as a weight control strategy will be discussed. Data will be presented on initial use of nicotine gum in the first four months of the trial on approximately 3500 participants. Differences in long-term use of nicotine gum characterized by age and gender will be presented on approximately 2000 participants.

WEIGHT GAIN AS A FUNCTION OF SMOKING CESSATION AND 2 MG NICOTINE GUM USE AT ONE-YEAR FOLLOW-UP. Mitchell A. Nides. University of California at Los Angeles, Los Angeles, CA.

Participants in the Lung Health Study smoking cessation program, a five-year, ten-site clinical trial sponsored by the National Heart, Lung and Blood Institute, who reported sustained nonsmoking for the 8 months preceding their first 12-month follow-up visit, gained a significant percentage of weight regardless of long-term 2 mg nicotine gum use ($p<0.05$, two-tailed). Males using Nicorette at 12 months (N = 72) gained an average of 5.6% of their baseline body weight while females (N = 50) gained an average of 6.0%. In contrast, males who never used or had discontinued use of Nicorette by the 12-month follow-up (N = 190) gained an average of 7.1% while females (N = 103) gained an average of 9.8%. Continued Nicorette use resulted in a significantly smaller percentage of weight gained at 12 months for females ($p<0.05$) and a nearly significant difference for males ($p=0.063$). Overall, males gained a smaller percentage of weight, but the only statistically significant difference was between males and females not currently using Nicorette ($p=0.0003$). The majority of weight was gained in the first few months following quitting smoking. Males using Nicorette at 4 months (N = 136) gained 4.7%, females (N = 94) 4.7%; males not using Nicorette (N = 145) gained 5.3%, and females (N = 57) 6.3%. The trend was for those using Nicorette to gain less weight at 4 months. Between the 4- and 12-month follow-ups only those participants who reported using Nicorette at both follow-ups did not gain a significant percentage of additional weight: Males (N = 69) gained 0.8% and females (N = 49) 0.6%. Males (N = 63) and females (N = 44) who had stopped using Nicorette between the 4th and 12th months gained 2.4% and 3.7% respectively, while males (N = 135) and females (N = 58) who were not using Nicorette at either the 4- or 12-month follow-ups gained an additional 2.0% and 3.7% respectively. These data indicate that quitting smoking resulted in significant weight gain after one year regardless of Nicorette use, although those using Nicorette gained less.

INVITED ADDRESS

Chair: *Jack E. Henningfield,* National Institute on Drug Abuse Addiction Research Center, Baltimore, MD

CHARACTERIZATION OF THE TOBACCO WITHDRAWAL SYNDROME AND IMPLICATIONS FOR TREATMENT. Dorothy K. Hatsukami. University of Minnesota, Minneapolis, MN.

This presentation will evolve around the characteristics of the tobacco withdrawal syndrome, its association with relapse to tobacco use and implications for treatment. In order for signs and symptoms to be classified as a true withdrawal syndrome, they must meet the following criteria: 1) a change in physiological, subjective and/or behavioral functioning as a result of deprivation from the drug; 2) time course of signs and symptoms that show an overshoot or rebound pattern; 3) alleviation of withdrawal symptoms when the drug is reinstated; and 4) the precipitation of withdrawal when a tobacco user is administered a drug antagonist. Studies we have conducted show a change in physiological, subjective and behavioral functioning during deprivation from cigarettes and smokeless tobacco. Furthermore, some of these signs and symptoms show an overshoot or rebound pattern. There is also evidence indicating that some of these symptoms are due specifically to nicotine (e.g., nicotine replacement and nicotine gum withdrawal studies) and are dose-related. However, the induction of withdrawal symptoms using nicotine antagonists has not been clearly demonstrated. As of yet, there are few studies which show that the tobacco withdrawal syndrome plays a significant role in relapse to tobacco. In fact, relapses have been found to occur long after the withdrawal symptoms have subsided. However, a recent study has demonstrated the occurrence of conditioned withdrawal responses which may be associated with relapse to tobacco. Furthermore, although nicotine gum has been

shown to reduce subjective withdrawal symptoms in general, there may be a potentiation of conditioned withdrawal symptoms with nicotine replacement.

MONDAY P.M.

PAPER SESSION

Stimulants and Anxiolytics: Behavioral and Physiological Effects
Chair: *Stephen C. Fowler,* University of Mississippi, University, MS

COCAINE BASE SMOKING IN RHESUS MONKEYS. Marilyn E. Carroll, Gilberto N. Carmona and Kelly L. Krattiger. University of Minnesota, Minneapolis, MN.

Three rhesus monkeys had been trained to drink a drug and/or water by making lip-contact responses on solenoid-operated drinking spouts. Responding on a similar spout activated a circuit that heated a coil of wire containing 10 mg of cocaine base. The coil was heated for 75 msec and the smoke exited the smoking tube protruding into the monkey's cage. The number of licks and sucking responses on this tube were recorded, and the results showed that the monkeys were actively inhaling on the tube. The monkeys rapidly self-administered the cocaine-base smoke *without* additional reinforcement with food or water. The fixed-ratio requirement for a smoke delivery was gradually increased to 16. Subsequently, a second-order schedule was implemented, whereby responding on a lever resulted in a brief stimulus associated with cocaine delivery after every 16 lever presses. The first FR 16 responses on the smoking spout completed after 85 brief stimulus deliveries activated the smoking device. A maximum of 4 deliveries were allowed per 1-hr session, and these were almost always earned. Lidocaine (10 mg) was then substituted for cocaine for 8 days and responding decreased substantially indicating that cocaine was functioning as a reinforcer. Extinction responding (increased intertrial licks and sucking responses) was also associated with the presentation of lidocaine. When access to the cocaine base was reinstated, responding increased and 4 deliveries were reliably earned each session. In subsequent experiments the number of smoking opportunities per day was increased to 8, a dose response function was obtained, withdrawal effects were examined and the effects of serotonin reuptake inhibitors, fluoxetine and sertraline as well as dietary L-tryptophan (a serotonin precursor), on cocaine-base smoking were investigated. (This research was supported by DA 02486.)

INTRANASAL COCAINE: EFFECTS OF LEARNING AND PERFORMANCE IN HUMANS. Stephen T. Higgins, John R. Hughes, Warren K. Bickel, Mark A. Capeless and Mary R. Lynn. University of Vermont, Burlington, VT.

The acute effects of intranasally administered cocaine (4, 48, 96 mg/70 kg) on human learning and performance were investigated in two recreational drug users. Subjects performed under a multiple schedule of repeated acquisition and performance of response sequences and the digit symbol substitution test (DSST), and also completed visual-analog ratings of drug effect. These tasks were performed immediately before and every 15–30 min for 2 hr after drug administration. Heart rate was measured every 5 min. Cocaine produced no discernible effects on accuracy of responding in the repeated acquisition and performance procedure; effects on overall rates of responding in that procedure differed as a function of drug dose and subject. In the DSST procedure, overall rates of responding and the total number of trials completed correctly increased as a function of drug dose in both subjects. Visual-analog ratings of drug effect and heart rate also increased as an orderly function of drug dose. Cocaine's effects on DSST performance, visual-analog ratings of drug effect and heart rate were discernible throughout the 120-minute session. These preliminary results contribute important new information on the human behavioral pharmacology of cocaine.

COCAINE-RELATED EXPECTANCIES: THEIR DOMAIN AND IMPLICATIONS FOR TREATMENT. Adam J. Jaffe. Yale University School of Medicine, New Haven, CT; and M. Marlene Kilbey and Gerald R. Rosenbaum. Wayne State University, Detroit, MI.

The present study involved the construction of a Cocaine Expectancy Questionnaire (CEQ) designed to explore the domain of adult cocaine-related expectancies. The questionnaire was based on extensive open-ended interviews with 73 adult noncocaine users, 12 experimental users and 20 abusers, as well as a review of the relevant literature. The items were then administered to a second, similar group. Item analysis was conducted to determine final item inclusion. A content analysis of the interviews and resulting questionnaire revealed that adults seem to hold well-formed expectancies about the effects of cocaine. Etiological and treatment implications of expectancies and the CEQ are discussed.

DISCRIMINATIVE STIMULUS EFFECTS OF *d*-AMPHETAMINE, METHYLPHENIDATE AND DIAZEPAM IN HUMANS. Stephen J. Heishman, W. Robert Lange and Jack E. Henningfield. National Institute on Drug Abuse Addiction Research Center, Baltimore, MD.

Human subjects were trained to discriminate between 30 mg *d*-amphetamine (Drug A) and placebo using a second-order schedule color tracking procedure. Daily experimental sessions tested one drug dose or placebo. All subjects learned the discrimination and reported increased subjective ratings of drug liking, drug strength, and good drug effects after administration of *d*-amphetamine compared to placebo. Subjects were then tested with *d*-amphetamine (3.75, 7.5, 15 and 30 mg), diazepam (5, 10, 20 and 40 mg), and methylphenidate (7.5, 15, 30 and 60 mg) to determine if the discriminative stimulus effects of these drugs would substitute for Drug A. Doses of *d*-amphetamine substituted for Drug A in some, but not all subjects; however, subjective effects corresponded to discriminative stimulus effects. None of the doses of diazepam substituted for Drug A. Only the highest dose of methylphenidate (60 mg) substituted for Drug A in all subjects, producing Drug A-like subjective effects. These results indicated that this procedure is useful for studying the discriminative stimulus effects of drugs in humans and that the subjective and discriminative stimulus effects of the tested drugs closely paralleled one another.

EFFECTS OF BUSPIRONE AND DIAZEPAM ON MOOD AND BEHAVIOR. Warren K. Bickel, John R. Hughes, Stephen T. Higgins and Mark Capeless. University of Vermont, Burlington, VT.

The present study examined the effects of buspirone and diazepam on subjects' reports of drug effects and on performance. Subjects were administered either buspirone (0, 10, 20, and 30 mg/70 kg of bodyweight) or diazepam (0, 10, 20, and 30 mg/70 kg