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Commission Scientifique
de l'Association Suisse
des Fabricants de Cigarettes
Case Postale 76

1701 F R I B O U R G

June 23rd, 1978

Commission Scientifique
de l'Association Suisse
des Fabricants de Cigarettes

Application:

ASFC-Laboratory Research grant
"Behavioral effects of nicotine".
Dept. of Behavioral Sciences
Turnerstrasse 1, 8092 ZURICH.

Project period:

October 1st, 1978 - September 30th, 1979

Project Director:

Prof. Dr. K. Bättig
Swiss Federal Institute of Technology
Turnerstrasse 1, 8092 ZURICH.

Accompanying personal grant requests:

- a) Dr. P. Driscoll: Psychogenetics and comparative physiology.
- b) Dr. J. Schlatter: Smoking and latent learning in humans.

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I. Report of current research

The general goals of the project "psychophysiological effects of smoking" have been outlined in the grant applications for the running project period (June 30th, 1977) together with a summary of previous research done in the area. The following results and methodological refinements have been achieved during the first 8 months of this first period since October 1977:

- a) Psychophysiological recordings: The technique of recording on a single track of a magnetic tape simultaneously ECG, EEG, EMG, Respiration, skin resistance is now firmly established. The older equipment for measuring skin resistance has been replaced by a system measuring skin conductance which yields more accuracy and is less susceptible to artefacts. The development of the necessary software for numerical computer analysis of these data is progressing and completed for the ECG data (pulse rate, pulse variation) EEG recording was improved by adopting new micro-preamplifiers which can be fitted directly to the electrodes on the head of the subject. This allows a considerable reduction of noise.
- b) Recording of smoking parameters: The system developed by BAT-Southampton for obtaining signals representing puffing pressure and puffing volume has been purchased from Projects Ltd., Cheltenham, England, and will be available within a few weeks. This system will allow to relate the effects of smoking on performance and psychophysiological functions to the individual differences in smoke aspiration behavior.
- c) Circulatory effects of nicotine: In a first series of pilot experiments involving 15 sessions the effects of smoking a 1.2 mg and 0.2 mg Nicotine cigarette have been compared with non smoking. No differences were found between the 0.2 mg Nicotine cigarette and the non smoking condition. 1.2 mg Nicotine produced a short lasting but pronounced decrease of the amplitude of the peripheral pulse lasting approximately 10 - 20 minutes

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before wearing off completely. This response was more consistent than the accompanying increases of heart rate and changes of skin temperature. Furthermore smoking the 0.2 mg Nicotine cigarette produced regularly more puffs per cigarette than smoking a 1.2 mg Nicotine cigarette. The 0.2 mg Nicotine cigarette was judged by most subjects to be less satisfactory than the 1.2 mg Nicotine cigarette.

d) Cognitive stress: The search for a stimulus presentation producing consistent changes of skin resistance was continued. The pilot experiments included the presentation of noise bursts, of standardized emotional word lists and of four digit numbers to be classified by the subject as prime or non prime number. A further test series involved single discrete presentation of the problems of the Stroop test. This test consists of "confusing" slides, showing for example the word "blue" written in red letters on a green background with the subject being asked to name within the shortest possible delay the complementary colors to each of the three colours present on the slide. The most consistent electrodermic responses were obtained with this last procedure, whereas both habituation and training affected to a greater degree responsiveness with the other tasks.

e) Latent learning: This test is subject of the personal grant application of Dr. Schlatter. A first series of systematic experiments involving 24 subjects is now terminated and the results are highly satisfactory. The task tests for configurational memory and individual learning strategies. It will be induced in the smoking experiments of the new project period.

f) Basic equipment: A serious difficulty exists with the insufficient capacity of the laboratory computer (PDP-11) installed at the Institute. An application for replacing the processor of this system by a more advanced type allowing multi-user application is pending. All peripheral equipment and interface, however, is available and fully operational.

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g) Animal research: This line of studies is subject of the application of Dr. Driscoll. Actual work concentrates on the analysis of further behavioral and physiological differences between the RHA and RLA strains which previously have been shown to react differentially to nicotine and also to show differences in brain chemistry.

h) Animal inhalation: The program is continued according to the application of Dr. Kistler who does all analytical work.

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II. Research Project

Generally formulated the research goals of the proposed experiments can be grouped into the following questions:

- a) Relations between behavioral (cognitive stress, latent memory, adjunctive behavior) and vegetative (psychophysiology) effects of nicotine.
- b) Relations between personality and nicotinic response (both behavior & psychophysiology).
- c) Relations between puffing behavior, respiration, nicotine plasma level and cardiovascular nicotinic response.

Since each experimental session requires considerable technical preparations and subsequent data analysis it is intended, to combine the study of these relations as far as possible within the same methodological framework.

A typical session consists of 70-80 minutes of recording the different biological potentials. Such a session is divided into several parts with presentation of series of Stroop problems and problems of latent learning which are carried out within each session both before and after an interval during which the subject is allowed for smoking or sham smoking.

Within this methodological frame and the necessary adaptations two sets of experiments are planned to be subject of the studies of two doctoral students. Beside the experiments which are subject of the application of Dr. Schlatter, Mr. Th. Suter already started his thesis work with the running grant period and Mr. St. Gyr is expected to join him with the proposed new grant period.

1.) Experiments Mr. Th. Suter: This set of experiments concentrates on the interaction between nicotine, cognitive stress, psychophysiological changes and personality. The preliminary experiments already carried out and mentioned under section a), c) and d) of the above report on current research allow for a first extended and systematic study. Toward this goal 40 male smokers have been selected on the base of personality assessments from 250 applicants for volunteering as subjects (AUPI - test, Baumann & Dittrich, 1975). This selection was made in view of the extraversion/introversion und neuroticism hypothesis (Eysenck, 1973). Each of these subjects, will undergo three experimental sessions, one with smoking a 0.2 mg/Nicotine cigarette, one with smoking a 1.2 mg/Nicotine cigarette and one without smoking. Psychophysiological recordings will include ECG, plethysmography, Respiration, skin conductance and EEG. The analysis of these data is expected to show interactions between personality and the magnitude of the different psychophysiological consequences of nicotine uptake as demonstrated by many authors (Agué, 1974, Brown, 1973, Coffman, 1969, Feyerabend et al., 1978, Frankenhäuser et al., 1970, Goldfarb et al., 1976, Kumar et al., 1977, Russell, 1973) as well as to throw additional light on the paradox of behavioral sedation and simultaneous sympathicomimetic stimulation induced by nicotine (Schachter, 1973).

2.) Experiments Mr. St. Gyr: This set of experiments is directed toward the interrelation of smoke aspiration (recording of puffing behavior) inhalation (subsequent respiratory cycle) plasma nicotine and circulatory effects (ECG and plethysmography). Studies done in this field by other researchers include investigations of smoking and plasma nicotine (Russell, 1975, Armitage et al., 1975) and Smoking or nicotine application and psychophysiological changes (Hynd et al., 1976, Levi, 1965, Dales et al., 1978, Hall et al., 1972, Westfall et al., 1964, Shean et al., 1971). The many inconsistencies seen in these

results could suggest that different factors of individuality such as smoking history, smoking habit, personality might play an important role. In view of the nicotine self regulation theory (Goldfarb et al., 1976, Kozlowski et al., 1975/1976, Ashton et al., 1970, Lucchesi et al., 1967, Jarvik et al., 1970) however, it would be highly desirable to obtain better insights into the relations between puffing behavior, inhalation and nicotinic response.

It is further expected that this paradigm might provide at a later stage a useful basis for the study of interactions of nicotine with other commonly used psychoactive substances (Caffeine, Alcohol, Diazepam etc.) and for investigations into the pharmacological basis of nicotinic action (Blockers of nicotinic action, agonists and antagonists of α - and β -noradrenergic transmission etc.).

The first year of this study is planned to be devoted for the necessary pilot experiments, especially in order to routinize quantitative analysis of puffing behavior. The necessary determinations of plasma and urine nicotine content will be carried out by the laboratory for clinical chemistry (Prof. Rosenmund, Kantonsspital, ZUERICH).

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III. Financial Budget

Period: October 1st, 1978 - September 30th, 1979.

A) Salaries:

i)	Doctoral student (Th. W. Suter) 2nd year	16'700.-	
	5,4% social fees	901.80	
	Insurance	85.-	
ii)	Doctoral student (St. Gyr) 1st year	14'600.-	
	5,4% social fees	788.40	
	Insurance	85.-	
iii)	Technician (V. Studer)	36'000.-	
	5,4% social fees	1'944.-	
	Insurance	115.-	
Total Salaries			71'219.20

B) Travel: 3'000.-

C) Supplies:

Chemicals, animal care, apparatus
maintenance. 2000.-

Chemical Analysis (Prof. Rosenmund)
Blood, URINE-NICOTINE, Urine Adre-
nalin / Noradrenalin 7000.-

Total Supplies 9'000.-

D) Unexpected expenditures 1'780.80

Total 85'000.-

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