

BRIEF REPORT

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SMOKING BEHAVIOUR UNDER CONDITIONS OF RELAXATION:  
A COMPARISON BETWEEN TYPES OF SMOKERS

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Abstract—Smoking behaviour, self-reported mood and cardiac activity were examined in 12 "sedative" and 12 "stimulant" smokers, defined using Mangan and Golding's questionnaire. This concerns the interaction between urge to smoke and external situation. "Sedative" smokers appear to experience their greatest need to smoke in situations characterized by low arousal; "stimulant" smokers in situations of high arousal. Members of each group were examined in two low arousal conditions. In one condition smoking was allowed, and in the other it was not. When allowed to smoke, it was shown that the two groups differed in their smoking behaviour: 10 stimulant but only 2 sedative smokers chose to do so. However, although smoking caused a significant increase in cardiac activity in smokers, no effects on subjective arousal were found. The implications of these findings are discussed.

INTRODUCTION

In recent years, there has been increasing interest in treating smokers not as a homogenous group, but as individuals who have different motives for smoking, and who are likely to respond to different methods of intervention (Royal College of Physicians, 1977). One possible distinction between smokers focuses on the arousal changing effects of cigarettes; this was originally suggested in a questionnaire study by Frith (1971). He identified two groups of smokers: sedative smokers, who smoke under conditions of high arousal in order to decrease arousal; and stimulant smokers, who prefer to smoke under conditions of low arousal in order to increase arousal. Frith (1971) based this distinction on earlier evidence that nicotine has biphasic effects on arousal (Armitage, Hall, & Sellars, 1969). Later evidence (Eysenck, 1973) suggested that the direction of the effect depends to a large extent on the resting level of arousal in the individual, which may be related to personality. Extraverts, characterised by low levels of arousal might be expected to smoke to increase such levels; the reverse being true for introverts.

This model has considerable intuitive appeal, particularly since it considers the relationships between the needs of the individual smoker and the influence of the environment. It has been strengthened by more recent evidence which supports both the early findings concerning the dual effects of nicotine (Ashton and Stepney, 1982; Mangan and Golding, 1978), and of expectations concerning the mediating role of personality

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(Eysenck and O'Connor, 1979; Ashton, Millman, Telford, & Thompson, 1974). However, the assumptions and implications of the model, are yet to be fully explored. For example, Myrsten, Anderson, Frankenhauser, & Elgerot, (1975) demonstrated that cigarettes only had a favourable effect on performance when stimulant and sedative smokers were in the situations they most preferred for smoking. In contrast, Williams, Tata, & Miskella, (1984) found no difference in performance increment between sedative and stimulant smokers in a simple non-stressful task. So the effective distinction between sedative and stimulant smokers still remains to be determined. Moreover, although these studies have considered differential effects of smoking, there has been little interest in systematically examining smoking as a dependent measure, in order to analyze the extent to which arousal acts as a trigger for the behaviour. Such an approach may well enhance our present knowledge concerning possible differences between smokers.

The present study therefore, attempted to assess the relative importance of low levels of arousal in (a) instigating smoking and (b) determining the physiological and subjective response to smoking, in sedative and stimulant smokers.

#### SUBJECTS

Two groups of smokers, from a population of middle tar smokers from the Cambridge area, were selected on the basis of their response to a smoking motivation questionnaire: "sedative" smokers and "stimulant" smokers. The questionnaire used (Golding, Harper, & Brent-Smith, 1983) comprised 10 pairs of statements, one of the pair describing a low arousal situation and one describing a high arousal situation. For each pair, subjects were asked to choose the situation in which they would be more likely to smoke. Scores range from 0 to 10, a high score indicating a greater desire to smoke in a high arousal situation, and a low score indicating a greater desire to smoke in a low arousal situation.

Selection of subjects was made against normative data produced by Mangan and Golding (personal communication). Twelve smokers comprised each group, the mean score being  $7.7 \pm 0.7$  for the sedative group, and that for the stimulant smoking group being  $2.2 \pm 0.9$ . The groups were matched for age (28.9 yrs.  $\pm 8.0$ , sedative group; 28.75 yrs.  $\pm 8.9$ , stimulant group), and proportion of males and females (6 of each sex per group). They were also matched for cigarette consumption ( $17.1 \pm 3.3$  cigs/day, sedative group;  $17.3 \pm 2.8$  cigs/day, stimulant group). All subjects completed Eysenck's personality questionnaire, (Eysenck, & Eysenck, 1975). Sedative smokers were found to be significantly more neurotic than stimulant smokers ( $t = 2.13$ ,  $df = 22$ ,  $P < 0.05$ ), mean N scores for the sedative smokers were  $12.8 \pm 3.0$ , and  $8.7 \pm 5.6$  for the stimulant smokers.

#### DESIGN AND PROCEDURE

Subjects were told that the purpose of the present study was the investigation of the psychological and physiological response of smokers and non-smokers to relaxation. They were asked not to smoke, drink tea or coffee for one hour before attendance, and to abstain from alcohol from midnight prior to the experimental day.

Subjects attended two experimental sessions (smoking permitted and not permitted) in the same week, at the same time of day, and the order of presentation of the conditions was counterbalanced. On both occasions, they underwent a 10 minute "baseline" period of sitting quietly and a 30 minute period during which the relaxation technique was practised. The relaxation technique consisted of subjects sitting quietly

and listening to a four minute tape recording of instructions on how to relax (Benson, Klenchuck, Marzetha & Rosner 1974; Cork and Cox, 1985). Following the instructions, subjects were asked to continue sitting quietly and carrying out the relaxation for a further 25 minutes. In the condition in which smoking was allowed, subjects were told that they could smoke if they wished, during the 30 minutes of relaxation, as the measurements taken depended on their being in a state usual for them in relaxing circumstances. When smoking was not allowed, subjects were told that they could not smoke, as baseline measurements were being taken which would be disrupted by smoking. Headphones were worn throughout this 30 minutes to mask any external noise. At the end of the experiment, subjects were debriefed and asked whether they were aware of the true intent of the study. All were convinced by the explanation they had been given.

#### MEASURES

*Stress and Arousal Checklist* (Mackay, Cox, Burrows, & Lazzarini, 1978; Cox and Mackay, 1985).

This inventory (SACL) provides independent measures of self reported stress and arousal. Studies so far have indicated that the two factors are differentially sensitive to a variety of task, drug and environmental effects (Mackay, 1980). Measures were taken before and after the relaxation period, and the effects of both relaxation and smoking on subjective stress and arousal were assessed using appropriate analyses of variance.

#### Heart rate

Cardiac activity was measured continuously throughout each session using a Medilog 4-24 tape recorder, and heart rate was calculated from ECG traces produced by the Pathfinder-1 high speed ECG analyser. Four sample measurements were used: the midpoint of the baseline period; one minute following the start, the midpoint, and one minute before the end of the relaxation period. Analyses of variance were used to compare changes in autonomic activity across the relaxation period. The immediate effect of smoking on heart rate in stimulant smokers was tested by comparing change scores (difference between scores 0-2 minutes before start of smoking and 0-2 minutes before end of smoking) in the smoking condition with change scores over equivalent periods in the non smoking condition using two way analysis of variance.

#### Cigarette smoking

Each subject brought his own or her own brand of cigarettes to the experiment, and number of cigarettes smoked by each individual was noted.

#### RESULTS

The first and most important observation was that 10 out of 12 stimulant smokers, but only 2 out of 12 sedative smokers chose to smoke when allowed to do so ( $\chi^2 = 9.79$ ,  $df = 1$ ,  $P < 0.01$ ). The 2 sedative smokers who smoked, and the 2 stimulant smokers who did not were disregarded from subsequent analyses.

In the non-smoking condition, there was a significant effect of relaxation on self-reported arousal; arousal decreased in all subjects from a level of  $5.7 \pm 3.2$  points to  $4.1 \pm 3.7$  points ( $F = 7.3$ ,  $df = 1, 20$ ,  $P < 0.02$ ). Subjective stress scores did not change, but were low throughout the experiment. Heart rate decreased significantly from  $89.9 (\pm 8.6)$  to  $78.9 (\pm 9.9)$  beats per min. in all subjects ( $F = 21.3$ ,  $df = 3, 60$ ,  $P < 0.0005$ ).

Considering only the stimulant smokers who smoked, it was clear that smoking did not affect subjective arousal. Arousal scores decreased across the relaxation period by almost exactly the same amount in the smoking condition, as in the non-smoking condition ( $F = 0.0$ ,  $df = 1,8$ ,  $P = 1.0$ ). However, there was a significant and expected effect of smoking on heart rate. Heart rate increased by  $14.6 (\pm 8.8)$  beats per min. in the smoking condition, compared with a slight decrease of  $3.3 (\pm 4.9)$  beats per min., over an equivalent period in the no smoking condition ( $F = 19.2$ ,  $df = 1,8$ ,  $P < 0.002$ ).

#### DISCUSSION

The present experiment supports the hypothesis that stimulant and sedative smokers behave differently in response to relaxation. Under conditions experienced by both groups of smokers as being low arousal and stress, only 2 sedative as compared with 10 stimulant smokers chose to smoke. The fact that sedative smokers smoked so little in these conditions suggests that relaxation training may be potentially useful as a method of reducing their cigarette consumption. However, on the evidence of this experiment, such training is less likely to be of benefit to stimulant smokers.

The initial observation of relatively higher  $N$  scores among sedative smokers agrees with the results of Warburton and Wesnes (1978), and Knott (1979). It is compatible with the suggestion that high scores on the Golding questionnaire (and other similar questionnaires) may partly reflect a desire to smoke when tense or nervous. This suggestion is supported in another study (Surawy and Cox, 1985) identical in design to that reported here, which investigated the behaviour of sedative and stimulant smokers under conditions of high stress and high arousal. Sedative smokers smoked significantly more under these conditions than in the present study (16 cigarettes in total). Stimulant smokers however, smoked the same number of cigarettes (10) in both studies. This suggests that while change in arousal is an important influence on the smoking behaviour of sedative smokers, it is much less important for stimulant smokers. The finding that, in the present experiment smoking had no effect on subjective arousal in stimulant smokers, supports this contention. The lack of effect however, was not simply due to the absence of any impact of smoking, as the expected increase in heart rate was observed. It could, of course, be argued that these smokers were seeking effects on arousal to which they might not be subjectively sensitive. However, the evidence on the seeming unimportance of arousal in instigating smoking in this group, makes this suggestion less likely.

The behaviour of the stimulant smokers, rather than reflecting a desire to modulate arousal, may well have been a response to some external aspect of the experimental situation. A separate finding (Surawy, Stepney, & Cox, 1985), that stimulant smokers were highly susceptible to environmental "cues" to smoking, supports this conjecture, which deserves further investigation.

It is clear that differences between smokers exist, a finding which has implications for specificity in intervention strategies. Furthermore, it is also clear that a typology which considers smoking only in terms of arousal is perhaps too simple to be of significant value in terms of both understanding and preventing the smoking habit (Stanaway and Watson, 1980; Williams et al, 1984).

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