THE SLEEP HABITS AND LIFESTYLE OF CIGARETTE SMOKERS

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One hundred men and 119 women between the ages of 15 and 80 years who were patients in the wards of a general hospital gave subjective reports of their sleep habits, smoking status and consumption of alcohol, tea and coffee—aspects of their lifestyle when at home. Patients who usually smoked more than 20 cigarettes per day also drank more alcohol and more tea or coffee than others. Heavy smoking and the frequent drinking of tea or coffee were associated with later times of going to bed at night but not with insomnia. Alcohol consumption was unrelated to any aspect of sleep habits. These findings are consistent with the view that heavy smokers tend to be more extroverted than non-smokers and seek arousal both by out-going social activities and by the use of stimulant drugs such as nicotine and caffeine. However, heavy smokers do not necessarily suffer from long-term emotional distress which would cause insomnia.

HEAVY smokers of cigarettes tend to have many characteristics in common. Among those characteristics which have been reported to date are personality measures (Heath, 1958; Eysenck *et alii*, 1960; Thomas, 1960; Eastwood and Trevelyan, 1971), a tendency to be involved in accidents (Matarazzo and Saslow, 1960), occupational preferences (Thomas *et alii*, 1970), body build (Seltzer, 1959), degree of facial wrinkling (Daniell, 1971), increased blood pressure and serum cholesterol (Thomas, 1960), decreased vitamin C concentration (Pelletier, 1968) and increased consumption of sucrose, tea and coffee (Bennett *et alii*, 1970).

The relatively constant psychosocial and behavioural characteristics of each person constitute his lifestyle. This is determined largely by the continual interaction between biological, psychological, social and environmental influences which reach a dynamic equilibrium over a period of time. Heavy smokers can be said to have a particular lifestyle, although clearly there may be many minor variations of this in individual people.

When trying to determine the role played by some aspect of a lifestyle in "causing" a particular disease, the effects of other factors with which that lifestyle is associated must be considered also. For example, it may be that in our urban communities there are several different aspects of the lifestyle of heavy smokers which influence the development of ischaemic heart disease, in addition to any more direct effects of their smoking which may exist (U.S. Public Health Service, 1964; Royal College of Physicians, 1971). Thus, there is a pressing need for detailed definitions of lifestyles in different people if the complex aetiology of such diseases is to be understood.

An investigation of sleep habits in hospital patients provided an opportunity to extend the definition of the smokers' lifestyle by seeing if there were any relationships between their cigarette smoking and their sleep habits when at home. Information was also available about their

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consumption of alcohol and tea or coffee. Our studies of sleep habits, using a detailed Sleep Questionnaire, among both hospital patients and medical students, have demonstrated that several aspects of sleep habits are related to psychological characteristics and social adaptation, age, long-term physiological differences in adrenocortical activity, and the presence of some physical disorders, notably ischaemic heart disease (Johns *et alii*, 1970, 1971*a*, 1971*b*, 1974). It was anticipated that because sleep habits form an important part of a person's lifestyle there may be differences between smokers and non-smokers.

METHODS

The Sleep Questionnaire, the method by which male patients were selected and the distribution of their ages have been described previously (Johns *et alii*, 1970); those for female patients were similar. The 100 male and 119 female patients, aged between 15 and 80 years, were all those in general medical and surgical wards of the Alfred Hospital, Melbourne, who were able to fill out both the Sleep Questionnaire and the Cornell Medical Index Health Questionnaire (CMI). The latter refers to a wide range of physical and psychological symptoms, habits and facts of medical history (Johns, 1972). The answers to one question in the CMI (Do you smoke more than 20 cigarettes a day?) enabled heavy smokers to be distinguished. Combining light smokers with non-smokers seems to be justified because the former more closely resemble the latter than they resemble heavy smokers (Thomas *et alii*, 1970). The answers to another question (Do you drink more than 6 cups of coffee or tea a day?) were used to distinguish those patients who were heavy drinkers of tea or coffee. Similarly, patients who were at least moderate drinkers of alcohol were identified by their answers to a third question (Do you usually take two or more alcoholic drinks a day?). Each patient's sleep habits were considered in terms of variables such as the usual times of going to bed on week nights and on weekends, the usual delay before falling asleep, the duration and quality of sleep, and the frequency with which hypnotic drugs were used. Heavy smokers were then compared with light smokers and non-smokers from the point of view of their sleep habits and their use of alcohol, tea and coffee.

The Chi-square test was used to determine the statistical association between smoking and the consumption of alcohol, tea or coffee by patients in different age groups (15 to 49 years and 50 to 80 years) of each sex. The relationship of each of these variables to sleep habits was determined by means of product-moment correlation coefficients and multiple regression analysis. The latter method of multivariate analysis enabled the association, for example, between heavy smoking and an aspect of a patient's sleep habits to be determined regardless of the relationships between the other variables which were all considered to act simultaneously (Cooley and Lohnes, 1962).

RESULTS

The proportion of patients who reported that they smoked heavily, drank many cups of tea or coffee, or drank at least moderate amounts of alcohol, decreased with age in both sexes (Table 1), although those changes were not statistically significant. Heavy smoking and the frequent use of alcohol were more common among men, whereas the heavy consumption of tea or coffee was more common among women. In each sex there was an association on the one hand between heavy smoking and the consumption of tea and coffee and on the other hand, between smoking and the use of alcohol. However, these associations were significant only in younger patients. For example, among male patients who were less than 50 years old, 60% of the heavy smokers were also heavy drinkers of tea and coffee ($P < 0{\cdot}01$) and 67% were at least moderate drinkers of alcohol ($P < 0{\cdot}05$).

TABLE 1

Percentage of Male and Female Subjects in Different Age Groups Who Reported That They Were Heavy Smokers, Heavy Drinkers of Tea or Coffee, or at Least Moderate Drinkers of Alcohol

	Age in Years	Percentage Men	Percentage Women
Smoke more than 20 cigarettes per day	15 to 49	31·2	27·2
	50 to 80	19·2	13·2
Drink more than 6 cups of tea or coffee per day	15 to 49	33·3	44·0
	50 to 80	19·2	32·1
Drink more than 2 alcoholic drinks per day	15 to 49	41·6	12·1(*a*)
	50 to 80	37·2	11·3(*a*)

(*a*) Significantly less ($P < 0{\cdot}001$) than corresponding figures for men.

The variables which were used to describe sleep habits are shown in Table 2. The sleep habits of this same group of male patients have been described previously (Johns *et alii*, 1970); those of the female patients were very similar. Correlation coefficients between each aspect of sleep habits and either smoking or the consumption of tea and coffee are also shown for each sex in Table 2.

TABLE 2

Correlations Between Various Aspects of Sleep Habits and Smoking Status or Consumption of Tea and Coffee in Male and Female Subjects

Variable	Correlation with			
	Heavy Smoking in		Drinking Tea or Coffee in	
	Men	Women	Men	Women
Time of going to bed on week nights	·24(*a*)	·17	·25(*b*)	·18(*a*)
Time of going to bed at weekends	·28(*b*)	·13	·13	·36(*c*)
Delay before falling asleep	·09	−·04	·00	·04
Difficulty in falling asleep (frequency)	·05	·04	·08	·06
Awakenings during the night (frequency)	−·09	−·08	−·12	·02
Awakenings during the night (total duration)	−·15	−·08	−·08	·01
Time of morning wakings on week days	·13	·02	·11	·11
Time of morning wakings on weekends	·15	−·03	·04	·08
Total duration of sleep at night	·00	·01	−·02	−·12
Delay before getting out of bed on week days	·04	·10	−·08	−·16
Delay before getting out of bed at weekends	−·01	·07	−·07	−·10
Nightmares (frequency)	·08	·14	·10	·16
Use of hypnotic drugs (frequency)	·02	·05	·10	·12
Subjective quality of sleep at night	·26(*b*)	·08	·09	·09
Sleep during the day (total duration)	−·11	·07	−·06	·06
Age	−·07	−·15	−·14	−·12

(*a*) $P < 0{\cdot}05$
(*b*) $P < 0{\cdot}01$.
(*c*) $P < 0{\cdot}001$.

Among the male subjects, heavy smokers usually went to bed later at night than non-smokers both on week nights and at weekends. On the average, heavy smokers

went to bed approximately 30 minutes later than non-smokers on week nights and 40 minutes later at weekends, a difference which was present both in young and old patients. Heavy smokers also reported having better quality sleep than non-smokers. Among the female patients, heavy smokers also tended to go to bed later at night, but this did not quite reach the level of significance. In neither sex was smoking related to difficulty in falling asleep, awakenings during the night, the duration of sleep at night or during the day, the frequency of nightmares, the time spent lying in bed after waking in the morning, or the use of hypnotic drugs. Because of the relationships which are known to exist between many of these variables (Johns *et alii*, 1971*a*), and because many of them are influenced by age (Johns *et alii*, 1970), multiple regression analysis was performed in which 15 parameters of sleep habits and the patients' ages were used simultaneously as predictors of whether or not they were heavy smokers. Among male patients, a significant prediction of smoking status (multiple correlation coefficient 0·53; $P < 0·05$) could be made on the basis of their sleep habits regardless of age. The best independent predictors were the usual time of going to bed at night at weekends, and the subjective quality of sleep. In fact more than 20% of the variance in smoking habits could be accounted for by these two aspects of sleep habits alone. The corresponding multiple correlation coefficient for female patients was not significant.

As with heavy smoking, increased consumption of tea or coffee was associated with late nights, but not with insomnia (Table 2). Using multiple regression analysis, a significant prediction of a patient's consumption of tea and coffee could be made on the basis of sleep habits and age in women (multiple correlation coefficient 0·50; $P < 0·05$), but not in men. The best single predictor, accounting for 22% of the variance in the consumption of tea and coffee by women, was their usual time of going to bed at night at weekends. Similar analyses were performed for alcohol consumption, but the relationships were insignificant for all aspects of sleep habits considered in both sexes.

DISCUSSION

These results derived from patients in medical and surgical wards of a general hospital in Australia confirm and extend the results of other surveys carried out elsewhere. An average of one in four patients of all ages smoked more than 20 cigarettes per day. Similar proportions of heavy smokers were found in a survey of the general community which is served by the Alfred Hospital, Melbourne (Rankin and Wilkinson, 1971). Thus, it is unlikely that there is any great excess of smokers among patients admitted to hospital.

The finding that heavy smokers tend to drink more tea and coffee than non-smokers confirms observations made by Thomas *et alii* (1970) among students in the U.S.A. and by Bennett *et alii* (1970) among hospital patients and others in Great Britain. An association between heavy smoking and alcohol consumption has been described previously for an Australian community (Rankin and Wilkinson, 1971). The additional finding of a tendency for heavy smokers and drinkers of tea and coffee to stay up later at night than other people adds another dimension to their respective lifestyles. As described elsewhere (Johns *et alii*, 1970), most people go to bed later at weekends (Friday and Saturday nights) than during the week. Nevertheless, there is a significant correlation between these times in the same subject. People tend to be consistent in going to bed either "early" or "late"; it forms part of their lifestyle.

Eysenck *et alii* (1960) found that smokers were more extroverted than either non-smokers or light smokers as measured by the Eysenck Personality Inventory. Later times of going to bed at night are consistent with Eysenck's concept of extroversion as an enduring psychological characteristic. In a group of medical students (mainly male), later than average times of going to bed both on week nights and weekends have been found to be correlated with scores on the Pd (psychopathic deviate) and Ma (hypomania) scales of the Minnesota Multiphasic Personality Inventory (Johns *et alii*, 1974). That is, students who consistently have "late" nights are characterized by enthusiastic and arousal-seeking behaviour with reduced awareness of the consequences of such behaviour. Smokers have also been found to have higher scores on the Pd scale of the MMPI than non-smokers (Stewart and Lavson, 1966). These findings are all consistent with a view propounded initially by Eysenck (1965) and others (Schubert, 1965) that the sort of person who is a heavy smoker, at least in our urban communities, feels best when stimulated, whether by nicotine or by out-going, enthusiastic social activities. Neurophysiological studies of visual evoked potentials have demonstrated that smoking does increase the level of arousal (Hall *et alii*, 1973).

The close relationship between "late" nights, heavy smoking and the consumption of tea and coffee in the present investigation suggests that caffeine is an alternative or additional drug with which extroverts seek stimulation. Differences in the social connotation of heavy smoking compared with drinking many cups of tea or coffee may account for differences in the proportions of men and women making use of nicotine and caffeine. By contrast, the increased consumption of alcohol was unrelated to sleep habits and presumably involved a different aspect of the lifestyle in heavy smokers.

Although some investigators have found evidence to the contrary (e.g., Srole, 1968), the absence of a significant relationship between smoking and "poor" sleep in the present investigation suggests that psychological disturbances involving emotional distress (notably anxiety), which produces both physiological hyperactivation and insomnia, are not characteristic of heavy smokers. There is evidence that insomnia is a sensitive but non-specific indicator of the intensity of emotional arousal engendered in daily life and continuing at night (Johns *et alii*, 1971*b*, 1974).

It could be argued that it is the stimulating effects of nicotine and caffeine which "causes" some people to stay up late at night. While this possibility cannot be refuted conclusively, it seems likely that different aspects of a person's lifestyle are present not as "causes" or "effects" of one another, but as influences which undergo mutual interactions. For example, the tendency to stay up late at

night may be enhanced by the stimulating effects of smoking and of drinking coffee, but "late" nights also provide more time for and thus may encourage more smoking and drinking. There is unlikely to be a single "cause" for the presence or absence of any particular aspect of a person's lifestyle.

If this is true, then it is likely that a heavy smoker who gives up this habit will also change other aspects of his lifestyle. This possibility should not be overlooked when attempting to ascribe a reduction in the incidence of some disease, such as ischaemic heart disease in ex-smokers, simply to their cessation of smoking (Royal College of Physicians, 1971). It must be remembered also that heavy smoking may form part of a very different lifestyle in different cultures, for example, in some Eastern European countries where smoking is not associated with ischaemic heart disease (Keys, 1970). What is needed, therefore, are more precise definitions of different lifestyles and their physiological concomitants, considering multiple physical and behavioural variables and their interactions simultaneously.

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REFERENCES

BENNETT, A. E., DOLL, R., and HOWELL, R. W. (1970), Sugar consumption and cigarette smoking, *Lancet*, 1: 1011.

COOLEY, W. W., and LOHNES, P. R. (1962), *Multi-variate Procedures for the Behavioural Sciences*, Wiley, New York.

DANIELL, H. W. (1971), Smokers' wrinkles, *Ann. intern. Med.*, 75: 873.

EASTWOOD, M. R., and TREVELYAN, M. H. (1971), Smoking and neurotic illness, *Lancet*, 1: 107.

EYSENCK, H. J., TARRANT, M., WOOLF, M., and ENGLAND, L. (1960), Smoking and personality, *Brit. med. J.*, 1: 1456.

EYSENCK, H. F. (1965), *Smoking, Health and Personality*, Weidenfeld and Nicolson, London.

HALL, R. A., RAPPAPORT, M., HOPKINS, H. K., and GRIFFIN, R. (1973), Tobacco and evoked potential, *Science*, 180: 212.

HEATH, C. W. (1958), Differences between smokers and non-smokers, *Arch. intern. Med.*, 101: 377.

JOHNS, M. W., EGAN, P., GAY, T. J. A., and MASTERTON, J. P. (1970), Sleep habits and symptoms in male medical and surgical patients, *Brit. med. J.*, 2: 509.

JOHNS, M. W., GAY, T. J. A., GOODYEAR, M. D. E., and MASTERTON, J. P. (1971*a*), Sleep habits of healthy young adults: Use of a sleep questionnaire, *Brit. J. prev. Soc. Med.*, 25: 236.

JOHNS, M. W., GAY, T. J. A., MASTERTON, J. P., and BRUCE, D. W. (1971*b*), Relationship between sleep habits, adrenocortical activity and personality, *Psychosom. Med.*, 33: 499.

JOHNS, M. W. (1972), Symptoms of neurotic illness in general hospital patients: Use of the Cornell Medical Index, MED. J. AUST., 2: 41.

JOHNS, M. W., BRUCE, D. W., and MASTERTON, J. P. (1974), Psychological correlates of sleep habits reported by healthy young adults, *Brit. J. med. Psychol.*, 47: 181.

KEYS, A. (editor) (1970), Coronary heart disease in seven countries, *Circulation*, 41: Suppl. 1.

MATARAZZO, J. D., and SASLOW, G. (1960), Psychological and related characteristics of smokers and non-smokers, *Psychol. Bull.*, 57: 493.

PELLETIER, O. (1968), Smoking and vitamin C levels in humans, *Amer. J. clin. Nutr.*, 21: 1259.

RANKIN, J. G., and WILKINSON, P. (1971), Alcohol and tobacco consumption, in *The Health of a Metropolis*, edited by J. Krupinski and A. Stoller, Heinemann Educational, Australia.

ROYAL COLLEGE OF PHYSICIANS (1971), *Smoking and Health Now*, Pitman Medical, London.

SCHUBERT, D. S. (1965), Arousal seeking as a central factor in tobacco smoking among college students, *Int. J. soc. Psychiat.*, 11: 221.

SELTZER, C. C. (1959), Masculinity and smoking, *Science*, 130: 1706.

SROLE, L. (1968), Social and psychological factors in smoking behaviour: The Midtown Manhattan study, *Bull. N.Y. Acad. Med.*, 44: 1502.

STEWART, L., and LAVSON, N. (1966), Smoking and rebelliousness, *J. Consult. Psychol.*, 30: 225.

THOMAS, C. B. (1960), Characteristics of smokers compared with non-smokers in a population of healthy young adults including observations on family history, blood pressure, heart rate, body weight, cholesterol, and certain psychological traits, *Ann. intern. Med.*, 53: 697.

THOMAS, C. B., FARGO, R., and ENSLEIN, K. (1970), Personality characteristics of medical students as reflected by the strong vocational interest test with special reference to smoking habits, *Johns Hopk. med. J.*, 127: 323.

U.S. PUBLIC HEALTH SERVICE (1964), *Smoking and Health: Report of the Advisory Committee to the Surgeon General of the Public Health Service*, Public Health Service Publ. No. 1103, Washington, D.C.

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