

## The sleep habits, personality and academic performance of medical students

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### Summary

The academic performance of 104 fourth-year medical students was assessed in relation to their sleep habits reported in a questionnaire and their scores on the Minnesota Multiphasic Personality Inventory. Poorer academic performance was related significantly to later times of waking up in the morning, particularly at weekends, and to subjectively poorer quality sleep, but not to the amount of sleep usually obtained. Poor academic performance was related also to scores on scales 3 (hysteria), 4 (psychopathic deviate) and 8 (schizophrenia) of the MMPI. Simple enquiries about sleep habits may make it easier for students who are at greatest risk of academic failure to be identified and helped.

**Key words:** \*SLEEP; \*PERSONALITY; \*EDUCATIONAL MEASUREMENT; \*STUDENTS, MEDICAL; MMPI; REGRESSION ANALYSIS; AUSTRALIA

### Introduction

The pattern of sleep and wakefulness in different subjects is known to vary with their age, the demands of their occupation, their physiological and psychosocial characteristics, psychiatric illness and some types of physical illness (Masterton, 1965; Monroe, 1967; Tune, 1969; Johns *et al.*, 1970, 1971a; Hartmann, 1973; Johns, 1974). Persistent insomnia, even of minor degree, may indicate a student's inability to cope with the various problems and demands of his daily life (Johns *et al.*, 1974). It has been suggested also that some students, for various reasons, may

often stay up so late at night that they obtain insufficient sleep to perform at their best next day (Thomas & Pederson, 1963).

In 1971 Webb & Friel compared two groups of American college students who differed in the amounts of sleep they usually obtained at night but did not find any difference in a wide variety of personality characteristics or in records of academic performance. However, factor analysis of sleep habits in several groups of subjects has shown that sleep may vary in its characteristics along several independent dimensions simultaneously, in addition to its quantity (Johns, 1975). Thus, failure to demonstrate a relationship between academic performance and the amount of sleep usually obtained is not surprising.

We have accumulated information on many different aspects of the sleep habits of medical students as assessed by questionnaire (Johns *et al.*, 1971b). Psychological correlates of their sleep habits have also been reported in terms of scores on the Minnesota Multiphasic Personality Inventory or MMPI (Johns *et al.*, 1974). In other experiments in the U.S.A., the academic performance of medical students has been related to their MMPI scores (Schofield, 1953).

The present report concerns the relationships between sleep habits, personality and academic performance in a group of fourth-year medical students.

### Methods

The experimental subjects were 104 students in the fourth year of their undergraduate medical training at Monash University; 89% of the total enrolment

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for that year. There were ninety-two male and twelve female students. The sleep questionnaire asked a series of twenty questions such as 'At what time do you usually go to bed at night on weekdays?', and 'How would you describe the usual quality of your sleep?' (Johns *et al.*, 1971b; Johns, 1975). Each subject selected the most appropriate answers from a range of alternatives tested. The overall quality of sleep was rated from 1 (very good) to 4 (very poor).

Each student's academic performance was assessed by a mean percentage score from seven examinations in four subjects, held at the end of the third year of the course (in November). Five of the examinations were held in the morning, two in the afternoon. A few students had failed these examinations but, after passing supplementary examinations in January, had proceeded to the fourth year. The sleep questionnaires were all answered on the same day in the following March and referred to sleep habits in the preceding few weeks. All subjects filled out the MMPI at a supervised session in June, 3 months after answering the sleep questionnaires but still several months before the next examinations were to be held.

Intercorrelations between eleven variables describing these students' sleep habits have been reported previously (Johns *et al.*, 1967b). In the present investigation these eleven variables were used in multiple regression analysis as predictors of the students' academic performance. Raw scores on thirteen basic scales of the MMPI (Dahlstrom *et al.*, 1972) were also used as predictors of academic performance in another multiple regression analysis.

Computer programs for these computations were derived from those of Cooley & Lohnes (1962), with modifications by one of the present authors (M.W.J.).

## Results

Three of the correlation coefficients between

TABLE 1. Correlations between academic performance and various aspects of sleep habits in medical students

	Correlation coefficient
Delay before falling asleep	0.055
Total time awake during the night	-0.089
Delay before arising in the morning	-0.102
Total duration of sleep at night	0.037
Time of going to bed on weeknights	-0.163
Time of going to bed at weekends	-0.085
Time of morning awakening on weekdays	-0.209*
Time of morning awakening at weekends	-0.295**
Total duration of sleep during the day	-0.060
Subjective quality of sleep at night	0.234*
Frequency of disturbing dreams and nightmares	-0.166

\*  $P < 0.05$ ; \*\*  $P < 0.01$ .

academic performance and sleep habits were statistically significant (Table 1). Students who performed best at their examinations usually woke up earlier in the morning, both on weekdays and weekends (Saturday and Sunday mornings), and had better quality sleep than students whose academic performance was poorer. The actual times of waking up in the morning on weekdays and at weekends and the subjectively rated quality of sleep are shown in Table 2 for students whose overall exam results were at the level of a borderline pass or fail, a clear pass, or honours. For each group the mean time of waking was considerably later at weekends than on weekdays. However, at weekends, the group with the highest exam marks woke up, on the average, 42 minutes earlier than the group with the lowest marks. This difference between groups was statistically significant (by analysis of variance) despite the relatively large standard deviation within each group. The corresponding difference on weekdays was only 15 minutes and did not quite reach statistical significance. The quality of sleep was reported as 'very good' by 73% of students whose

TABLE 2. Mean times of waking up in the morning at weekends and on weekdays and the subjective quality of sleep reported by students whose exam results were in the lower, middle and upper parts of the range. The standard deviations are shown in parentheses, those for times being expressed in minutes.

	Mean exam result in the range:			F-value and probability level*
	43.0-54.9	55.0-64.9	65.0-84.0	
Time of waking at weekends	0856 (55)	0852 (65)	0814 (69)	3.94; $P < 0.02$
Time of waking on weekdays	0707 (27)	0656 (32)	0652 (25)	2.49; $P > 0.05$
Quality of sleep (rated 1-4)	1.69 (0.63)	1.35 (0.57)	1.27 (0.45)	5.03; $P < 0.01$
No. of students	35	43	26	

\* No. of degrees of freedom = 2 and 101.

exam marks were highest, by 70% of those with a clear pass, and by only 40% of those with borderline results. The others described their sleep either as 'moderately good' or 'moderately bad'. Difficulty in falling asleep, awakening during the night, the usual duration of sleep at night or during the day, and the delay before arising from bed in the morning were all unrelated to academic performance (Table 1).

In the multiple regression analysis, academic performance was predicted significantly from all eleven aspects of sleep habits considered together (multiple  $R = 0.48$ ,  $P < 0.01$ ). The best predictor variable (having the highest standard partial regression coefficient) was the usual time of waking up in the morning at weekends. This accounted for 10.6% of the variance in academic performance whereas all eleven predictor variables accounted for 22.7% of that variance.

Academic performance was inversely related to scores on scales 3, 4 and 8 of the MMPI (Table 3). That is, the worst performance was by students who tended to be neurotic and extroverted, prone to unhappy social relationships, and having an unrealistic self-awareness of their capabilities and limitations. The multiple correlation coefficient between academic performance and all the MMPI scores considered together did not reach statistical significance (multiple  $R = 0.40$ ,  $P > 0.05$ ).

TABLE 3. Correlations between academic performance and scores on various scales of the MMPI

MMPI	Correlation with academic performance
L (lie)	-0.038
F	-0.174
K (defensiveness)	-0.038
1 (hypochondriasis)	-0.134
2 (depression)	-0.086
3 (hysteria)	-0.197*
4 (psychopathic deviation)	-0.216*
5 (masculinity-femininity)	0.059
6 (paranoia)	-0.118
7 (psychesthesia)	-0.039
8 (schizophrenia)	-0.194*
9 (hypomania)	-0.146
0 (social introversion)	-0.070

\*  $P < 0.05$ .

Previous analysis of the relationships between sleep habits and MMPI scores for the same group of students has shown that the times of going to bed at night and of waking in the morning were related

directly to scores on scales 3 and 4 as well as scales F, 6 and 9. These findings were interpreted to mean that 'late' sleepers were more extroverted or aggressively outgoing in their daily lives, but had less concern for the consequences of their behaviour than 'early' sleepers did (Johns *et al.*, 1974). In the present context, 'early' sleepers, who were more realistic in their self-appraisal, more sensitive to the consequences of the actions, and who were presumably therefore more conscientious, also performed better academically than 'late' sleepers.

## Discussion

There is an adage which advises us that 'early to bed and early to rise, makes men healthy, wealthy and wise'. To the extent that better academic performance as a medical student has been shown to be related both to early morning awakening and to better mental health, and that academic performance may be presumed to have more than adequate intelligence. Within such a group, the relative levels of adage may have been vindicated.

Medical students who have already successfully completed 3 years of their undergraduate education may be presumed to have more than adequate intelligence. Within such a group, the relative levels of academic performance must depend to a large extent on the motivation, application to the task, and emotional stability of each student. The interrelations between sleep habits, personality and academic performance which we have described are consistent with these tenets.

It should be emphasized that the measures of academic performance, personality and sleep habits were taken several months apart. Thus, the relationships between them presumably reflect long-term characteristics of the subjects rather than the acute effects of 'cramming' just before the examinations, which might involve temporary changes from the usual pattern of sleep and wakefulness. Students with the best academic performance tended to wake and rise early in the morning, even when there may not be a special requirement to do so, as at weekends. Young adults usually go to bed later at night and sleep until later next morning at weekends than they do on weekdays. However, each subject tends to retain his position in relation to his peers as an 'early' or 'late' sleeper (Johns *et al.*, 1971b; Johns, 1975).

Compared with 'early' sleepers, 'late' sleepers have

been found in the past not only to be more extroverted but also to attain their maximum body temperature later in the day and to perform less well at various laboratory tasks in the morning than in the afternoon (Kleitman, 1963; Blake & Corcoran, 1972). The preponderance of morning examinations in our study may have disadvantaged the 'late' sleepers. However, Holloway (1967) did not find any difference in the examination results of dental students who attended lectures in the late afternoon rather than in the morning.

In keeping with the earlier findings of Webb & Friel (1971), academic performance was not related to long-term differences in the amount of sleep which students usually obtained at night. However, a sudden change from a subject's usual pattern of sleep and wakefulness may produce behavioural effects next day which are similar if the change involves either a moderate decrease or an increase in the amount of sleep (Taub & Berger, 1973). In the present investigation, difficulty in getting off to sleep at night and awakenings during the night, which indicated minor degrees of insomnia in about 10% of all the students, were not related to their academic performance. Nevertheless, a relationship of this type may become important with more severe insomnia. A more subtle characteristic of sleep, its subjective quality, was related to academic performance.

The present results are strikingly similar to those relating MMPI scores and academic performance in first-year medical students at the University of Minnesota (Schofield, 1953). Students there who were 'underachievers' had significantly higher scores than 'achievers' did on MMPI scales L, 3, 4 and 8 (cf. scales 3, 4 and 8 in the present investigation).

In a recent survey of a large cohort of students entering all faculties in Monash University, later academic failure and withdrawal from university were related not only to poorer academic performance in the past but also to recent mental illness, life stresses, poor family and social conditions, and an 'extroverted' and 'neurotic' personality (McMichael & Hetzel, 1975). These findings are consistent with the present results although the latter were derived only from medical students who were continuing their university course. By contrast, some other attempts to relate academic performance to measures of neuroticism and of introversion-extroversion (derived, for example, from Eysenck's Personality Inventory) have yielded conflicting

results in different groups of subjects and in each sex (Entwhistle & Cunningham, 1968; Welford, 1973; Dubble, unpublished).

None of the statistical relationships which we have described was very strong and this is understandable in view of the many other factors which influence the variables concerned. In addition, the results do not enable us to predict with confidence that a student's academic performance would be improved by his going to bed earlier at night and arising earlier in the morning, although that possibility is not excluded. Responses to a few questions about the usual quality of sleep and the time of waking in the morning, particularly at weekends, may make it easier for those students who are at greatest risk of academic failure to be identified and helped. However, our results suggest that neither an extensive personality inventory such as the MMPI nor our sleep questionnaire, by itself, would enable accurate predictions to be made of academic performance within the range we have considered.

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