Career preference and personality differences in medical school applicants

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Abstract *Doctors in different specialities differ in personality, attitudinal and other measures. These differences might be the result of self-selection, or an effect of socialization in undergraduate and postgraduate training or of specialist selection. In two studies we assessed the association between personality and other measures in* applicants *to medical school, since associations at that stage must reflect self-selection, rather than the effects of training.*

In study 1, preferences for 11 medical specialities were assessed in 509 medical school applicants being interviewed at University College London Medical School in 1989–1990. A large range of demographic, biographical and personality measures was also obtained in these individuals. Canonical correlation suggested five independent dimensions that linked career preferences with background measures. An exploratory stepwise multiple regression was used to find the most significant predictors for each career speciality and a number of strong patterns emerged, many of which made intuitive sense in terms of conventional stereotypes of doctors in those specialities. Study 2 was a direct a priori *test of the significance of the important variables identified in study 1. Five hundred and sixty-three interviewees at UCLSM during 1991–1992 completed identical questionnaires to those used in Study 1 and the validity of the predictors found in Study 1 was assessed by fitting the same regression equations as had previously been identified. For 10 of the 11 careers the variables produced a highly significant prediction of preference. It is concluded that personality differences between doctors in different specialities are in part the result of self-selection, and not just the result of training or selection.*

Introduction

Doctors in different medical specialities are often claimed to differ in their personality and attitudes (Fishman *et al.*, 1972; Nielsen, 1981; Wakeford *et al.*, 1986), and stereotypes of the specialities typically reflect such differences (Wolf *et al.*, 1987), although not all studies report differences in actual personality (Coombs *et al.*, 1993). Pre-clinical medical students have different beliefs about various medical specialties (Furnham, 1986a, 1986b), and personality and attitude measures are predictive of the career *preferences* (if not actual choices) of medical students (Davies *et al.*, 1968; Gough, 1975; Juan *et al.*, 1970; Lewett *et al.*, 1987;

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Mowbray *et al.*, 1971; Powell *et al.*, 1988; Schumacher, 1964; Walton, 1969; Yufit *et al.*, 1969). Additionally demographic and other background factors are predictive of career preference (Davis *et al.*, 1990; Kosa, 1969; Matteson *et al.*, 1977; McGrath *et al.*, 1977; Paiva *et al.*, 1971), as also are individual experiences of personal illness (Crimlisk *et al.*, 1987).

The origin of career preference decisions is important, both theoretically and for staffing predictions and manpower planning: do they result from socialization, self-selection or institutional selection? That is, are speciality choices a result of inculcation by undergraduate and postgraduate training of particular attitudes, or are they the result of self-selection, individuals with personality and attitudes 'typical' of particular specialities preferring to go into them, or an interaction of the two? In this paper, and in distinction to other studies, we assess the possibility of self-selection by measuring career preferences and personality and demographic factors in medical school *applicants*. Differences in personality related to career preference at this stage cannot be the result of medical school training, since the subjects have not yet entered medical school, and hence must reflect self-selection for particular specialities. It does not of course mean that these students will eventually end up in those specialities, although career preference is relatively stable in medical students and young doctors (Egerton, 1983; Parkhouse, 1976; Parkhouse *et al.*, 1978; Rothman, 1985; Shapiro *et al.*, 1988; Shuval, 1980; Zimny, 1980), and many final career decisions are made very early in careers (Hutt *et al.*, 1981; Zeldow *et al.*, 1992).

In this paper we report two similar studies, the first of which was exploratory, and the second of which was confirmatory.

Study 1

Method

Applicants who had applied to University College London School of Medicine (UCLSM) for admission in October 1990, and who had attended for interview during the autumn and winter of 1989–90, were asked to complete a 15-page questionnaire while waiting for their interview. It was made clear to all applicants that completion was voluntary, that the results were entirely confidential and that they would not be used for selection.

The questionnaire asked about preferences for 11 particular careers in medicine, each of which was rated on a four-point scale from 'Definite intention to go into this', through 'Very attractive' and 'Not very attractive' to 'Definite intention not to go into this'. The questionnaire contained a range of personality measures: a shortened version of the Sensation Seeking scale (10 items; one scale) (Rubin *et al.*, 1975); the Study Process Questionnaire of approaches to learning (18 items; 9 sub-scales) (Biggs, 1978, 1979); estimates of time spent on hobbies and recreational activities (15 separate items); preference for different activities (9 separate items); empathy (28 items; four sub-scales) (Davis, 1980, 1983); the Decision Making Questionnaire (21 items; 7 sub-scales) (French *et al.*, in press; West, 1988); a shortened version of the Eysenck Personality Inventory (29 items; three sub-scales) (Eysenck *et al.*, 1964); tolerance of ambiguity (16 items; one scale) (Budner, 1962); stress coping scale (29 items; 11 sub-scales) (Parker *et al.*, 1982); Belief in a Just World scale (16 items; 2 sub-scales) (Zuckerman *et al.*, 1964); and a self-typing scale (6 items). The choice of these measures was based on a review of the applied psychology and medical education literature. Additionally the questionnaire contained a range of questions concerning demographic, social and educational factors which allowed measures of: nationality, sex, social class, age, type of schooling, previous UCCA applications, for medicine or other subjects, university education of mother and father, medical qualifications of mother and father, age at which

first considered and age at which definitely decided to become a doctor, eight separate influences on applying to study medicine, ethnic origin, religious belief, saying of prayers, reading of holy books and attendance at a place of worship, and the importance of religion in everyday life and in upbringing. Many of these measures had proven useful in a previous study (McManus, 1985).

The final destination of all interviewees in October 1990 was ascertained from UCCA (Universities' Central Council on Admissions), and candidates divided into four groups: accepted for medicine at UCLSM; accepted for medicine elsewhere; accepted for non-medical course; and not accepted for any course.

Data were analysed using SPSS-X (Anonymous, 1988). Multivariate statistical analysis was by means of the REGRESSION and DISCRIMINANT programs. Missing values were replaced with means where necessary (Cohen *et al.*, 1975).

Results

Of 644 interviewees, 509 completed the questionnaire and 507 (78.7%) provided usable data. Of those completing the questionnaire, 127 (25.0%) eventually arrived at UCLSM, 205 (40.4%) studied medicine elsewhere, 50 (9.9%) studied subjects other than medicine and 125 (24.7%) did not go to university in October 1990.

Career preferences were assessed on a four-point, forced-choice scale (Table 1). Careers showed large differences in popularity, and within careers there was substantial variability in their popularity. Hospital medicine, paediatrics and surgery were perceived to be the most popular, and community medicine, pathology and anaesthetics the least popular.

The relationship of career preference to personality and other background measures was assessed by means of multiple regression. Each of the 11 specialties was considered separately, and the four choices of response for career intention were scored from 4 for 'Definite intention to go into this', through 3 and 2 to a score of 1 for 'Definite intention not to go into this'.

Because of the large number of predictor variables (97), and because of the risk of type I errors with stepwise regression methods, a portmanteau test for overall significance was carried out in two ways. Firstly a canonical correlation was used to relate the 11 career measures to the 97 predictors: the first five canonical variates were significant (Wilk's Lambda = 0.0373 (1089, 4382 df, $p < 0.001$); 0.0610 (980, 3993 df, $p < 0.001$); 0.0939 (873, 3602 df, $p < 0.001$); 0.1349 (768, 3209 df, $p = 0.001$); 0.1722 (665, 2814 df, $p = 0.023$)), confirming that significant relationships were present and that the inter-relations between measures and predictors were multi-dimensional. Secondly, for each of the career preferences taken separately, a multiple regression was carried out in which *all* of the 97 predictors were entered at the first step; this showed a significant prediction for five of the 11 career measures (Surgery, $p < 0.001$; Psychiatry, $p = 0.004$; General Practice, $p < 0.001$; Medical Research, $p < 0.001$; and Public Health, $p < 0.001$), resulting in multiple R values of 0.55, 0.48, 0.51, 0.53 and 0.60 respectively.

Forward entry stepwise multiple regression was used to identify the personality and other measures which best predicted interest in each of the particular careers, successive items being entered until none remaining was significant at the 5% level, and all of those in the analysis were significant at the 5% level. Table 2 summarizes the significant predictors for each of the 11 careers.

A total of 332 (65.5%) of the interviewees were known to have eventually been accepted to study medicine, either at UCLSM or elsewhere. A discriminant analysis comparing those accepted with those rejected, using all 97 personality and biographical variables along with

Table 1. *Percentages of interviewees who indicated particular degrees of interest in different medical school specialities in Study 1 (first percentage) and Study 2 (second percentage in italics). Sample sizes range from 419 to 485 for Study 1 and 489 to 540 for Study 2*

Career 1989–90 *1991–92*	Definite intention *not* to go into this (%)	Not very attractive (%)	Very attractive (%)	Definite intention to go into this (%)
Anaesthetics	16.0	67.0	16.9	0.0
	12.9	*68.2*	*18.1*	*0.8*
Pathology	11.0	58.9	29.1	1.0
	11.0	*54.0*	*33.1*	*1.8*
Surgery	4.1	20.2	64.5	11.1
	4.8	*16.0*	*64.0*	*15.2*
Medicine in Hospital (including Cardiology, neurology, etc)	1.3	13.0	76.3	9.4
	0.4	*11.3*	*78.5*	*9.8*
Geriatric Medicine	18.3	63.0	17.8	0.9
	18.5	*61.7*	*19.1*	*0.8*
Obstetrics and Gynaecology	3.8	34.1	58.5	3.6
	5.5	*39.6*	*51.6*	*3.3*
Paediatrics	2.9	20.1	68.4	8.6
	3.6	*21.9*	*65.2*	*9.3*
Psychiatry	12.1	40.0	44.6	3.3
	13.8	*35.8*	*47.4*	*3.1*
General Practice	9.2	29.0	52.5	9.4
	12.8	*28.4*	*50.2*	*8.6*
Medical Research	20.5	43.3	31.3	4.9
	19.1	*43.9*	*33.3*	*3.8*
Public health community medicine	24.7	50.3	23.2	1.7
	29.4	*53.0*	*16.7*	*1.0*

the 11 career preference measures, found no significant overall prediction (Wilk's lambda = 0.767, Chi-squared = 119.13, 108 df, NS).

Of the 332 interviewees offered a medical school place, 127 (38.3%) were accepted at UCLSM. Discriminant analysis comparing those accepted at UCLSM with those accepted elsewhere showed no significant overall prediction (Wilk's lambda = 6.538, Chi-squared = 123.75, 108 df, NS).

Discussion study 1

Study 1 provides *prima facie* evidence, even at the time of medical student selection, that individuals considering a career in particular specialities show different personality profiles from those considering other specialities. Without wishing to discuss the results of Table 2 in great detail, it is worth considering two groups who are often highly contrasted—potential surgeons and potential psychiatrists. In general the variables which predict a higher interest in psychiatry are not those that predict a lower interest in surgery, or vice versa; indeed, the only two variables which are shared, father having a university degree and mother not being medically qualified have the same effect in both groups. Nevertheless the variables show large differences between the specialities; thus although an interest in surgery shows no association with measures of empathy, an interest in psychiatry correlates with Fantasy (imaginative transposition into the feelings of fictional characters), Perspective-taking (spontaneous adoption of others' viewpoints), and Personal Distress (personal unease in tense interpersonal

Table 2. *Predictors for the various medical careers. In Study 1 variables were selected by stepwise forward selection, and the order of entry and the significance of entry, as well as the nature of the effect, are shown for each variable. In Study 2 variables were entered in the same order as that selected in Study 1. The significance at entry is shown, along with an indicator as to whether the effect is in the same or the opposite direction to that of Study 1. Variables which are significant in both Study 1 and Study 2 are shown in italics*

Study 1			Study 2	
Order of entry	Significance at entry	Variable	Significance at entry	Direction of effect
Anaesthetics				
1	0.004	Locus of control: greater belief in Fate	0.653	Same
2	0.014	Time allocation: more time spent reading books	0.853	Opposite
3	0.025	Empathy: lower score on scale of empathic concern	0.511	Opposite
4	0.040	Father less likely to be medically qualified	0.381	Same
Pathology				
1	0.001	Self-typing: higher rating for 'Studious'	0.990	Same
2	0.013	Preferred activities: talking to friends rated lower	0.808	Opposite
3	0.032	Coping with stress: more likely to drink alcohol, consume drugs or engage in sexual behaviour	0.162	Same
4	0.021	*Time allocation: more time spent on hobbies*	0.047	Opposite
5	0.037	*Time allocation: less time spent talking to friends*	0.044	Same
6	0.046	Coping with stress: more likely to use stimulants such as cigarettes or coffee	0.055	Opposite
7	0.042	Locus of control: greater belief in Fate	0.411	Same
Surgery				
1	*0.001*	*Sex: more likely to be male*	0.003	Same
2	0.001	Father less likely to be medically qualified	0.411	Same
3	0.001	*Age when definitely decided to study medicine: earlier*	0.001	Same
4	0.002	Preferred activities: talking to friends rated lower	0.446	Opposite
5	0.012	Encouragement to study medicine: greater effect of watching television, films or listening to the radio	0.283	Same
6	0.030	*Decision Making Questionnaire: More likely to be have a highly controlled decision making style*	0.001	Same
7	0.030	Tolerance of ambiguity: less tolerant	0.672	Opposite
8	0.019	Father more likely to have a university degree	0.729	Opposite
9	0.036	Self-typing: higher rating for 'Sporty'	0.054	Same
10	0.046	Eysenck Personality Inventory: higher score on neuroticism scale	0.396	Same
11	0.043	Preferred activities: higher rating for making things	0.170	Same
12	0.049	Mother less likely to be medically qualified	0.522	Same
Medicine in hospital				
1	0.004	Social class: lower social class	0.240	Same
2	0.007	Study Process Questionnaire: higher Deep strategies for study	0.096	Same
3	0.007	Encouragement to study medicine: higher from parents	0.776	Same
4	0.017	Encouragement to study medicine: lower from students already studying at medical school	0.181	Opposite
5	0.029	Decision making questionnaire: more resistant to social pressure in decision making	0.887	Opposite
6	0.035	Coping with stress: more likely to drink alcohol, consume drugs or engage in sexual behaviour	0.258	Opposite
7	0.047	*Age of definitely deciding to study medicine earlier*	0.001	Same
8	0.039	Father less likely to be medically qualified	0.531	Same

Table 2. *Continued*

Study 1 Order of entry	Study 1 Significance at entry	Variable	Study 2 Significance at entry	Study 2 Direction of effect
Geriatric medicine				
1	0.001	Coping with stress: less likely to drink alcohol, consume drugs or engage in sexual behaviour	0.018	Same
2	0.004	Encouragement to study medicine: less influence of parents	0.253	Same
3	0.005	Encouragement to study medicine: more influence of books	0.147	Same
4	0.015	Coping with stress: less use of self-blame	0.385	Same
5	0.014	*Empathy: higher score on empathic concern*	0.001	Same
6	0.018	Locus of control: greater belief in Fate	0.459	Same
7	0.033	Religion more important in everyday life	0.539	Same
8	0.046	Preferred activities: making things rated lower	0.582	Same
Obstetrics and gynaecology				
1	0.002	Sex more likely to be female	0.001	Same
2	0.002	Father less likely to have a university degree	0.409	Same
3	0.008	Coping with stress: more likely to watch television	0.109	Same
4	0.016	*Study Process Questionnaire:* higher score on strategies for Deep learning	0.022	Same
5	0.031	Self-typing: higher rating for 'Party goer'	0.971	Same
6	0.025	Study Process Questionnaire: higher score on strategies for Strategic learning	0.230	Opposite
Paediatrics				
1	0.001	*Sex: more likely to be female*	0.001	Same
2	0.028	Coping with stress: less likely to drink alcohol, consume drugs or engage in sexual behaviour	0.272	Same
3	0.015	*Self-typing: lower rating for 'studious'*	0.016	Opposite
4	0.028	Mother less likely to have a university degree	0.256	Same
5	0.036	Coping with stress: more likely to watch television	0.583	Opposite
6	0.034	Study Process Questionnaire: higher score on strategies for Strategic learning	0.430	Opposite
Psychiatry				
1	0.001	*Empathy: higher score on Fantasy scale*	0.001	Same
2	0.005	Time allocation: less time spent watching television	0.409	Same
3	0.011	Time allocation: more time spent watching theatre/drama/etc	0.236	Same
4	0.020	Father more likely to have a university degree	0.381	Opposite
5	0.008	Mother less likely to be medically qualified	0.186	Same
6	025	Empathy: higher score on personal distress	0.163	Same
7	0.019	Study Process Questionnaire: higher score on motives for Deep learning	0.977	Opposite
8	0.023	*Sensation Seeking Scale: higher score*	0.001	Same
9	0.024	Encouragement to study medicine: more encouragement from parents	0.814	Same
10	0.040	*Empathy: higher score on perspective taking*	0.001	Same
General practice				
1	0.001	*Age when definitely decided to study medicine: later*	0.001	Same
2	0.001	Empathy: higher score on empathic concern	0.116	Same
3	0.001	*Tolerance of ambiguity: less tolerant of ambiguity*	0.037	Same
4	0.001	Belief in a Just World: less belief in a just world	0.324	Opposite
5	0.011	*Locus of control more belief in Fate*	0.039	Opposite
6	0.014	*Encouragement to study medicine: more encouragement from own general practitioner*	0.001	Same

7	0.027	Preferred activities: lower rating for going to cinema	0.632	Opposite
8	0.036	Study Process Questionnaire: lower score on motives for strategic learning	0.102	Same
9	0.035	Decision Making Questionnaire: more resistant to social pressure in decision making	0.567	Opposite
10	0.046	Encouragement to study medicine: less encouragement from newspapers	0.577	Same
Medical research				
1	0.001	*Self-typing: rated higher as 'Scientific'*	0.001	Same
2	0.001	*Study Process Questionnaire: higher score on motives for Deep learning*	0.001	Same
3	0.001	*Ethnic origin: more likely to be from an ethnic minority*	0.001	Same
4	0.001	Preferred activities: lower rating for talking to friends	0.329	Same
5	0.001	Time allocation: more time spent reading books	0.129	Same
6	0.001	Schooling: more likely to have been educated in the public sector rather than private education	0.265	Same
7	0.006	Study Process Questionnaire: lower score on strategies for Surface learning	0.088	Same
8	0.017	Coping with stress: more likely to ignore	0.882	Opposite
9	0.022	Preferred activities: more likely to prefer playing with computers	0.615	Same
10	0.022	*Time allocation: less time spent playing sport*	0.035	Opposite
Public health, Community medicine				
1	0.001	Mother less likely to be medically qualified	0.481	Same
2	0.001	*Religion more important in everyday life*	0.001	Same
3	0.001	Empathy: higher score on Perspective-taking	0.137	Same
4	0.003	Time allocation: less time spent watching television	0.834	Same
5	0.003	Study Process Questionnaire: lower score on motives for strategic learning	0.077	Same
6	0.009	Study Process Questionnaire: lower score on strategies for Deep Learning	0.383	Same
7	0.036	Eysenck Personality Inventory: lower scores on Lie scale	0.123	Opposite
8	0.040	*Ethnic origin more likely to be from an ethnic minority*	0.014	Same
9	0.046	Time allocation: more time spent working for exams and on school work	0.792	Same
10	0.043	Age when definitely decided to be a doctor: later	0.070	Same
11	0.046	*Coping with stress: more likely to watch television*	032	Opposite

settings), of which only Personal Distress shows any association with other speciality interests. Intriguingly the fourth dimension of empathy, Empathic Concern (sympathy and concern for unfortunate others), despite showing no association with psychiatry, shows positive associations with Geriatric Medicine, General Practice and lower with Anaesthetics. Factors associated with an interest in Surgery, such as encouragement from watching television, a more controlled decision-making style, being self-rated as sporty, being more neurotic and preferring making things are *only* correlated with an interest in surgery, and no other speciality, whereas an earlier age at wanting to study medicine, less interest in talking to friends and being less tolerant of ambiguity are not associated with psychiatry, but are associated with other medical specialities. The conclusion is that the effects we have found are very specific to particular specialities, and are not usually general effects correlated across many specialities.

Despite the potential interests of the results presented so far, they must nevertheless be treated with some care since the statistical analysis has principally been exploratory, with a serious risk of type I statistical errors resulting from multiple significance testing, and from

the nature of stepwise regression itself. We have attempted to minimize that risk by our strategy of using a portmanteau test in the form of a single canonical correlation to control the experiment-wise error rate (Hand *et al.*, 1987). Nevertheless it is clear from many analyses of the effectiveness of forward stepwise regression that it is extremely vulnerable to type I errors and that it is almost impossible to limit them effectively by any currently-available statistical method (Miller, 1990). the only solution to the problem is an old one: to replicate the findings on an independent sample. It perhaps should never cease to be emphasized that, ultimately, a statistically significant result does not mean that an effect is proven but instead only means that if the study is repeated then there is a higher than chance likelihood of again finding a similar effect. We therefore carried out a second study which was formally identical to that of Study 1, using an independent sample of similar size to the first, and looking to see which of the predictors we had identified as significant on the first occasion were also significant on the second occasion.

The principal analyses of Study 2 were a set of multiple regressions intended to be identical to those carried out in Study 1 with the exception that these would be *a priori* rather than *a posteriori* as was the case in Study 1. The logic is as follows: in Study 1 there is a serious danger that some, most, or potentially even all, of the results found are principally the result of chance factors, the nature of stepwise procedures being that they inevitably capitalize on chance associations. In Study 2 we therefore ran *exactly* the same set of regression equations on an entirely independent set of data. If it were indeed the case that the findings of Study 1 were merely the result of chance associations and type I errors then the regression equations should show no significant predictive power in Study 2. Furthermore, in the absence of truly significant effects, only 5% of the individual variables identified in Study 1 should show significant results at the 0.05 level of significance in Study 2; and when the directions of effect are looked at in Study 2 then 50% of the variables should show effects in the *opposite* direction to that previously found in Study 1. Study 2 therefore provides a strict test of the associations identified in Study 1.

Study 2

Method

Applicants who had applied to the medical school of University College London (UCLSM) for admission in October 1992, and who were selected for interview during the autumn and winter of 1991–92, were asked to complete a similar questionnaire to that used in Study 1. The only substantial difference from Study 1 was that the questionnaire was sent to applicants by post along with a stamped and addressed return envelope. As before it was made clear that completion was voluntary, that the results were entirely confidential and that they would not be used for selection itself.

The final destination of all interviewees in October 1992 was ascertained from UCCA (Universities' Central Council on Admissions), and candidates divided into four groups: accepted for medicine at UCLSM; accepted for medicine elsewhere; accepted for a non-medical course; and not accepted for any course. Statistical methods were similar to those of Study 1.

Results

Of 732 interviewees, 563 (76.9%) provided usable data. Of those completing the questionnaire, 124 (22.0%) eventually arrived at UCLSM, 214 (38.0%) studied medicine elsewhere,

82 (14.6%) studied subjects other than medicine and 143 (25.4%) did not go to university in October 1992. These proportions were not significantly different from those in study 1 (Chi-square = 6.28, 3 df, NS).

Table 1 shows the career preferences of the 1992 cohort of applicants. They are broadly very similar to those of the 1990 cohort, except that statistical analysis using t-tests, and after correction of significance levels for multiple testing by a Bonferroni procedure, suggested only that public health medicine was somewhat less popular in the 1992 cohort than in the earlier cohort ($p = 0.0264$ after Bonferroni correction).

Hierarchical multiple regressions were carried out for each of the 11 dependent variables using those variables which were found to be significant in Study 1, entering the variables in exactly the same order as that found in Study 1. The multiple regression models are therefore identical in the two cases. Of the 11 predictive equations based on the whole set of variables identified in study 1, all but one were significant, and most were highly significant (Anaesthetic: $F(4,559) = 0.359$, NS; Pathology: $F(7,556) = 2.076$, $p = 0.044$; Surgery: $F(12,551) = 3.856$, $p < 0.001$; Medicine in Hospital: $F(8,555) = 2.362$, $p = 0.017$; Geriatric Medicine: $F(8,555) = 4.564$, $p < 0.001$; Obstetrics and Gynaecology: $F(6,557) = 10.466$, $p < 0.001$; Paediatrics: $F(6,557) = 5.222$, $p < 0.001$); Psychiatry: $F(10,553) = 5.445$, $p < 0.001$; General Practice: $F(10,553) = 6.352$, $p < 0.001$; Medical Research: $F(10,553) = 9.451$, $p < 0.001$; and Public Health and Community Medicine: $F(11,552) = 3.699$, $p < 0.001$). Table 2 shows the significance of each of the individual variables in the regression equations. Of 92 variables found to be significant in Study 1, 24 (26.1%) were also significant in Study 2, a value significantly higher than the 5% expected by chance (Chi-square = 77.5,1 df, $p < 0.001$). Of the 92 effects found in study 1, 69 (75%) were in the same direction in Study 2, a value significantly different from a chance prediction of 50% (Chi-square = 23.0, 1 df, $p < 0.001$). The proportion was somewhat higher in those effects which were significant in Study 2 (19/24; 79.2%) than in those which were not significant (50/68; 73.5%), although the difference was not statistically significant (Chi-square = 0.301, 1 df, NS); however, in both cases the proportions were significantly different from 50% (Chi-square = 8.16 and 15.05, 1 df, $p < 0.005$ and $p < 0.001$ respectively). Taking the results overall it must therefore be concluded that many of the variables identified in Study 1 as significant predictors are indeed genuine replicable predictors of career preferences. Those variables which are significant in both Study 1 and Study 2 are italicized in Table 2 to make them easier to identify. In most cases they are probably genuine predictors, although the few in which the direction of the effect has reversed between the two studies should be treated with caution. It is also probable that a number of the variables which are non-significant in Study 2 are also genuine predictors, since the proportion of effects in the same direction as Study 1 amongst the variables which are non-significant in Study 2 is significantly higher than chance would predict; however there is at present no method by which the identity of those variables can be ascertained from the current data sets.

A concern with three of the career choices, Surgery, Obstetrics and Gynaecology, and Paediatrics, is that in Study 1 the most important predictor in each of them is the sex of the applicant. Although of interest in its own right it could be argued that there is a sense in which sex is not a personality measure *per se* (although because of its frequent correlation with a range of other measures it can act as a proxy for many components of personality). To assess in Study 2 the effect of sex upon the overall significance of the predictors derived from Study 1, we carried out hierarchical multiple regressions in which firstly sex was entered and then the significance of the remaining predictors was assessed *en bloc*. For surgery the effect of the remaining 11 predictors still remained highly significant ($F(11,551) = 3.3804$, $p < 0.001$), whereas for Obstetrics and Gynaecology and for Paediatrics the remaining effects

were not significant ($F(5,557) = 1.9953$, $p = 0.077$ and $F(5,557) = 1.8574$, $p = 0.100$ respectively).

As in Study 1 a comparison was also made of applicants accepted or not accepted for medical school using all of the variables which had been measured. In contrast to Study 1, a discriminant analysis found some evidence for differences between the 225 applicants accepted for any medical school and the 338 applicants who were rejected by all medical schools (Wilk's lambda = 0.758. Chi-squared = 140.32,108 df, $p = 0.0199$). In view of the absence of any such effect in Study 1, and the fact that a total of four discriminant analyses were carried out in the two studies, so that a Bonferroni correction would adjust the present significance level to 0.0796, this result was not treated as significant and was not explored any further. Comparison by discriminant analysis of those accepted at UCLSM with those accepted elsewhere found, as in Study 1, that there were no significant differences between the two groups (Wilk's lambda = 0.638, Chi-square = 126.65, 108 df, NS).

Discussion: general

The present data make it clear that applicants to medical school already have well-defined preferences for certain careers, with a highly reliable rank ordering of careers across candidates: Surgery, Medicine, Paediatrics and General Practice were the most popular and Geriatric Medicine, Anaesthetics, Medical Research and Public Health were the least popular in each cohort. A previous study has shown that career preferences do not differ in acceptances and rejects (McManus, 1985; McManus *et al.*, 1984). Despite the presence of an overall order of popularity for particular careers, there are individuals who, for each speciality, show patterns different from the group as a whole. The present study asked whether preference for careers could be predicted by personality and other background biographical variables. A statistical analysis suggested that some of our measures of personality and biography were predictive of interest in particular careers. Since none of the students in this study had been accepted for medical school the correlations can in no way be attributed to undergraduate medical training, since they are present prior to it. The results provide support for a conceptual model of career choice in which individual characteristics, such as personality, specifically such things as coping style, empathy and approach to studying, are conceptually matched to the demands and perceived opportunities of particular careers (Mitchell, 1975) (although it should be noted that some careers, such as Paediatrics and Obstetrics and Gynaecology are more popular and others such as Anaesthetics are less popular than their actual representation of career posts in the NHS would suggest).

This study has only considered applicants who included UCLSM on their UCCA application form, and therefore there may be some concern that applicants who apply to UCLSM specifically or to London schools in particular are different from other medical school applicants. This seems unlikely. Firstly, the applicants in the present study had also applied to four other medical schools, many of which were not in London. Secondly, in unpublished analyses from a 1990–91 survey of applicants to five English medical schools (McManus *et al.*, 1995), of which UCLSM was one, we have found no differences between applicants applying to UCLSM and those applying elsewhere (in particular to two schools in the North of England, Sheffield and Newcastle-upon-Tyne). Thirdly, even if there were differences in *mean* score between those applying to UCLSM and those applying elsewhere, the present study is principally concerned with differences in *correlational structure*, and that is much less likely to be different between applicants to different schools. Overall therefore we are confident that our study represents a reasonable summary of applicants to British medical schools in general.

A further concern might be with the setting of significance levels, and in particular our choice of a 5% alpha level for inclusion in the multiple regressions of Studies 1 and 2. What, for instance, would have happened if we had chosen a more stringent criterion such as 0.01 at this stage? That (and any other criterion) can readily be assessed in Table 2 by scanning down each column until the level of significance becomes greater than the proposed alpha. (It should be noted that because all significance levels are contingent upon those above them in the stepwise entry, occasionally significance levels become *more* significant at a particular step, and that is entirely acceptable in multiple regression. However, it must be emphasized that those seemingly more significant entries could not have been entered at an earlier stage since they were not significant when only those variables prior to them had been entered). Using a $p < 0.01$ criterion rather than $p < 0.05$ would have resulted in only 34 entries in Study 1 as opposed to the present 92. What happened in the 58 which would have been excluded? If they had been there purely due to chance then only 5% of them, i.e. about 3, should have been significant in Study 2 at the 5% level. In fact 14 (24%) were significant, of which 6 (10%) were significant at the 0.001 level. The conclusion seems inescapable that using a 5% rather than a 1% level was not merely allowing in extra variables which were pure noise; instead many of them represented reliable and replicable results. In the final analysis, such considerations are merely playing with numbers. As in any scientific study, the final test of whether the results of what is essentially an exploratory study are valid will be the extent to which other researchers call find similar relationships to those which we have identified.

Given the large number of possible associations which our study has revealed, it is necessary to be selective in discussing them. Here we will divide them into several categories.

Perhaps the most important category is those variables which show consistent and significant associations in Study 1 and Study 2. These are highly likely to be genuine, and to replicate in further testing. Interpreting them and exploring them further is therefore likely to be very fruitful. Some make intuitive and immediate sense, and the subtleties of their variation also support the likelihood of their validity. Thus it is intriguing that potential psychiatrists not only show higher scores on the Fantasy and Perspective-taking scales of the Empathy measures, but also show higher Sensation Seeking scores (a drive to obtain more extreme sensory experiences). But what is particularly intriguing is firstly that these variables do not appear on any of the other 10 careers; and that in the sole case where another career does show an association with empathy it is Geriatric Medicine, but with the *Empathic concern* sub-scale. Such a replicable distinction between the different measures of empathy simultaneously validates both the original measures of empathy and also the present pattern of associations. Other associations can also be highly specific: thus on the Decision Making Questionnaire potential surgeons show a more highly-controlled decision-making style, a scale that does not emerge on any of the other careers, but is significant in both studies for surgery. In contrast, although surgeons seem to show an earlier age for deciding to study medicine, that association is also found for Medicine in Hospital, but for no other careers, with the possible exception of Public Health, for which the reverse association is almost significant on both occasions. Amongst other highly specific associations which, we believe, would undoubtedly merit further exploration are the tendency for potential pathologists to spend less time talking to friends, for future general practitioners to be less tolerant of ambiguity, for potential medical researchers to have higher motives for Deep Learning, and for religion to be more important to those interested in going into Public Health. Finally, the tendency for applicants from ethnic minorities to be more interested in Medical Research and Public Health is, we believe, an association which has not been reported before, despite extensive comparison of ethnic minority with other applicants (McManus *et al.*, 1989).

A second category of variables is those which are significant in Study 1 but, although not

significant in Study 2, show effects in the same direction in the two studies. Some at least of these will be genuine effects which will replicate in future studies, since it is clear that in substantially more than 50% of non-significant cases the effect is in the same direction in both studies. Many of these measures fit conveniently with conventional stereotypes of particular careers: thus for those interested in research to spend more time playing with computers, for those interested in surgery to be more 'sporty' or to be more neurotic, for those interested in anaesthetics to have a focus of control which puts more emphasis upon fate (that is, life is by and large uncontrollable) or for possible psychiatrists to be more interested in the theatre does in each case fit with popular intuitions, and in each case would merit further study.

A further level of analysis concerns those measures which are *not* statistically significant on any occasion. Thus it is intriguing that extraversion does not appear in a single one of the tables; likewise social class, age, internal and external locus of control, attendance at place of worship and measures of many cultural activities simply do not appear anywhere as career correlates. Given the size of our sample we have to conclude that these measures are probably unimportant in determining career choice, at least for those careers we have studied here in this age group. Of course if they *had* been significant then it would no doubt have been straightforward to concoct an explanation for their association, particularly given that we had chosen them in the first place because we thought they might be predictive, but the fact of the matter is that they are not.

The final way of viewing the present data is in terms of the specialities themselves. In several cases there are clear sets of variables which show unique correlations (e.g. psychiatry, public health, medical research, surgery). It is also, however, worth mentioning anaesthetics, for which no variable we looked at showed a consistent association, and paediatrics and obstetrics and gynaecology, for which no personality variables were significant after taking sex into account. Two comments are worth making. It might be that there simply are few correlates of a career interest in these specialities—and to some extent that might be supported by the general absence of stereotypes for these specialties. The other possibility is that correlates do exist but that at the stage of medical school application they have not appeared. It might be that if applicants were studied later then correlations would appear. Either way it is of some interest that anaesthetics, despite its lack of correlations in our samples, is one of the few specialities in which attempts have been made to put selection on a firm psychometric basis (Reeve, 1980, 1984; Vickers *et al.*, 1990), although the fact that as many as 40% of anaesthetists have previously trained in other specialities (Parkhouse *et al.*, 1990) might also suggest that the speciality has a relatively inchoate image both to junior doctors and, *a fortiori*, to medical school applicants.

This study has only concerned itself with applicants to medical school. Amongst those applicants who have now entered medical school and will probably graduate as doctors, it will be of great interest to observe which actually enter their preferred careers. More specifically, will those who eventually succeed in entering their chosen specialities be those whose personalities are most consonant with the stereotypical view of practitioners in that speciality? Of greater interest is whether the individuals most highly regarded by their peers, and those for whom there are other more objective indicators of competence, will be those with particular personality characteristics. To what extent will such successful doctors conform to the stereotype for that speciality? Implementation of selection procedures that determine the career destiny of doctors within 5 years of registration (Department of Health and Social Security, 1987) imparts a sense of urgency to answering these questions. To do so requires long-term longitudinal studies, which are being undertaken at present.

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References

ANONYMOUS (1988). *SPSS-X User's Guide.* (3rd ed.). Chicago: SPSS.

BIGGS, J.B. (1978). Individual and group differences in study processes. *British Journal of Educational Psychology, 48,* 266–279.

BIGGS, J.B. (1979). *A survey of students' study processes.* Unpublished manuscript, University of Newcastle, New South Wales.

BUDNER, S. (1962). The scale of tolerance—tolerance of ambiguity. *Journal of Personality, 30,* 29–50.

COHEN, J. & COHEN, P. (1975). *Applied multiple regression/correlation analysis for the behavioral sciences.* (1st ed.). Hillsdale, NJ: Lawrence Erlbaum.

COOMBS, R.H., FAWZY, F.I. & DANIELS, M.L. (1993). Surgeons' personalities: the influence of medical school. *Medical Education, 27,* 337–343.

CRIMLISK, H. & MCMANUS, I.C. (1987) The effect of personal illness experience on career preference in medical students. *Medical Education, 21,* 464–467.

DAVIES, B.M. & MOWBRAY, R.M. (1968). Medical students: personality and academic achievement. *British Journal of Medical Education, 2,* 195–199.

DAVIS, M.H. (1980). A multidimensional approach to individual differences in empathy. *JSAS Catalog of Selected Documents in Psychology, 10,* 85.

DAVIS, M.H. (1983). Measuring individual differences in empathy: evidence for a multidimensional approach. *Journal of Personality and Social Psychology, 44,* 113–126.

DAVIS, W.K., BOUHUIJS, P.A., DAUPHINEE, W.D., MCAVOY, P.A., ALEXANDER, D.A., COLES, C., DONALDSON, M., HOFVEDT, B.O., WAKEFORD, R.E. & WARREN, V.J. (1990). Medical career choice: current status of research literature. *Teaching and Learning in Medicine, 2,* 130–138.

DEPARTMENT OF HEALTH AND SOCIAL SECURITY (1987). *Hospital medical staffing: achieving a balance: plan for action.* London: DHSS.

EGERTON, E. (1983). Career preference enquiry among Queen's University medical undergraduates and graduates: a follow-up. *Medical Education, 17,* 105–111.

EYSENCK, H.J. & EYSENCK, S.B.G. (1964). *Manual of the Eysenck Personality Inventory.* London: University of London Press.

FISHMAN, D. & ZIMET, C. (1972). Speciality choice and beliefs about specialities among freshman medical students. *Journal of Medical Education, 47,* 524–533.

FRENCH, D.J., WEST, R.J., ELANDER, J. & WILDING, J.M. (in press). Decision-making style, driving style, and self-reported involvement in road traffic accidents. *Ergonomics.*

FURNHAM, A.F. (1986a). Career attitudes of preclinical medical students to the medical specialities. *Medical Education, 20,* 286–300.

FURNHAM, A.F. (1986b). Medical students' beliefs about nine different specialties. *British Medical Journal, 293,* 1607–1610.

GOUGH, H. (1975). Speciality preferences of physicians and medical students. *Journal of Medical Education, 50,* 581–588.

HAND, D.J. & TAYLOR, C.C. (1987). *Multivariate analysis of variance and repeated measures: a practical approach for behavioural scientists.* London: Chapman and Hall.

HUTT, R., PARSONS, D. & PEARSON, R. (1981). The timing of and reasons for doctors' career decisions. *Health Trends, 13,* 17–20.

JUAN, I. & HALEY, H. (1970). High and low levels of dogmatism in relation to characteristics of medical students. *Psychological Reports, 26,* 535–544.

KOSA, J.D. (1969). The medical student: his career and religion. *Hospital Progress, 50,* 51–53.

LEWETT, L.S., GREENBERG, L.W., FOLEY, R.P., GOLDBERG, R.M., SPIEGEL, C.T. & GREEN, C. (1987). Another look at career choice and learning preferences. *Medical Education, 21,* 244–249.

MATTESON, T. & SMITH, V. (1977). Selection of medical specialities: preferences versus choices. *Journal of Medical Education, 52,* 548–554.

McGRATH, E. & ZIMET, C. (1977). Female and male medical students: differences in speciality choice selection and personality. *Journal of Medical Education, 52,* 293–299.

McMANUS, I.C. & RICHARDS, P. (1984). An audit of admission to medical school: 1. Acceptances and rejects. *British Medical Journal, 289,* 1201–1204.

McMANUS, I.C. (1985). *Medical students: origins, selection, attitudes and culture.* MD thesis, University of London.

McMANUS, I.C., RICHARDS, P. & MAITLIS, S.L. (1989). Prospective study of the disadvantage of people from ethnic minority groups applying to medical schools in the United Kingdom. *British Medical Journal, 298,* 723–726.

McMANUS, I.C., RICHARDS, P., WINDER, B.C., SPROSTON, K.A. & STYLES, V. (1995). Medical school applicants from ethnic minorities: identifying if and when they are disadvantaged. *British Medical Journal, 310,* 496–500.

MILLER, A.J. (1990). *Subset selection in regression.* London: Chapman and Hall.

MITCHELL, W.D. (1975). Medical student career choice: a conceptualization. *Social Science and Medicine, 9,* 641–653.

MOWBRAY, R. & DAVIES, B. (1971). Personality factors in choice of medical speciality. *British Journal of Medical Education, 5,* 110–117.

NIELSEN, A. (1981). Medical students' attitudes about psychiatry. *Archives of General Psychiatry, 38,* 1144–1155.

PAIVA, R. & HALEY, H. (1971). Intellectual, personality and environmental factors in career speciality preferences. *Journal of Medical Education, 46,* 281–289.

PARKER, G. & BROWN, L. (1982). Coping behaviours that mediate between life events and depression. *Archives of General Psychiatry, 39,* 1386–1392.

PARKHOUSE, J. (1976). A follow-up of career preferences. *Medical Education, 10,* 480–482.

PARKHOUSE, J. & HOWARD, M. (1978). A follow-up of the career preferences of Manchester and Sheffield graduates of 1972 and 1973. *Medical Education, 12,* 377–381.

PARKHOUSE, J. & ELLIN, D.J. (1990). Anaesthetics: career choices and experiences. *Medical Education, 24,* 52–67.

POWELL, A.S., BOAKES, J.P. & SLATER, P. (1988). Hostility and the medical student: how a trait measure influences perception of medical specialties. *Medical Education, 22,* 222–230.

REEVE, P. (1984). Selection of anaesthetists: is there a better method? In J.N. LUNN (Ed.), *Quality of care in anaesthetic practice* (pp. 231–252). London: MacMillan.

REEVE, P.E. (1980). Personality characteristics of a sample of anaesthetists. *Anaesthesia, 35,* 559–568.

ROTHMAN, A.I. (1985). Statements of career intentions as predictors of career choices. *Journal of Medical Education, 60,* 511–516.

RUBIN, Z. & PEPLAU, L. (1975). Who believes in a just world? *Journal of Social Issues, 31,* 65–89.

SCHUMACHER, C. (1964). Personal characteristics of students choosing different types of medical careers. *Journal of Medical Education, 39,* 278–288.

SHAPIRO, M.C., WESTERN, J.S. & ANDERSON, D.S. (1988). Career preferences and career outcomes of Australian medical students. *Medical Education, 22,* 214–221.

SHUVAL, J.T. (1980). *Entering medicine: the dynamics of transition.* Oxford: Pergamon Press.

VICKERS, M.D. & REEVE, P.E. (1990). Selection methods in medicine: a case for replacement surgery? *Journal of the Royal Society of Medicine, 83,* 541–543.

WAKEFORD, R.E. & ALLERY, L. (1986). Doctors' attitudes, medical philosophy, and political views. *British Medical Journal, 292,* 1025–1027.

WALTON, H.J. (1969). Personality correlates of a career interest in psychiatry. *British Journal of Psychiatry, 115,* 211–219.

WEST, R.J. (1988). *The Royal Holloway and Bedford New College (RHBNC) Decision Making Questionnaire (DMQ).* London: Royal Holloway and Bedford New College.

WOOLF, J. & McMANUS, I.C. (1987). Medical stereotypes and medical realities. *British Medical Journal, 294,* 1660.

YUFIT, R., POLLOCK, G. & WASSERMAN, E. (1969). Medical speciality choice and personality. *Archives of General Psychiatry, 20,* 89–99.

ZELDOW, P.B., PRESTON, R.C. & DAUGHERTY, S.R. (1992). The decision to enter a medical speciality: timing and stability. *Medical Education, 26,* 327–332.

ZIMNY, G.H. (1980). Predictive validity of the medical speciality preference inventory. *Medical Education, 14,* 414–418.

ZUCKERMAN, M., KOLIN, E., PRICE, L. & ZOOB, J. (1964). Development of a sensation seeking scale. *Journal of Consulting Psychology, 28,* 477–482.