

Preclinical anxiety: the stress associated with a *viva voce* examination

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Summary. It is shown that the state anxiety scores of 75 preclinical students taking a series of written and oral examinations, and measured just prior to taking a *viva voce* examination, were substantially raised. There was no correlation of anxiety with overall examination performance.

Key words: *Anxiety; Students, medical/ *psychol; Educational measurement/ *methods; *Stress, psychological; Education, medical, undergraduate; London; Attitude of health personnel

Introduction

The *'viva'* is an important part of medical examinations, from the preclinical period right through to higher professional examinations, and is usually regarded as a particularly stressful part of the assessment. This stress might be thought to play one of three roles: to improve performance by shifting candidates to a more optimal point along the inverted-U curve linking stress and performance (the 'Yerkes-Dodson Law') (Levitt 1980); to act as a warning (and perhaps a method of screening) for medical students of the stress they are likely to meet in subsequent practice; or, as Simpson (1972) suggested, to have a totemic or symbolic role, representing a 'rite of passage' in the process of medical professionalization. This paper looks at the levels of anxiety measured at the time of a

viva voce examination, considers background and situational factors affecting those levels, assesses the relation to examination performance and discusses its origins.

Method

One of the preclinical departments at St Mary's Hospital Medical School, London gave permission to study students taking its examination at the end of the second preclinical year. At the end of the second year, examinations are taken concurrently in anatomy, physiology, biochemistry, pharmacology, pathology, psychology, sociology and statistics. An overall pass is required in the examination before entry to the clinical course. The undergraduates sit a 3-hour written examination in this particular subject and then a few days later all have a 20-minute *viva voce* examination with two examiners, one of whom may be an external. Separate marks are awarded for the written examination and the *viva*, although for the purposes of this study we only had access to the totalled mark. The *viva* examination means in effect that the candidate's written mark may be moved upwards or downwards, and hence no candidates can with certainty regard themselves as 'safe'. University regulations prohibit giving any further information concerning the allocation of marks either in this subject or overall.

Candidates usually assemble some 15 minutes before the time of their examination, and during that time they were asked by CBA or UMVG to complete the State-Trait Anxiety Inventory (STAI) (Spielberger *et al.* (1970)),

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the first part of which assesses an individual's anxiety at that particular moment (state anxiety) and the second part of which assesses the degree to which anxiety is a personality component (trait anxiety). This is a widely used test, for both clinical and research purposes, some 300 papers being published on it since its introduction (Buros 1978). On emerging from the *viva* students were handed a second, more general questionnaire asking about their social and educational background, and their perceptions of their performance in sessional and first-year examinations, and containing the 'syllabus-boundness' questionnaire of the University College London Study Habits questionnaire (Lucas *et al.* 1976), which assesses the degree to which students confine their work principally to the syllabus (and hence it also assesses the degree of examination orientation). Finally, students were asked for any general comments upon either *vivas* in particular or examinations in general.

Together the two questionnaires took between 5 and 10 minutes to complete.

Results

Of the 90 candidates taking the examination, 75 (83.3%) completed the anxiety inventory. Of the remainder, a few refused, and the rest had insufficient time to complete the questionnaires, either due to arriving late or else being intent upon last-minute revision.

Figure 1 shows the state anxiety scores for the candidates. For comparison purposes Fig. 1 also shows the norms given by the compilers, and it also shows the state anxiety scores of applicants to St Mary's Medical School either before ($n=160$) or immediately after ($n=167$) their selection interview (McManus & Richards 1984a, b). The interviewees are in general about 3 years younger than the students in the present study, but are otherwise similar in background and qualifications. The mean anxiety scores of *viva voce* candidates (males 53.6; female 60.7) were slightly higher than for the most stressful manipulation reported on American college students in the manual for the STAI ('the students viewed a stressful movie depicting several accidents in a woodworking shop' [Spielberger *et al.* 1970]) ($t=1.89$, 73 df,

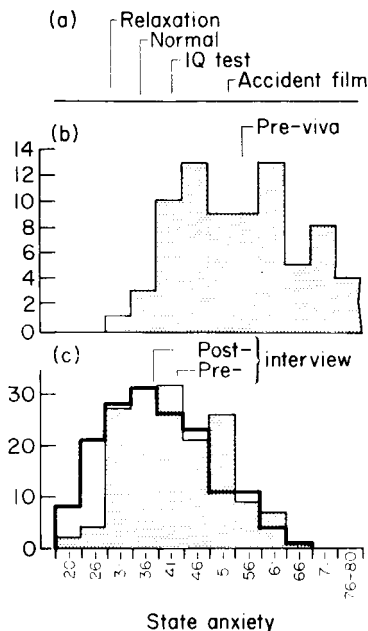


Figure 1. (a) Shows the mean state anxiety scores (adjusted for the sex distribution of our sample) as reported in the test manual for groups of American college students under four conditions; (b) Shows the distribution of state anxiety scores of 75 medical students before a *viva voce* examination. The mean is indicated by the short vertical line; (c) Shows the distribution of state anxiety scores of medical school applicants before ('Pre-') or after ('Post-') their selection interviews, the shaded distribution being for pre-interview assessments. The short vertical lines indicate mean scores.

$P<0.01$), and were substantially higher than for American college students taking an IQ test ($t=10.35$, 73 df, $P\leq 0.001$), although it must be accepted that to a certain extent these differences might be explained by differences in reference group and culture. By contrast, the anxiety levels of interviewees were only mildly raised (although the significant difference between pre- and post-interview applicants ($t=4.54$, 325 df, $P<0.001$) confirms the face validity of the method of assessment), and were significantly lower in each case than for *pre-viva* students ($t=9.29$, $t=12.28$, 325 df, $P\leq 0.001$, $P\leq 0.001$ respectively).

The STAI is printed with the state questions on one side and the trait questions on the reverse side of a single sheet of paper. Unfortu-

nately, only six *viva* candidates completed the trait questionnaire, the vast majority of the remainder of the candidates simply omitting to turn the sheet over; this is primarily due to a defect in the presentation of the questionnaire, the two sides appearing to be almost identical and there being no explicit instruction to turn over the sheet. There was no evidence that those who did complete the state score were significantly less anxious than those who did not. In the survey of applicants the trait scores were not significantly higher than in controls, confirming that the high levels of state anxiety found in our group cannot be explained in terms of high levels of trait anxiety.

Examination performance. Figure 2 shows the correlation between state anxiety and examination performance of the candidates, both on the exam on its own and on the total of the examination marks at the end of the second

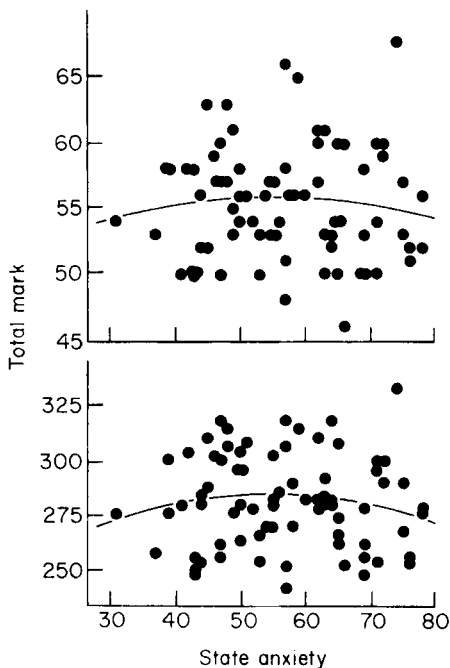


Figure 2. Shows the relationship between state anxiety scores immediately before the *viva voce* examination, and the marks of candidates in the particular examination (top), and overall (bottom). The curve indicates the least-squares parabola; in neither case is the linear or the quadratic component statistically significant.

year (of which this subject forms a proportion). In neither case is there evidence of a linear regression ($r=0.0028$; NS) or, as would be predicted by the Yerkes-Dodson Law, of a quadratic regression ($r=-1.01$, 71 df, NS). Neither was there any relation between state anxiety and marks obtained in sessional examinations, or with the candidates' perceived performance in first-year examinations. There was an almost significant tendency ($r=-0.223$, $P=0.054$) for those with lower average A-level grades to have higher state anxiety scores, although a history of having repeated some A-levels did not show the same tendency.

Background factors. Female students had significantly higher state anxiety scores than males ($P<0.01$), as is conventionally found in the STAI at higher anxiety levels, although it is not clear if this represents a true difference in anxiety, or a difference in response to the questionnaire. Women performed significantly better than men in the examination in question ($P<0.05$), as they did in the anatomy, biochemistry, pharmacology, psychology and sociology exams and all of the sessional exams, although they did not perceive that they had performed better in first-year exams, and they did not have better A-level grades.

Candidates educated in the private sector (i.e. 'public' schools) had significantly lower anxiety scores than those educated in the public sector ($P<0.01$). Social class, having been to a single-sex school, age, not having English as one's mother tongue, having a previous degree, or having parents with a degree did not relate to state anxiety. There was no relation between syllabus-boundness and anxiety levels. There was no evidence that those candidates wishing to take an intercalated BSc degree (18; 24.0%), for which higher grades overall would be necessary, were more anxious.

Comments by candidates

A total of 47 candidates (62.7%) wrote comments on the blank sheet provided. A number concerned aspects of the timing and structure of examinations in general, and the teaching of particular subjects, and will not be discussed further here.

There was a wide range of views expressed

concerning *viva voce* examinations: 'No criticism—an excellent means of examining'; 'so many marks (often 30%) based on such a short interview—is this a good idea?'; 'I do not feel that *vivas* are situations in which a person's knowledge can be tested to his best advantage'; 'the best way to assess someone's knowledge'. Some candidates showed views reminiscent of those predicted by cognitive dissonance theory (Aronson 1969); '*Vivas* are essential—I hate doing them but they should be compulsory'.

Several comments concerned stress: 'the subject may not perform as well as they can due to nerves'; 'It is unfair to fail people who have already passed just because of poor *viva* performance due to nerves'. Others justified the stress: 'prepares students for *vivas* at finals, and perhaps other stressful experiences they may have to endure'; 'you've got to learn to talk sometime'. One candidate suggested that the effect of stress could be lessened by 'giving the examiners some basic training as to how to assess the examinee's nervousness'.

Opinions differed on who should be *vivaed*: 'Should either all be compulsory or not at all'; 'Should be confined to borderlines, controls and prize candidates. There is no point in *vivaing* people who have already passed—it is a waste of time to the department and causes unnecessary stress'; 'Non-compulsory *vivas*—it's a bastard if you've got one and are not sure if it's a control'. Some comments concerned the difficulty in setting standards; 'Hard to believe that the external knows to what standard we have been taught, and what topics have been emphasized'.

Comments by the department concerned

An earlier draft of this paper was shown to the members of staff of the department concerned. The head of department summarized the departmental attitude to *vivas* as follows:

'The *viva* is viewed by the department as being of major importance; the students are told this from the very beginning of the course. They are all given practice *vivas* and they are instructed as to what is being sought . . . We believe we have a responsibility both to the student and to society at

large to ensure that the student has acquired a framework of knowledge of basic principles [in the subject] as well as attitudes towards [the content] which are compatible with safety and responsibility . . . we attempt to use the *viva* not only as an examination of factual knowledge but also [to assess] whether the general appreciation of the subject by the candidate is compatible with a sense of responsibility and safety. We penalize candidates, for example, who guess with abandon . . . Similarly, we penalize candidates who lack proper understanding of the basic issues involved . . . The *viva* is thus used to some extent to assess these attitudes and whether or not [they are] compatible with safe and responsible [practice] in the candidate's future career. It is thus more than about simple recall . . . In their future careers, students will have to think . . . on their feet; they will not have an opportunity to write a 30-minute essay. Practice *vivas* help to develop this facility and a *viva* examination constitutes something of a test of this ability . . . Examiners are experienced with the problem of anxiety in *vivas*. It is in their own interest as well as that of the student to develop [a] helpful and effective interplay as much as possible. They therefore do their best to allay the anxiety experienced by the student.'

Discussion

Viva voce examinations, and probably clinical examinations also, produce a disproportionately high degree of anxiety in candidates, the level being substantially higher than a conventional selection interview. As one examiner has put it, 'the candidate must always be assumed to be uneasy and over the top of the arousal efficiency curve—that is, so tense that his performance is prone to fall off when any minute additional stress is applied' (Dudley 1979). Not all examiners are so sympathetic; 'an examiner who detects sweating, hyperventilation, tremor, pallor, ataxia or dysarthria in a candidate wonders if he will be in a similar state when faced with a moribund patient in diabetic coma' (Cohen 1982). That *vivas* might be expected to be highly stressful is clear from

Gray's (1982) analysis of the causes of anxiety: 'the major inputs to the behavioural inhibition system (and thus the adequate stimuli for anxiety) are: stimuli that warn of punishment or non-reward, novel stimuli and innate fear stimuli (including those that arise during social interaction . . .)'. Various defence mechanisms are adopted by the anxious candidate (Green *et al.* 1967).

Many examiners are experienced with the effects of anxiety upon candidates, and take this into account when making assessments; and indeed the department being studied makes it clear that it is aware of this process. The degree of awareness by individual examiners, and the mechanisms for compensation for such perceived anxiety, are not open to assessment in the current study, and would require a very different study design, although they would be of great interest.

High anxiety levels are likely to impair performance relative to a low anxiety baseline; as Eysenck (1982) has put it: 'Worry and other task-irrelevant cognitive activities associated with anxiety always impair the quality of performance because [they] compete with task-relevant information for space in the processing system'.

Could it be that the very high anxiety levels we have found are particular to the examination we have chosen to study? Perhaps this is true in so far as all examinations are unique, although the subject in question does not have a reputation amongst medical students as being the most difficult or awkward *viva*. We would have liked to assess anxiety in first-year students to determine whether anxiety is learned from previous *vivas*, or is an anticipatory response (most students not having had formal *viva* examinations before coming to medical school), but this was not possible due to the objections of some of the staff of one preclinical department who feared that the additional stress of completing our questionnaire would either 'push some of the students over the top', or alternatively might provide a legitimate excuse if the student should subsequently be failed. Informal interviews with other medical students suggest that there is nothing particularly atypical about either this examination, this cohort of students, or this medical school.

The role of learning in causing *viva* anxiety is not clear. By the end of their second preclinical year students have experienced a large number of *vivas*, both formal and informal. This previous experience might have one of two effects. Firstly, it might be expected to produce habituation to the situation, and hence a *decreased* anxiety. Conversely, students might develop an increased awareness of the importance attached to this form of assessment, and that, coupled with the knowledge that failure rates in preclinical exams can be substantially higher than those experienced in school prior to entering university, might *increase* anxiety levels. Only a longitudinal design could separate these two possibilities, but once again would be of great interest.

Although the students in this study are showing high levels of anxiety just before their *viva* it must be emphasized that while it is reasonable to suspect that the cause of the anxiety is indeed the *viva* itself, this conclusion cannot be proven without a far more extensive study, taking into account in particular the fact that the students have experienced continual pressure from written and other *viva* examinations for a period of several weeks, and are necessarily anxious about the overall outcome.

Is anxiety a necessary part of the educational value of *viva* examinations? Generally, we have found no correlation between overall examination performance and *viva* anxiety; however, *viva* performance was not measured separately, and another study (Bull 1959) found no correlation between *viva* marks and written examination marks. Nevertheless, it is statistically unlikely that there would be a correlation between either component of the final mark and anxiety without an association between the overall mark and anxiety. It is questionable whether *viva* anxiety acts as a useful predictor of inability to deal with acute clinical problems (and it would be more questionable still if preclinical examiners felt this to be a part of the role of preclinical *vivas*). Certainly, if *viva* anxiety alone were used as a criterion of suitability for dealing with medical emergencies then some of the best qualified candidates would be excluded (see Fig. 2). It is unlikely that anxiety acts as a motivating factor in those who have performed poorly in previous formal and sessional ex-

aminations, since in this study there is an absence of correlation of anxiety with performance in previous examinations.

Evidence available suggests that the *viva* examinations can be subject to a number of biases, although we have no evidence for such specific biases in this particular examination. In the published literature it has been shown that marks are correlated with the number of words spoken by the candidate (Evans *et al.* 1966), the time of day at which the exam takes place (Colton & Peterson 1967) and the sex and appearance of the candidate (Simpson 1972, p. 138). Although some studies suggest that the majority of the questions asked in *vivas* test only simple recall (Evans *et al.* 1966; McGuire 1966) rather than understanding *per se*, we could find no correlation in this one examination between syllabus-boundness and anxiety levels.

Very few factors predict which candidates become most anxious. In this study the only two were sex (which might represent a difference in response to the questionnaire rather than a true difference in anxiety levels) and school type. The latter is unlikely to be a response bias due to a 'stiff upper lip', since in our study of applicants to medical school no correlation was found between school type or anxiety and the Lie (or Social Acquiescence) scale of the Eysenck Personality Questionnaire; it is also noteworthy that anxiety did not correlate with social class, parental degrees, or the sex type of the school. The correlation with school type, therefore, probably represents a result of implicit or explicit training for this particular type of social occasion, by some schools.

In conclusion we would like to suggest that the level of anxiety found at the time of a *viva voce* examination is sufficiently high to be a cause for concern, that this stress is probably unlikely to be of any educational value, either in motivating the candidate or in providing the examiner with a useful predictor of subsequent medical competence (Cohen 1982), that examiners should carefully question the utility and purpose of the unintended side-effects of this form of assessment, and that the precise origins of the anxiety should be the subject of further research.

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