Executive Summary

THE UNIVERSITY OF
WESTERN AUSTRALIA

UMAT: A Validity Study

A review of the underlying constructs and an analysis of the content of the
Undergraduate Medicine and Health Sciences Admission Test

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Annette Mercer and Neville Chiavaroli

With contributions by Sam Hambur and Sean Pywell

PART 1

Background

1. UMAT had its beginnings at Newcastle University in the early 1990s. In the late 1990s, use of the test spread to several other universities and it is now used by thirteen institutions in Australia and New Zealand for selection into a range of courses. However, the major application is still for selection into medical courses.

2. The approach taken in this validity study has been to elucidate the constructs underlying the three sections by reference to current literature on the topics; to identify tests which measure similar constructs; to identify the types of items used in UMAT; to compare these with those used in similar tests; and to evaluate the extent to which UMAT measures these constructs.

Selection issues

3. Some of the major themes which have emerged in the abundant literature on the topic of the selection of medical/dental students are:

- Prior academic achievement is important, whether it is used as a threshold or as part of the selection algorithm. This factor appears to be a better predictor than intelligence, as measured by general intelligence tests. Intelligence is multi-facetted and more emphasis needs to be given to some of its aspects other than those related to academic ability; emotional intelligence, for example.
- There is general agreement on the need for the inclusion of qualitative/humanistic variables in the selection process, but little agreement on which qualities, how to operationalise them and how to use them in the selection mechanism.
- Selection methods should be valid, reliable, feasible, acceptable as well as fair, open and transparent.
- Selection systems should be multi-faceted, adaptable and evidence-based.
- A variety of new instruments are being developed, trial tested and evaluated. Some are useful for screening rather than for selection, that is they 'select out' rather than 'select in'.

- New processes are expensive in time and resources, but are necessary given the increasing number of academically qualified applicants.

4. There is a dilemma attached to selection today for the professionals of tomorrow. Influences of market forces and the potential for different ranges of skills required, different economic and ethical environments and different settings in the workplace make it difficult to predict suitable characteristics for a future workforce. Many believe that it is preferable to aim to select people who will succeed in the medical/dental course rather than to attempt to identify those who may be successful practitioners.

Characteristics of 'good' doctors/dentists

5. There appears to be sufficient preliminary data indicating an impact of personal qualities on the performance of members of the professions to warrant further research into selection criteria for medical/dental courses. A high priority is given to interpersonal skills and empathy. Evidence suggests that work on learning styles is likely to be fruitful. The quality of 'conscientiousness' from the Five Factor Model of psychology appears consistently in the literature. From the perspective of patients, communication skills are a major focus, along with the ability to be responsive to the needs and expectations of others. However, there are difficulties in the methods available to measure such qualities.

6. Interpersonal and cognitive aspects are both very important and should be viewed as central to setting priorities for medical education. A consistent theme in the literature is that it is no longer sufficient to possess high-level academic skills at the expense of effective relationships with others.

7. Professional development is now being incorporated into the medical curriculum. The literature suggests that critical thinking skills may be an important predictor of student success and clinical judgement and that a pre-disposition to these skills may be valuable.

8. A recent UK study indicates that academic ability, motivation for medicine, extra-curricular interests, team work experience and leadership skills are all important characteristics. In addition, emotional intelligence and information literacy have also emerged as being relevant to good practice.

Clinical reasoning

9. Clinical reasoning is seen as a complex integration of critical thinking and data collection; it requires clinicians to analyse information, use inductive and deductive reasoning, make inferences and reach conclusions on the basis of available information. Clinical competence requires a combination of clinical skills, knowledge and problem solving ability.

10. There is a lack of definitive evidence of a relationship between academic entry scores and clinical performance. More is needed than just high-level academic achievement, one aspect of which is the ability to use and apply knowledge.

11. Explicit training in problem solving has become a feature of most medical education courses, due to the rapid increase in required scientific knowledge. The ability to access and use information effectively is central to this.

12. Reasoning strategies are interdependent with the contents of memory. In the clinical situation there are time constraints which necessitate the blending of strategy and memory. Demonstrated abilities in the required strategies seem to lead to easier adaptation to effective clinical reasoning.

PARTS 2 & 3

UMAT Construct and Content Validity

13. UMAT is a cognitive (or mental) ability test designed to determine aptitude for study in medicine, dentistry and other courses for health professionals. It is not a test of personality, values or attitudes, nor is it a measure of previous learning in academic domains.

14. Section 1 of UMAT (Logical Reasoning and Problem Solving) is made up of two related abilities. 'Logical reasoning' assesses candidates' ability to draw logical conclusions from supplied information, to make appropriate classifications and generalisations, and to engage in more formal reasoning. 'Problem Solving' is designed to examine the broader aspects of reasoning, such as identifying relevant information, identifying missing or required information, generating and testing plausible hypotheses, evaluating information, both implicit and explicit, in order to draw appropriate conclusions, and to plan further action.

15. The literature indicates that such measures of reasoning are indicative of general or 'fluid' intelligence. There is also a close association between general reasoning ability and language ability, possibly mediated via the working memory. The Logical Reasoning component has much in common with Critical Thinking. Both these constructs and problem solving are generally regarded as important attributes in the education of professionals.

16. UMAT Section 1 is characterised by context–based items, of a general scientific nature, which distinguishes it from most other tests of logical reasoning which have a predominantly humanities focus. UMAT Section 1 further aims to reduce reliance on language ability by utilising some non-text based material and low verbal loading.

17. Section 2 of UMAT (Understanding People, formerly Interaction Skills) assesses the ability to identify, understand, and, where necessary, infer the thoughts, feelings, behaviour and/or intentions of people depicted in specific situations. This section was extensively revised between 2003-2004. The new construct is related to the constructs of Empathy, Emotional Intelligence and Social Intelligence. These constructs are well-supported in the literature.

18. UMAT Section 2 is characterised by a conceptualisation as a cognitive ability rather than as a personality trait, a context-specific approach (rather than a universal or prescriptive approach), and as a performance-based instrument (rather than self-report).

19. UMAT Section 2 was specifically developed as a paper-based, objective selection instrument suitable for high-stakes assessment in the (cognitive) interpersonal domain. Its underlying construct and operationalisation through context-based MCQ items is supported by several other similarly ability-based tests reported in the psychological literature. However, UMAT Section 2 has greater variability in context and question type than these other tests.

20. Section 3 of UMAT (Non-verbal Reasoning) assesses candidates' ability to reason in the abstract and solve problems in non-verbal contexts. This section has recently been reviewed and the previously used 'embedded figures' items have been removed. The remaining items now consist solely of patterns or sequences of shapes. This is consistent with the literature and current practice on non-verbal testing.

21. Key higher level non-verbal intellectual abilities include analogical reasoning, categorical classification and sequential reasoning, and these abilities have been shown to be associated with academic success and professional competence. The literature also indicates that 'non-verbal reasoning' is strongly related to general or 'fluid' intelligence. However, the main rationale for the assessment of non-verbal reasoning appears to be the desire to obtain a

measure of cognitive ability which is relatively independent of language ability and specific cultural knowledge.

22. The three item types used in Section 3 form a coherent dimension. There is some commonality with Section 1 Problem Solving items, but they remain psychometrically distinct on higher level factor analysis. The removal of Embedded Figures items is supported by factor analysis which demonstrated significantly different psychometric properties in these items.

23. The assessment of reasoning skills, as opposed to knowledge of specific domains, is supported by the practice of other medical selection tests. The rationale appears to be that such skills reflect the capacity to engage subsequently in clinical reasoning.

24. The items utilised in UMAT appear soundly based on underlying constructs and current testing approaches. However, while it is informed by these cognate constructs and tests, UMAT remains essentially unique in its specific conceptualisation and configuration, in order to offer some protection against imitation and/or unauthorised disclosure by coaching colleges. Several collections of sample items have been released to allow candidates to become familiar with the construct and items.

25. Psychometric data indicate that UMAT items are generally of high quality. There is no indication that speed plays a significant part in performance. Both gender and language background appear to influence performance on UMAT to some degree, but such differential performances appear to be in the direction predicted by the underlying constructs.

26. The psychometric properties of UMAT scores appear to support usage as either separate scales, or a single combined scale, as is currently the more common practice by user institutions. However, it needs to be borne in mind that the aggregation of scores leads to a reduction in information about candidates' differential ability across the three sections.