

# Selecting Pharmacy Students with Appropriate Communication Skills

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This paper investigates the selection procedures for admission into pharmacy school in order to assess the appropriateness of students' communication skills. The communication skills of a cohort of pharmacy students in their first year of the pharmacy program were studied to explore the value of multiple selection procedures for the process of admission to pharmacy school. A short interview, a multiple choice test which measures verbal and quantitative abilities, and a written task which rates students on their academic communication skills were compared. Based on the extensive correlations found between these measures, and the professional practice requirements, arguments are presented for the greater use of such tests in determining which applicants to admit to pharmacy school.

## INTRODUCTION

Selection procedures for pharmacy students in English speaking countries differ in the degree of emphasis placed on skills in communication and general academic ability. There are many studies in the literature on the procedures for selection of students into all health professional courses including pharmacy-(1-4). Possibly more important than prior academic achievement in the selection paradigm, is the recognition of those qualities which are deemed to be essential for the best professional practice(5). While such qualities as moral reasoning, empathy and the capacity to cope with uncertainty may be more difficult to measure with psychometric tests, it is relatively easy to assess the communication skills of health professional degree applicants. This may be done by the use of instruments which require reading comprehension and information processing skills and by the use of an interview(6). Although there are general papers in the literature on admission methods, there is, to our knowledge, nothing that indicates how the various parameters in a selection algorithm are coordinated to choose applicants who are admitted to a pharmacy program.

In the U.S. and Canada, pharmacy programs lead to the BS in Pharmacy or the PharmD. Some colleges require one, two or three years of pre-pharmacy education before entry, while others integrate the essential curriculum with study in the professional college(7). English courses are listed among the pre-pharmacy requirements by the vast majority of the 81 U.S. pharmacy schools or colleges, and frequently speech courses are listed as well. A survey reported in 1994 that the average semester credit requirement for English and speech courses was 9.0 which was about 12 percent of the total credit requirements(8). The Pharmacy College Admission Test (PCAT) is included in selection criteria by 43 schools, 33 schools require an interview and a further 11 use the interview as an option(7). Of the five separate areas scored in the new PCAT (since 1993), communication skills are measured by two criteria:

reading comprehension and verbal abilities. There is a clear intention of U.S. schools to guarantee good written and verbal skills(9).

Acceptance into college to study pharmacy is at the undergraduate level in Australia and the U.K., and requires a high grade in the final high school exit examinations. If entry is from previous study at University, a superior academic record is needed. In contrast to the U.S., Australia and the U.K. place little emphasis on English or communication skills apart from the contributions these make to each applicant's final high school exit score in Australia, and to the English requirements in the first four years of high school (O-levels) in the U.K. The selection procedures used in Australia and the U.K. virtually ignore the essential requirements for communication abilities, which are then further developed in pharmacy programs and necessary for the best practice of the pharmacy profession(9-12).

Some communication problems among students have been noted informally in the final year of the pharmacy program in the U.S.(13) and among graduates by Australian registration authorities during licensure reviews.<sup>2</sup> One survey of preceptors and externs noted weaknesses or deficiencies in this area(14).

It is therefore important to have some measure of communication skills at course entry to screen for minimum competency. This may be achievable by the use, for example, of the PCAT parameters which measure verbal skills and reading comprehension, or with other tests which achieve this. For the prediction of year one GPA, the PCAT reading comprehension and verbal scores were found to be significant in some studies

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**Table I. Correlations (Spearman) between measures of communication skills and STAT scores**

	MASUS literacy criteria				STAT		
	A	B	C	D	Verbal	Quantitative	Total
Interview	0.24**	0.16	0.27**	0.38**	0.25**	0.05	0.21**
A	1.00	0.56**	0.47**	0.40**	0.38**	0.11	0.33**
B		1.00	0.57**	0.45**	0.39**	0.15	0.35**
C			1.00	0.62**	0.52**	0.14	0.45**
D				1.00	0.54**	0.18*	0.49**
STAT-verbal					1.00	0.38**	0.90**
STAT-quantitative						1.00	0.73**
STAT-total							1.00

Correlations above were based on the following N: Interview-MASUS=155; Interview-STAT=164; MASUS- STAT=153.

\* P<0.05; \*\* P<0.01

summarized by Cunny and Perri(15). As well, the reading comprehension score of the PCAT was the strongest predictor of first professional pharmacy year GPA for Black and Asian pharmacy students(16). In Australia, the importance of communication skills was shown in an examination of cohorts of entering pharmacy students in which poor written communication skills was correlated with failure to graduate in minimum time(17).

There may well be value in the use of a range of procedures to determine the appropriateness of students' communication skills in the selection process, as the information gained can be used as a starting point for building up an accurate profile of the skill base of an entering cohort. Once the students have commenced the course, this profile can be further enhanced by the addition of information gathered from diagnostic measures of these skills and course assessment. This information can be useful for teaching staff to help them tailor the curriculum to students' needs and monitor student progress(18).

The overall aim of the study was to determine if the introduction of a criterion measuring verbal ability as an admission requirement could serve to predict students' communication skills and, potentially, academic performance and progression. We therefore tested an entry cohort of pharmacy students at the University of Sydney on three measures of communication skills: an interview; a measure of written communication skills; and a multiple choice test which is constructed to measure both verbal and quantitative skills. We were also interested to establish whether the use of multiple measures would provide any advantage over a single measure. We therefore wished to evaluate students' performance on the multiple choice test, the Special Tertiary Admission Test (STAT)(19), in predicting other measures of communication skills. The STAT, like the PCAT, is easily and economically administered and can be considered as a tool for selection or admission procedures.

## METHODOLOGY

Students who entered year one pharmacy in 1997 and completed the year were included in the study. Selection was based on the tertiary entrance rank (TER) for students who entered directly from the final year of high school (N=115). The TER is a rank used solely for university selection, and is determined from the best ten units of subjects taken in the final two years of high school. Applicants with one or more years of university study were selected on the basis of their previous university performance. The communication skills of these students were assessed to determine the associations between an interview, academic written skills and an external university admission

test, the STAT.

The students were graded in an interview (N=170), were assessed for their literacy skills with the MASUS (Measuring the Academic Skills of University Students) test (N=159) (18, 20), and were assessed with the STAT multiple-choice test (Australian Council for Educational Research, Camberwell, Vic, 3124) (N= 167).

In the interviews, an assessor role-played a health professional, such as a pharmacist or medical practitioner, and was interviewed about his or her work by each student. Assessors were academic staff drawn from Pharmacy and the Learning Centre. Two assessors were present at the interview and each assigned the student a global rating based on pre-established criteria from one (poor) to five (excellent) where three, four and five were deemed to represent satisfactory or better oral communication skills. Descriptors for each rating took the following factors into account: interview structure; coverage of topic, including factual and emotional aspects; focus on topic; initiation of topic changes; questioning strategies; follow-up of interviewee's responses; fluency and accuracy of speech; clarity of speech; confidence; and awareness of non-verbal behavior. All assessors were trained using pre-recorded interviews.

The MASUS test is used to diagnose students' strengths and weaknesses in written communication. It requires students to write a short essay based on course related materials provided, and is rated on four criteria:

- A use of source material
- B structure and development of the text
- C control of academic style
- D grammatical correctness.

Ratings ranged from one (poor) to four (excellent) where satisfactory or better ratings are three and four. Unsatisfactory MASUS ratings are taken to mean that a student's progress will be impeded or even delayed by his/her written communication skills.

The STAT is a general ability test used for tertiary admission in which half the questions measure verbal skills and half measure quantitative skills(19). The verbal items involve understanding, reasoning and critical thinking, while the quantitative items involve comprehension, application, decision making and problem solving. The STAT scores available for each student range from 100 to 200 for each part and for the total, together with a percentile rank for each. A score of 100 is awarded for a zero raw score and a score of 200 is awarded for a perfect raw score. The test is calibrated within a year and between years with a network of common items, and the per-

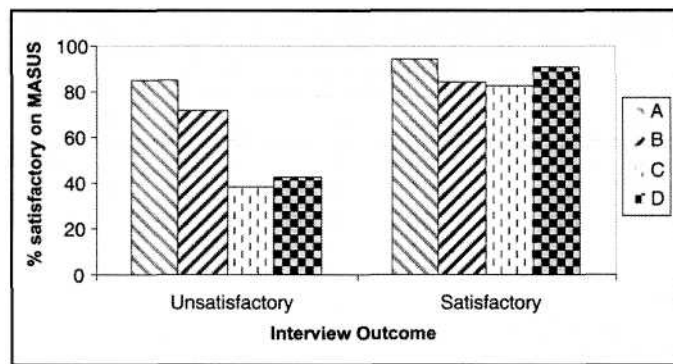
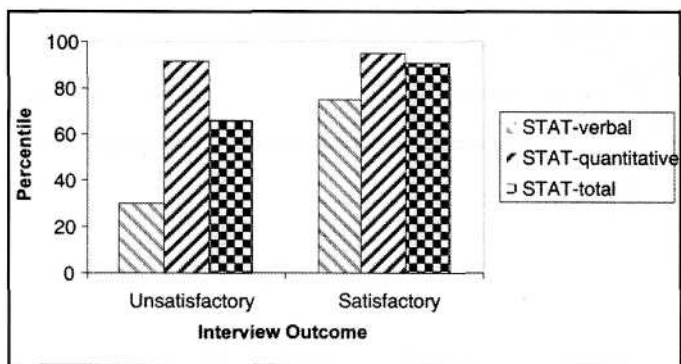


Fig. 1. Comparisons of median STAT percentiles ACER within satisfactory (n= 142) and unsatisfactory (n=22) interview groups.

Fig. 2. Percentage of satisfactory MASUS literacy ratings within satisfactory (n=142) and unsatisfactory (n=22) interview groups.

Table II. Correlations between TER and interview, MASUS ratings, and STAT scores<sup>a</sup>

Interview	MASUS				STAT			
	A	B	C	D	Verbal	Quantitative	Total	
TER	0.07	0.11	0.14	0.19	0.23*	0.24*	0.21*	0.27**

\*P<.05; \*\*P<.01

<sup>a</sup> Spearman correlations except for the Pearson correlation between STAT-verbal and TER. Correlations were based on the following N: Interview-TER=111; MASUS-TER=108; STAT-TER=110.

centile ranks have remained very stable from year to year.

The weighted average mean score (WAM) for the first year courses was statistically tested against the communication measures and the entry selection rank (TER). The WAM is scored as a percentage and is similar to the GPA in its interpretation. Data were investigated by standard exploratory data analysis and logistic regression was used to predict satisfactory versus unsatisfactory interview and MASUS outcomes from the STAT(21). The Mann-Whitney U test was used to evaluate differences in scores for the satisfactory versus unsatisfactory interviewees. Unless otherwise stated, the level of significance accepted was P< 0.05. Multiple linear regression was used to predict the weighted average mark (WAM) for all courses studied.

## RESULTS

Significant correlations were obtained between the various measures of communication skills and the STAT-total score (Table I). Both the verbal and quantitative skills are combined in the STAT-total. The interview ratings were positively correlated with three of the four MASUS criteria and with both the STAT-verbal and STAT-total scores. The MASUS ratings also correlated positively with the STAT-verbal and STAT-total scores. In contrast, the STAT-quantitative score was not significantly correlated with the interview or the MASUS criteria apart from MASUS D, grammatical correctness. Correlations with the high school exit parameter, the TER, which is based on four to six subjects assessed in part by a state wide exam, were also examined as shown in Table II. Again, except for criterion D, the TER was unrelated to the interview or MASUS criteria.

From the interviews conducted (N=170), 14 percent of students were rated one or two and were deemed to have unsatisfactory oral communication skills. This was considerably lower than the percentage (33 percent) of students whose MASUS ratings included at least one unsatisfactory rating (one or two), and who were considered to need assistance with their written communication skills. Of these students, 13 (eight per-

cent) were unsatisfactory in three or all of the four MASUS criteria.

The performance of the satisfactory and the unsatisfactory interview groups on the STAT and the MASUS was compared. Figure 1 shows the comparison of the median STAT-verbal and total percentiles and indicated a significantly higher median rank in the satisfactory interview group (Mann-Whitney U test; STAT-total P<0.01; STAT-verbal P<0.01). No difference was found with the STAT-quantitative rankings. Results for the MASUS assessment were similar to those obtained with the STAT. The Mann-Whitney U test showed, a significantly higher median rank in the satisfactory interview group for each MASUS rating, A - D (P<0.01). Figure II shows the percentage of satisfactory MASUS literacy ratings within the 'satisfactory' and 'unsatisfactory' interview groups.

Using logistic regression, the dichotomous outcome of the interview, unsatisfactory or satisfactory, was investigated using the STAT scores as independent predictor variables (Table III). Both the verbal and the total scores were statistically significant predictors of oral ability. These scores were also predictors of the MASUS outcomes, similarly measured as unsatisfactory or satisfactory (Table IV). The odds ratios for the STAT-verbal and STAT-total ranged from 1.09 to 1.24 and from 1.11 to 1.24 respectively. These indicate that the STAT values are good predictors of communication skill outcomes.

The MASUS criteria scores, TER, interview scores, STAT-verbal and STAT-quantitative scores were investigated as predictors of the WAM. The only statistically significant predictors were the TER, MASUS C and STAT-quantitative (Table V) which together accounted for 41.4 percent of the variance in the WAM. The TER accounted for the major part of this, while MASUS C accounted for the least. The results of this regression are comparable to predictions of GPA, summarized by Cunny and Perri (15), apart from the absence of a real measure of reading comprehension.

## DISCUSSION

The problems of selection of the most suitable students to

**Table III. Prediction of interview outcome from STAT scores using logistic regression (N=164)**

	Odds ratio	95% Confidence limits		P
		Lower	Upper	
STAT-verbal	1.12	1.06	1.19	<0.001
STAT-quantitative	1.04	1.00	1.09	0.07
STAT-total	1.12	1.06	1.22	<0.001

**Table IV. Prediction of MASUS literacy outcome from STAT scores using logistic regression**

MASUS criterion		Odds ratio	STAT 95% Confidence limits		P
			Lower	Upper	
A	STAT-verbal	1.11	1.03	1.20	<0.001
	STAT-total	1.09	1.00	1.19	0.03
B	STAT-verbal	1.09	1.04	1.14	<0.001
	STAT-total	1.11	1.05	1.18	<0.001
C	STAT-verbal	1.17	1.10	1.24	<0.001
	STAT-total	1.17	1.09	1.25	<0.001
D	STAT-verbal	1.24	1.14	1.35	<0.001
	STAT-total	1.24	1.14	1.36	<0.001

**Table V. Prediction of WAM from TER, STAT-quantitative and MASUS Criterion C**

Predictor	Standard coefficients	t	R <sup>2</sup>	F	df	Model P
TER	0.444	5.598				
STAT-quantitative	0.288	3.643				
MASUS C	0.170	2.190				
			0.414	23.90	3,101	0.001

admit to pharmacy schools are substantially different in the U.S. from those faced in Australia, New Zealand and Britain. There is some debate in the U.S. on the most suitable students to admit, and an editorial view has been expressed that choice of students with strength in chemistry and mathematics is probably coupled with relatively undeveloped interpersonal skills(22). The major fraction of the intake in Australia, New Zealand and Britain is directly from high school so that there is no prior tertiary study to serve as a predictor of performance, and procedures rely very heavily on final school exit results. Furthermore, these countries have not relied on any testing, such as that offered by the PCAT, which assesses general verbal and mathematical abilities as well as specific knowledge and understanding of biology and chemistry.

The use of multiple selection criteria is a more complex and a richer process in which desired characteristics of the student cohort can be sought. These characteristics must obviously include measures of aptitude for study of mathematics, biology and chemistry, and should also encompass generic attributes such as problem solving abilities and the capacity for tertiary study. Powis, in referring to the selection of medical students suggests that procedures could also exclude those deemed to be 'conspicuously unsuitable' from the profession(2). The demand for places in pharmacy colleges is high and cohorts of applicants display very good academic skills measured by prior tertiary results or school exit marks. Thus, the use of multiple selection criteria affords an increased likelihood of making the best choices from a large pool of applicants. This should have an impact on student success, reduce attrition and potentially improve the professional services offered by graduates after registration.

The results of the present study indicate that the three measures of verbal aptitude, STAT, MASUS and interview are

correlated. As expected, there were associations between both the STAT-verbal and STAT-total scores, and all four MASUS criteria and the interview. However, the STAT-quantitative score was related only to the STAT-total and MASUS criterion D, grammatical correctness (see Table I). The STAT-total score is a composite mark derived from the quantitative and verbal questions. Its significant association with the MASUS criteria, A, B and C, and the interview grade is obviously due to the contribution of the STAT-verbal questions to the STAT-total score. The association of criterion D with the STAT-quantitative score is probably related to the nature and method of presentation of the items in the STAT instrument. The quantitative items do not merely assess arithmetic skills but address mathematical reasoning skills through the use of text and tables or diagrams. To answer correctly, the candidate is required to read and interpret the text as well as the tables or diagrams. If the candidate has substantial grammatical weakness as detected by the MASUS instrument, they are more likely to misinterpret the question and give an incorrect response. The final school exit result was clearly unrelated to the interview and MASUS ratings except D (Table II), and although it was correlated with STAT scores, it does not have value as a predictor of communication ability. However, it should be noted that the range of TER values was narrow because entry to pharmacy is highly competitive, and those offered a position are in the top decile.

More than half of the students, who were deemed unsatisfactory at the interview, were unsatisfactory in at least three of the four MASUS criteria. It is perhaps not surprising that weaknesses with oral communication skills at an interview were reflected in the students' written communication skills. Although a large proportion of the cohort (about 60 percent) did not use English as the first language at home, nearly all of these students completed their schooling in English. This stu

dent profile is typical of cohorts of Australian university students in health sciences. The relationship between the students' language background and their academic performance was not the focus of this study. However, recent research indicates that tertiary students from non-English speaking backgrounds (NESB) experience difficulties with English which affect their academic performance(23-25).

The utility of the STAT-verbal scores (ranging from 136-178) and the STAT-total scores (ranging from 136-183) as predictors of communication abilities is particularly clearly indicated from the results of the logistic regression. For example an increase in the STAT-verbal score of one is 12 percent more likely to be associated with a satisfactory interview (Table III), and is 11, 9, 17 and 24 percent more likely to be associated with satisfactory A, B, C, and D written communication skill criteria, respectively (Table IV). However, neither of the STAT scores was a significant predictor of first-year pharmacy performance (Table V). This could be partly explained by the fact that the tasks and assessment procedures that were applied for year one courses did not depend heavily on verbal skills. Moreover, none of the written communication skills criteria, apart from MASUS C, was a predictor of the WAM. In contrast to the STAT-verbal and total scores, the quantitative score was a predictor and accounted for 8.9 percent of the variance in the WAM. Quantitative abilities are required for chemistry, mathematics, statistics and pharmaceutical science which together comprise about one half of the year one contact hours and assessment.

In contrast to our results with the STAT-verbal test, early studies of the value of the PCAT parameters showed that both verbal score and reading comprehension predicted pharmacy year one GPA(15), and these also correlated with performance in the licensure examinations(26,27). More recent data for eleven schools in the U.S.(28) showed that the composite PCAT score was a good predictor of first year pharmacy GPA in agreement with the early studies. In one study of pharmacy students from non-white backgrounds, the reading comprehension score was the more important of the two predictors of year one pharmacy GPA(16). There are, however, differences between the PCAT verbal ability and reading comprehension questions(29) and the STAT questions(30) which measure verbal abilities. The former measures non-scientific word knowledge and tests understanding of scientific topics, while the latter probes the student's understanding, reasoning and critical thinking of a wide range of general topics. The STAT questions and the level of reasoning which they demand appear more complex.

Not all studies of the PCAT have found it to be satisfactory. Only relatively small contributions were found in its ability to predict first year pharmacy GPA in an early study(31), and in a study since the simplification of the test in 1993, neither the old nor the new test was a significant predictor of first year academic success(32). Despite the availability of the PCAT for more than 25 years, only about one half of U.S. colleges incorporated it into their admission procedures for 1999, and there is little or no information in the literature describing how it is used. It may be that the reduced value of the test as a predictor of performance later in the course is recognized, and that schools are relying more heavily on the pre-pharmacy GPA, an interview and other parameters(26). In countries where the major group entering pharmacy is directly from the final year of high school there are fewer parameters to rely upon. The STAT offers some value as a general tool developed for use by

universities to determine the suitability and preparedness of applicants for tertiary study.

Our earlier study(17) suggested that better progress of students through the degree program could be achieved if a literacy barrier examination were set, and those who failed to meet the requirements were excluded from the program. However, it would be more equitable and economical to employ one or more measures of communication skills as a filter to eliminate those who are less suitable from eligible applicants in the selection process. As well, the direct use of such instruments to select those with better skills is consistent with the essential nature of the pharmacy profession and the required education programs(11). It may be that the use of measures of these skills to select students more suited to the communication aspects of pharmacy would reduce the attrition rates below the reported 12-15 percent(33). In Australia and New Zealand, the STAT test is available, while in the U.S. the PCAT goes some way towards measuring verbal ability.

To further strengthen the selection process, an interview may be incorporated to assess communication skills as well as non-cognitive factors such as motivation and empathic behavior. However, to gain substantial value, it should be structured(34,35). While selection interviews are effective, they are necessarily time consuming and therefore expensive for faculty staff and for the profession. The interview should be scored and incorporated into a selection algorithm or alternatively, it should be used as a final step to confirm or refuse an offer. The structured interview enables a more informed choice of students with desirable qualities, such as those with appropriate interpersonal attributes, knowledge of the profession and good spoken and aural communication abilities. A major goal of pharmacy education is surely to produce graduates with these qualities and attributes.

Although we did not use the interview as part of the selection process, the use of the post admission interview in this study for diagnostic purposes still yielded useful information about students' communication skills. This information was reinforced by the other measures and enabled pharmacy staff to have an accurate profile of students' skills. It also enabled staff in pharmacy to collaborate with learning support services to introduce timely and appropriate support for those students diagnosed with weaknesses.

## CONCLUSION

Tertiary institutions have the primary responsibility to set entry standards and admission procedures for pharmacy and other courses. In doing so, they address the necessity to choose academically more capable applicants who are best suited to their chosen profession or for the degree. As well, it is desirable that the procedures used are transparent and equitable. The conflict that arises in selecting and assembling these procedures is one of accuracy versus expediency. Institutions wish to minimize waste due to attrition, failure leading to enrolments for more than the minimum time and loss of graduates from a profession for which individuals find themselves unsuited or dissatisfied. The application of multiple selection criteria may reduce wastage but the procedures incorporated into the processes of student selection must address the cost effectiveness of the effort.

The present study has shown that the inclusion of tests or measures of communication skills within a student selection paradigm is likely to identify those who possess superior abilities and are more likely to succeed. Of the three measures studied, the STAT is the most easily and economically admin

istered and has now been incorporated into pharmacy student selection procedures at the University of Sydney. The success in teaching the communication aspects of the course to appropriately selected students can be expected to be greater. It will be important to assess in a longitudinal study the success of such a strategy in producing more suitable practitioners for the pharmacy profession in the future.

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