COMPARISON OF GENDER PERFORMANCE ON AN INTELLIGENCE TEST AMONG MEDICAL STUDENTS

Muhammad Sohail Ali, Muhammad Imran Suliman*, Abida Kareem, Mariam Iqbal
United Nations Integrated Mission in Timor Leste, *Department of Medicine, Mohi-ud-Din Islamic Medical College, Mirpur, Azad Jammu and Kashmir

Background: Since the Government of Pakistan abolished the gender based system of admission to medical colleges, all colleges have seen a huge influx of female medical students, reaching up to 70–80% of all students in some colleges. This trend is still persisting about 15 years after the decision. The objectives of the current study were to assess if there is any significant difference between male and female medical students in scores on a structured, standard, robust test of intellectual ability. Exact venue of the research is withheld for confidentiality. The study was carried out in 2003–2005. **Methods:** A cross-sectional, comparative study with sample size of 150 students, 75 male and 75 female students. Participants signed a consent form, were assessed on Raven's Standard Progressive Matrices (SPM), and data was analysed using SPSS-12. **Results:** On the SPM test, the male students as a group, scored higher than the female students as a group, the difference was small but statistically significant (p=0.015). **Conclusion:** Performance on the SPM inclines in favour of the male gender group. More research needs to be carried out into the other possible factors that could explain the gender disparity in medical colleges in Pakistan.

Keywords: Gender, intelligence, performance, IQ Scoring

INTRODUCTION

In the early 1990s a decision was made by the Government of Pakistan that permanently changed the face of medical education in the country. Before then, admission in medical colleges was influenced, among other things, by the gender of the student. There were limited seats for female students, and the larger proportion of seats was for male candidates. Since admission was based on Higher Secondary School Certificate (HSSC) examination results, this quota system resulted in a gaping difference between the merit levels for the two genders, with the merit for girl students sometimes exceeding that for the Male students by 75–100 marks. The government abolished the gender based quota system, and a single merit level was set for all applicants. The effects of this decision have been profound. All medical colleges witnessed an immense influx of female students, with the female to male ratio sometimes reaching 75:25, the merit level soured, and we were eventually producing many more female than male doctors. Later on, the merit system was replaced by a competitive entry test, with final admission being based on a combination of HSSC results and entry test results. This change did not have any significant impact on the gender disparity being witnessed, with female students still outnumbering male students very significantly. The perception that this may be a transient phenomenon has also been disproven with the trend still persisting about 15 years after the initial policy change. The long-term consequences of this process are debatable, but some interesting observations and intriguing questions are highlighted by these developments.

A few things became very obvious in this situation. Female students were uniformly performing better than male students in both the board examinations and in medical colleges, and this hasn't changed over the last 15 years. This situation raises numerous academic and research questions. Are female students more intelligent or capable than male students, or does our examination system put them at some advantage? Are they more hardworking, or is there some other reason for their consistently better performance? With this background scenario, we decided to embark on a study that could shed some light on the situation.

The current article is the first of a series; based on the preliminary data from a wide study that attempted to answer the following questions: (1) Do female medical students perform systematically better than male students on unbiased intelligence tests? (2) How do the scores achieved on these intelligence tests correlate with students' scores in board examinations, and medical college entry test results?

The specific objective of the current research article is to assess whether there is any statistically significant difference between male and female medical students in scores on a structured, standard, robust test of intellectual ability.

MATERIALS AND METHODS

The study methodology was a cross-sectional, comparative research. We aimed for a sample size of 150 students, 75 male and 75 female students. The research was carried out in 2003–2005 in a well reputed medical college based in an urban city of Pakistan.

Medical students from 1st and 2nd years were randomly selected through their college roll-numbers. They were explained about the research, and were

requested to sign a consent form. The subjects were then assessed for intellectual ability using the Standard Progressive Matrices (SPM). The results were then compiled, and statistical analysis was carried out. The software package SPSS-12 was used to apply chi-square test on the categorical data generated by the SPM, and the level of statistical significance was set at $p \leq 0.05$.

Standard Progressive Matrices (SPM), developed by Raven in 1938, is a measure of intellectual ability. It has been revised with time, and has three versions (coloured, standard, and advanced).[1,2] It specifically measures ability to form perceptual relations and to reason by analogy. (1) Since it is not influenced by language, it does not require translation. It is primarily an extensive pattern completion test, and norms have been developed for a number of populations, including USA, Mainland China, India, and Australia etc. [1–3] It displays strong internal consistency (0.8–0.95) and test-retest reliability (0.6–0.9);[4,5] besides good correlation with other standard IQ tests, e.g., the Stanford Binet, the WISC-R, and the WAIS-R, ranging from 0.54–0.86.[1,2]

Individual scores are plotted into one of the following categories: GRADE I: Score lies at or above 95th percentile. [Intellectually superior]. GRADE II: Score lies at or above the 75th percentile [Definitely above average in intellectual capacity]. GRADE III: Score lies between the 25th and 75th percentiles [Intellectually average]. GRADE IV: Score lies at or below the 25th percentile [Definitely below average in intellectual capacity]. GRADE V: Score lies at or below 5th percentile [Intellectually impaired].[1,2]

RESULTS

The mean age of the students was 19±1.5 years. The SPM score categories are shown in Table-1 and the graphical representation is provided in Figure-1.

Table-1: Standard Progressive Matrices (SPM) grades of the study subjects

	Female (n=75)		**Male** (n=75)		
SPM GRADE	No.	%	No.	%	*p*
I ≥95 percentile	3	4	9	12	0.02
II ≥75 percentile	43	58	44	59	0.09
III 25–75 percentile	29	38	22	29	0.01

Statistical significance of difference ($p<0.05$)

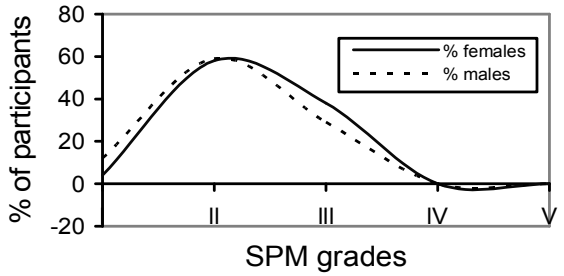

Figure-1: Comparison of SPM categories among male and female students

The results obtained in the study revealed that significantly more male students scored in the 'intellectually superior' category (Grade I) as compared to the female students. There were roughly the same percentage of females and males in the 'above average' category (Grade II), while significantly more females scored in the 'intellectually average' category (Grade III). When we plotted the data in a graphical chart, we saw that the scores of both groups fell into a bell curve (which was expected) but the bell curve for the male students was significantly shifted to the left (towards the higher score range) as compared to that for the females. The summary of the results is that, on the Standard Progressive Matrices test, the male students as a group, scored higher than the female students as a group, and the difference was statistically significant (p=0.015).

DISCUSSION

The results of this study need to be interpreted and understood in the light of previous research on the subject.

Studies carried out in various parts of the world have revealed a gradual increase in the proportion of female students in medical schools, but this has never been as drastic as that seen in Pakistan. Hall *et al* examined trends in applicants to US medical schools from 1974–1999 for changes in demographics, and found that female applicants increased from 20% of the pool in 1974 to 45% of the pool in 1999.[6] Similar gradual increase have been documented by Hinkley[7] in Florida, Colborn *et al*[8] in South Africa , and again by Cooper[9] in Wisconsin , but as noted above, none of these changes have been as marked as that seen in Pakistan during the last 15 years. Furthermore, the possible reasons for such a major shift are also difficult to identify from the available literature.[6,8] The possible causative factors could be biological, environmental or social, as explained below.

Haier, Luders and their associates carried out research studies on brain anatomy, general intelligence, and gender differences.[10–12] They reported that the brains of men and women do differ physically. Men have larger brains than women by about 8–10%, but the female brain often has a larger corpus callosum. Women's brains were also seen to possess deeper fissures and sulci. At a cellular level, women had nine times more white matter in areas of the brain associated with intelligence than men did, while men had six times more grey matter in these areas. But since the men and women achieved similar IQ test results, the researchers concluded that the different types of brain architecture lead to comparable overall intellectual performance.

Other studies consistently show that the average IQ scores of men and women are equivalent.[13–15] However, some gender-specific findings persist; viz. men tend to perform better on spatial questions, while women outpace men on reading and other verbal skills. Men

score more at the extremes of IQ scoring — both high and low.

Morley and Toga have focused on the possible genetic influences and their interaction with the endocrine system.[16,17] Sex hormones, such as testosterone and oestrogen, appear to have a role in brain development and function. Furthermore, cognitive abilities in one individual can change along with hormonal fluctuations. This has been documented throughout the menstrual cycle for women and even daily and seasonally in men as testosterone levels change.

So, what could account for the small but significant gender difference that we saw in our study? There are a number of possible options; (1) Because of the relative male advantage in spatial tasks, the SPM (being a pattern completion test) could have contained a small systemic bias in their favour, or (2) It was seen that the main difference between the SPM scores was in the highest grade, which could reflect the same finding as reported above, that males are over-represented in the extremes of the IQ scores. (3) The difference could be the result of several factors acting together (menstrual cycles, environmental and social influences, etc). (4) The finding could be a statistical error due to a small sample size, or (5) It could be a real difference documented by the study.

But that brings us to another question. If the male students performed better, or at least as well as the female students, how do we account for the gross over-representation of female students in medical colleges that we set out to study? One thing we can say, with some certainty now, is that it is not due to a systematic difference in intellectual abilities. That means we will have to look elsewhere for the answers. Other possible factors could be social influences (the greater acceptability of ladies in the medical profession versus other fields), environmental factors (female students being less influenced by negative external and peer pressures leading male students to activities besides studying and career building), or even psychological factors (female students having to prove themselves in a male dominated society may become more hardworking and motivated in the process) etc. but these are all untested hypotheses and research questions for the future.

CONCLUSIONS

In contrast to the huge influx of female students in medical colleges, the systematic difference in performance on the SPM inclines in favour of the other gender group.

More research needs to be carried out into the other possible factors as discussed above, which could explain this interesting phenomenon. Future research studies in this subject need to include many more possible variables, since multiple influences may be acting in confluence to give rise to this difference. Furthermore, the sample size in future studies would have to be larger to arrive at more robust results.

REFERENCES

1. Nunnally JC, Bernstien IH. Psychometric Theory. 3rd ed. New York: McGraw-Hill; 1994.
2. Sadock BJ, Sadock VA. Comprehensive Text Book of Psychiatry. 7th ed. New York: Lippincott Williams & Wilkins; 2000.
3. Anastasi A. Psychological testing. 6th ed. New York: McMillan; 1998.
4. Buros OK. The ninth mental measurement yearbooks. New Jersey: Gryphon Press; 1985.
5. Kahn HF. Application of latent trait theory to Raven's standard progressive matrices. Dissertation Abstracts International. 1985;46:1559–60.
6. Hall FR, Mikesell C, Cranston P, Julian E, Elam C. Longitudinal trends in the applicant pool for U.S. medical schools, 1974-1999. Acad Med 2001;76:829–34.
7. Hinkley RE. Changes in profiles of students admitted to Florida allopathic medical schools 1990–1996. J Fla Med Assoc 1998;84:578–82.
8. Colborn RP, Kent AP, Leon B. The changing medical student population at the University of Cape Town. S Afr Med J 1995;85:256–61.
9. Cooper RA. Impact of trends in primary, secondary, and postsecondary education on applications to medical school. I: gender considerations. Acad Med 2003;78:855–63.
10. Haier RJ, Jung RE, Yeo RA, Head K, Alkire MT. The neuroanatomy of general intelligence: sex matters. NeuroImage 2005;25:320–7.
11. Haier RJ, Jung RE, Yeo RA, Head K, Alkire MT. Structural brain variation and general intelligence. NeuroImage 2004;23:425–33.
12. Luders E, Narr KL, Thompson PM, Rex DE, Jancke L, Steinmetz H, *et al*. Gender differences in cortical complexity. Nat Neurosci 2004;7:799–800.
13. Benbow CP, Lubinski D, Shea DL, Eftekhari-Sanjani H. Sex differences in mathematical reasoning ability: Their status 20 years later. Psychological Science 2000;11:474–80.
14. Fingelkurts AA. Exploring Giftedness. Advances in Psychology Research, Vol 9. Nova Science Publishers; 2002.p 1377.
15. Leahey E. Gender differences in mathematical trajectories. Social Forces 2001;80:713–32.
16. Morley KI, Montgomery GW. The genetics of cognitive processes: candidate genes in humans and animals. Behav Genet 2001;31:511–31.
17. Toga AW, Thompson PM. Genetics of brain structure and intelligence. Annu Rev Neurosci 2005;28:1–23.

Address for Correspondence:

Dr. Muhammad Sohail Ali, Consultant Psychiatrist & Stress Counselor, United Nations Integrated Mission in Timor Leste, Dili, Timor Leste (East Timor). **Tel:** +670-3312210, +61(8)89463900, +212-9630099/ Ext:/5805, **Cell:** +670-7230612
Email: ali173@un.org , sohailali98@yahoo.com, sohailali98@gmail.com