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## RESEARCH ARTICLE

# METACOGNITIVE AWARENESS: A ROAD TO ACADEMIC SUCCESS

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**ABSTRACT**

**Background:** Real knowledge is to know one's ignorance. The ability to identify the existence of lacunae in the learning process by a learner is due to metacognitive awareness. Metacognitive awareness (which is the knowledge of one's own cognitive process) development is imperative to assist a learner perform optimally, particularly in assessments. A medical student, burdened with the pressures of never ending academics would be wise to cultivate metacognitive skills. In order to cultivate these skills, a baseline evaluation of the existing skills is necessary.

**Aims:** To analyse the role of metacognitive awareness on the academic scores in medical students. The effect of gender on metacognitive awareness and academic scores were also analysed. In this cross-sectional study, all first year medical students studying in a medical college in South India were included using the complete sampling method.

**Methods:** Metacognitive awareness inventory, a validated questionnaire, was administered to all the students. The average academic scores for the whole of first year of medicine in all the subjects were calculated.

**Results:** The results were statistically analysed using ANOVA and independent t test and the software used was SPSS version 22. Depending on the metacognitive awareness scores, students were grouped into 3 categories; low (<50%), average (50-80%) and high (>80%). Awareness was compared to the academic scores and the difference in groups was found to be significant ($p<0.01$). A gender wise significance was also noted in the low ($p<0.05$) and average ($p<0.01$) categories.

**Conclusion:** Metacognitive awareness has an important role to play in determining the academic outcome. Hence, incorporation of metacognitive awareness strategies in the medical curriculum is recommended.



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## INTRODUCTION

'Real knowledge is to know the extent of one's ignorance' – Confucius

Education imbibes in people the ability to develop their skills and expertise thereby alleviating ignorance. Through education, one realises, not only one's own potential but also enables one to use this potential for self development and for the benefit of the society. Job guarantees, career progress and a good quality of life- are all dependent on academic outcome and hence the pressure on the student to perform well. Academic outcome is to an extent determined by the goals set by the individual (Coutinho, 2007). These achievement goals may be performance driven or mastery driven (Dweck and Leggett, 1988). Formulation of goals, in turn are dependent on the metacognitive awareness of the individual. Metacognitive awareness is the latest buzz word in educational psychology.

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According to Encyclopedia, metacognition is defined as 'An educational process that incorporates knowledge about one's abilities, the demands of given tasks, and potentially effective learning strategies' (Miller-Kaene, 2016). It is seen as a central contributor to different aspects of cognition like memory, problem solving, assessment, attention and intelligence (Kruger and Dunning, 1999). Research is abound regarding metacognition awareness, but the most popularly accepted model is the two factor model proposed by Schraw and Dennison which divides metacognitive awareness into two components namely metacognitive knowledge and metacognitive regulation, but a constant interplay between these components makes it nearly impossible to study the effect of each individually on academic performance (Schraw and Dennison, 1994). But suffice to say, that there is a body of evidence which highlights the importance of the role played by metacognitive awareness on academic performance (Hong *et al*., 2015; Zulkiply, 2009).

In the first year of medical training, explicit training in self efficacy is highly recommended since there occurs a transition

from reliance on parental guidance to development of personal responsibility and self regulated learning (Mytkowicz *et al*., 2014). A student as a learner undergoes metamorphosis from a dependent to inter dependent and finally an independent lifelong learner which is a major requirement of this medical profession. Studies also show that there might be an influence of gender on the metacognitive awareness with females being more aware than males (Panchu *et al*., 2016). The present study was conducted with the aim in mind of evaluating the role played by self reflection or metacognitive awareness on the academic performance of first year medical students.

## MATERIALS AND METHODS

This cross sectional study was done in Jubilee Mission Medical College and Research Institute in South India for a period of one year on 100 first year medical students using the complete sampling method. After obtaining institutional ethics clearance (Institutional Ethics Committee approval number: 23/ 16/ IEC/ JMMC&RI) the students were informed about this study and 86 students gave the consent to participate. The metacognitive awareness inventory was administered to the students after giving clear instructions during a theory hour. It took them approximately 20 minutes to fill the questionnaire.

**Metacognitive awareness inventory**: It is a 52 item based validated tool used to assess metacognitive awareness. Of these 17 questions assess metacognitive knowledge and 35 questions assess metacognitive regulation which are the components of metacognitive awareness. The questions are of the true and false pattern with the score of 1 mark for each answer that indicates the option true (Schraw and Dennison, 1994). All the results were tabulated and the scores obtained were divided into percentages and the students classified into the following categories; low (score <50%), average (50-80%) and high (>80%) scorers.

**Academic scores**: the average score of all the three first year subjects in the Indian medical curriculum (Anatomy, Physiology, Biochemistry) were calculated and the overall performance determined. The mean of the overall score was used for analysis. This provided a fairly robust measure of success in the university exams. The results so obtained were analysed.

**Statistical analysis**: The metacognitive awareness of medical students was tabulated and compared with the academic scores. The effect of gender was also analysed. The components of metacognition were also compared with academic scores. The tests used were ANOVA and independent t tests; analysis was done on Statistical Package for Social Science (SPSS) version 22.

## RESULTS

The study included 86 participants of which 49 were females.

**Table 1. Metacognitive awareness and academic scores of medical students in India**

| Metacognitive awareness scores | N | Academic Mean | Std. Deviation | p value |
|---|---|---|---|---|
| <50 | 11 | 63.94 | 8.44 | 0.01** |
| 50-80 | 70 | 62.95 | 7.92 | |
| >80 | 5 | 68.67 | 10.96 | |

**ANOVA p<0.01

(Table 1) shows the classification of metacognitive awareness scores into 3 categories (<50, 50-80 and >80 and is compared to the academic mean obtained by calculating the average of all the marks secured in all subjects of the first year MBBS curriculum (p<0.01) using ANOVA. The number of students was 86 of both genders.

**Table 2. Gender wise distribution of Metacognitive awareness and academic scores of medical students in India**

| Metacognitive awareness scores | Gender | N | Academic Mean | Std. Deviation | t value | df | P value |
|---|---|---|---|---|---|---|---|
| <50 | Male | 3 | 54.44 | 9.77 | -3.13 | 9 | 0.012* |
| | Female | 8 | 67.50 | 4.63 | | | |
| 50-80 | Male | 32 | 59.95 | 7.10 | -3.09 | 68 | 0.003** |
| | Female | 38 | 65.48 | 7.77 | | | |
| >80 | Male | 2 | 65.84 | 8.25 | -0.42 | 3 | 0.702 |
| | Female | 3 | 70.56 | 13.88 | | | |

* p<0.05; **p<0.01

(Table 2) demonstrates the influence of gender on the metacognitive awareness and academic scores. Independent t test has been used for analysis. The table shows a higher academic mean score in females in each category of metacognitive awareness scores while high significance is seen in the 50-80 category (p<0.01). The number of females studied was 49 while the rest were males.

**Table 3. Comparison of metacognitive components on academic scores in males**

| Male Gender | Score | N | Mean | Std. Deviation | p value |
|---|---|---|---|---|---|
| Metacognitive knowledge scores | <50 | 4 | 55.42 | 3.70 | 0.001*** |
| | 50-80 | 25 | 60.07 | 7.75 | |
| | >80 | 8 | 61.25 | 7.60 | |
| Metacognitive regulation scores | <50 | 5 | 58.66 | 9.67 | 0.0001*** |
| | 50-80 | 31 | 59.62 | 6.97 | |
| | >80 | 1 | 71.67 | | |

ANOVA ; p<0.001

(Table 3) shows the academic scores in the components of metacognition in male medical students. A high significance is seen in both metacognitive knowledge and regulation scores (p<0.001, p<0.0001 respectively) implying the importance of the role played by metacognitive awareness components on a student's academic performance. The data was analysed by ANOVA.

**Table 4. Comparison of metacognitive components on academic scores in females**

| Female Gender | Score | Mean | N | Std. Deviation | p value |
|---|---|---|---|---|---|
| Metacognitive knowledge scores | <50 | 14 | 65.12 | 8.95 | 0.009** |
| | 50-80 | 29 | 65.57 | 6.83 | |
| | >80 | 6 | 71.11 | 8.21 | |
| Metacognitive regulation scores | <50 | 6 | 63.89 | 4.90 | 0.0001*** |
| | 50-80 | 40 | 66.29 | 7.73 | |
| | >80 | 3 | 68.33 | 13.33 | |

ANOVA ; ** p<0.01;*** p<0.001

In (Table 4) we see the comparison of metacognitive components with academic scores in female medical students also showing a high significance in both the components of metacognitive awareness (p<0.01, p<0.0001 respectively using ANOVA).

## DISCUSSION

It is not ignorance but the ignorance of ignorance that is the death of knowledge (Dunning *et al*., 2003). The first year of medicine is a transitional phase from school to college wherein the student is exposed to new difficulties like stricter schedules, numerous teachers, newer styles of teaching coupled with the pressure to perform well; all leading to demotivation. In fact, it maybe that the student is not optimally utilizing his learning potential or has not fully developed his metacognitive abilities. This is generally known as 'sleeping potential' (Veenman *et al*., 2006). Our role as a successful educator is to tap and harness this sleeping potential and hence this demotivated student becomes an agile learner. With this aim in mind, a large study is being conducted in our institution focussing on the metacognitive awareness and reading strategies of medical students and their cumulative academic performance in the first year of MBBS. (Table 1) shows the classification of metacognitive awareness scores into low (<50%), average (50-80%) and high (>80%) categories and the mean academic score in each category. On comparing the low and average scorers, the average scorers performed poorer academically (mean=62.95) than the low scorers (mean=63.94). This shows that the presence of awareness alone may not be sufficient to score well, exposing the role of reading strategies in the students (Panchu *et al*., 2016). The high scorers in metacognitive awareness have a better academic outcome which implicates the role of the presence of awareness and reading strategies for success in exams. Metacognitive awareness also plays a central role in learning. The traditional method of teaching involves didactic lectures which a student must listen to. The fact whether the student 'hears' or 'listens to' a lecture is reflected in his academic scores because 'hearing' differs from 'listening'. Listening involves the process of thinking, which is conscious awareness / metacognition (Lundsteen, 1979). The usage of specific metacognitive strategies makes a learner a skilled reader (Winnie, 2010). One can safely predict that a skilled reader will be a good performer.

The gender wise distribution of metacognitive awareness and academic scores (Table 2) clearly shows that females outperform males in each category which is statistically significant. Our findings are consistent with the findings of Narang *et al* and Iri *et al*. and not in accordance with Sawar *et al* and Rekha Rani *et al*. (Narang and Saini, 2013; Yahya, 2013; Sarwar *et al*., 2009; Rani and Govil, 2013). The answer to this enigma may lie in tradition. Traditionally India has a male dominated society and the man shoulders the responsibility of the well being of his family. As academic outcome directly relates to his welfare and that of his family's', the burden to perform well also has to be borne by him. This may lead him to set achievement goals which are performance based and not mastery based. Mastery based goals are those which helps a person attain mastery of content and these have been linked to good metacognitive awareness. While performance goals focus only on scores, it does not create competencies (Dweck and Leggett, 1988). It is advisable to assess the achievement goals of this same subset of population and in a larger sample size to get a clearer picture. The two factor metacognitive awareness model followed in our study classifies metacognitive awareness into metacognitive knowledge and metacognitive regulation (Schraw and Dennison, 1994). In our previous study, we have already established that men have better knowledge and women better regulation (Panchu *et al*., 2016). Hence in this study, we thought it wise to compare the metacognitive knowledge and regulation scores within the genders (Table 3 and 4). On comparing the males, most of them fall in the average category for both the components and there is a statistically significant difference. This is also seen in the females. But our finding points to an interesting observation. On comparing the academic scores with the components of metacognition, we find that those who had better regulation had better academic scores (Panchu *et al*., 2016). Metacognition knowledge in males was higher than regulation, hence regulation forms an important criteria in predicting their academic outcome. Females had better metacognitive regulation (Panchu *et al*., 2016). But in women, metacognitive knowledge was the determining factor for good academic performance (Table 4). Divya Narang *et al* and Yahya Iri *et al* also note that metacognitive knowledge is better than regulation in their study population, but for improving academic scores, regulation plays the key role in males and knowledge in females which instigates the need for further investigations (Narang and Saini, 2013; Yahya, 2013).

### Conclusion

As educators, especially in the medical field, the responsibility lies on us to create awareness among medical students of their ignorance and to device strategies to help them overcome it. It is suggested that metacognitive awareness training be imparted first to the teachers who can further incorporate these strategies in their students to create doctors who are competent learners, readers, performers and practioners.

**Ethics clearance:** Obtained from the institution ethics committee.

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