

**ORIGINAL RESEARCH****Study of the perceptions of crossword puzzle as an active tool of learning for I year MBBS students: An original research****<sup>1</sup>Dr. Nirmala D, <sup>2</sup>Dr. Hema. N, <sup>3</sup>Dr. Swetha B, <sup>4</sup>Dr. Deeepa L N**<sup>1</sup>Professor and Head, Department of Anatomy, J.J.M Medical College, Davangere-04, Karnataka, India<sup>2</sup>Professor, Department of Anatomy, ESICMC & PGIMS, Rajajinagar, Bangalore-10, Karnataka, India<sup>3</sup>Associate Professor, BGS Global Institute of Medical Sciences, Global Health City Kengeri, Bangalore, Karnataka, India<sup>4</sup>Professor, Department of Community Medicine, East Point Medical College, Bangalore-10, Karnataka, India**Corresponding author**

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**Abstract**

**Background:** The traditional method of teaching Anatomy to 1<sup>st</sup> year medical students is by lectures and practical demonstrations. Students may find it difficult to concentrate and get complete involvement to learn by the didactic lectures. The challenge faced by students is the struggle in remembering and retaining the information. The active learning and involvement of the students is the need of the hour to make it easier in learning and remembering in a short duration. Hence adjuncts like crossword puzzle have been included in our study and the perceptions of the student have been documented.

**Objectives:** To determine the perceptions of the students on using crossword puzzle as a tool in active learning of Anatomy

**Methodology:** Crosswords built using free Internet resource were given to the 1<sup>st</sup> year Medical students of 2015 batch in groups of 5 each. The first group to successfully complete the puzzle was rewarded. Student perceptions in solving the crossword were examined with a questionnaire with both open and close ended questions and measured on Likert scale

**Result and Conclusion:** Students found crossword puzzle can be applied as problem solving approach which involved recall of the subject.

Majority of the students agreed crossword puzzle leads to active involvement of all participants in a group

**Keywords:** Crossword, Medical students, Active learning, Perceptions

**Introduction**

Anatomy is taught to 1<sup>st</sup> year medical students traditionally by lectures and practical demonstrations. Students find it difficult to recall & reproduce various terminologies which are presented to them for the first time in medical college. Also they are expected to learn a lot in a short duration of time where the first year course is reduced to less than a year in reality. Hence active involvement of students in learning is emphasised to achieve the goal.

Active learning promotes acquisition of skills & attitudes such as communication skills, cooperative learning, critical thinking & self directed learning. Researchers have advocated use of games & puzzles in classrooms as active learning formats. <sup>[1]</sup> Students have been found to prefer games & other alternative methods over traditional methods. <sup>[2]</sup> The Objectives of the study is to use crossword puzzle as an active learning tool and to evaluate students perception about the same. Crossword puzzles have been shown to be effective tool in learning & increasing vocabulary. Since use of crosswords in anatomy as active tool is hardly reported, the present study is undertaken.

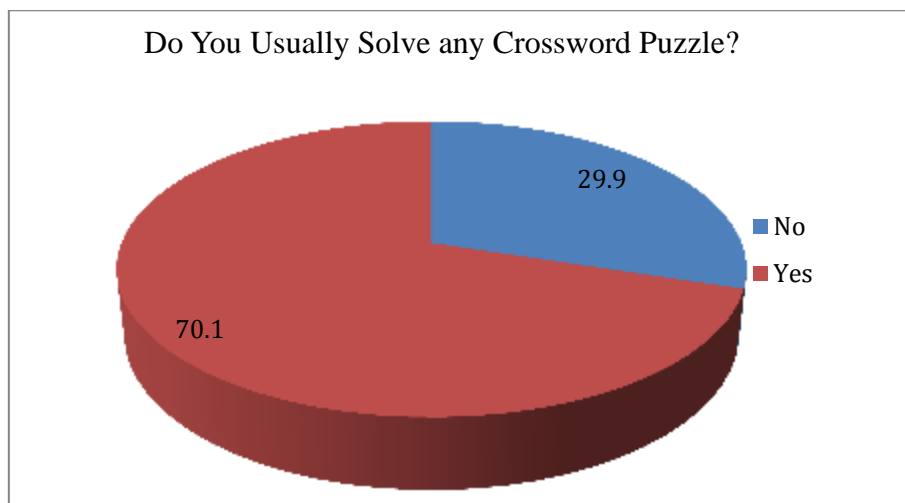
### Materials and Methods

This study was conducted in a Medical College in Karnataka among first year Medical students. It is a cross sectional study. The study was conducted on 1<sup>st</sup> year medical students of 2015-16 batch. A topic which was already taught and dissected during regular dissection hours was selected. A crossword puzzle was designed using free online resource. After obtaining written consent, 67 students were given crossword puzzle to solve. They were divided into 11 groups of six each, wherein the 11<sup>th</sup> group consisted of 7 students. Time allotted was 20 min. Once all the groups completed and submitted the puzzle, the answers were disclosed and discussed. Then a pre validated questionnaire was administered to them. Feedback was taken from the students to evaluate their perceptions about crossword puzzle as an active learning tool using 5 point likert scale where 1 = Strongly Disagree, 2= Disagree, 3=Neutral, 4=Agree and 5=Strongly agree. The collected data was coded and entered into Microsoft excel and analysed. Percentages and proportions were calculated. Mean scores and standard deviation for each question on perceptions using Likert scale was also calculated.

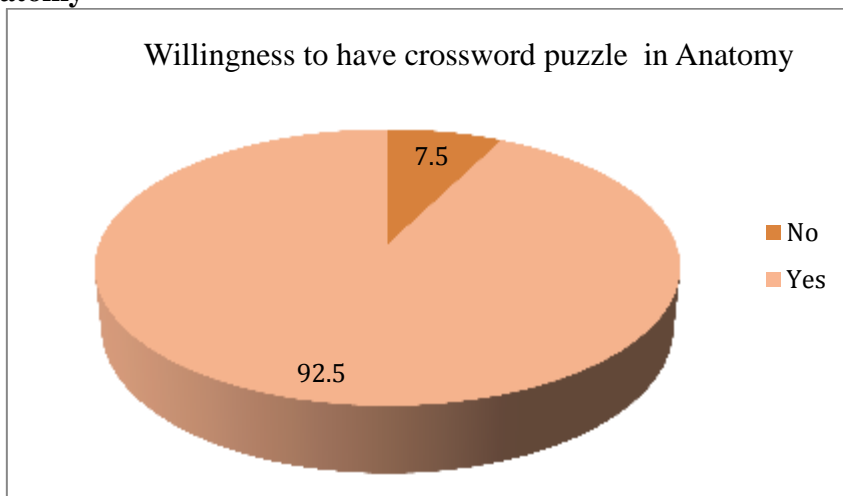
### Results

Total of 67 first year MBBS students participated in the study. Among them, 38 (56.7%) students were girls, 19 (28.3%) were boys and 10 (16%) of them had not specified the gender in the questionnaire. It was found that about 70% of the students usually had the habit of solving crossword puzzle. The study also showed that majority of the students (92.5%) wanted to solve crossword puzzles in Anatomy for other topics as well.(Figure 1 & 2) Around 49.3% of the students used to solve the crossword atleast once a month and around 13.4% of them used to solve weekly. On the other hand 43.3% of students told that they want to solve puzzle in Anatomy on a weekly basis (Figure 3 & 4) .

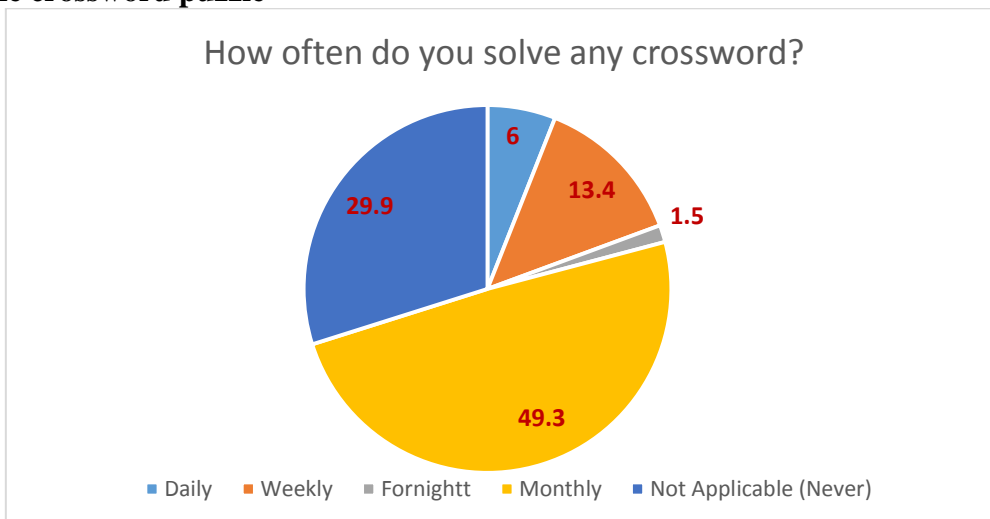
**Figure 1:- Piechart showing the percentage of students who used to solve crossword puzzle**



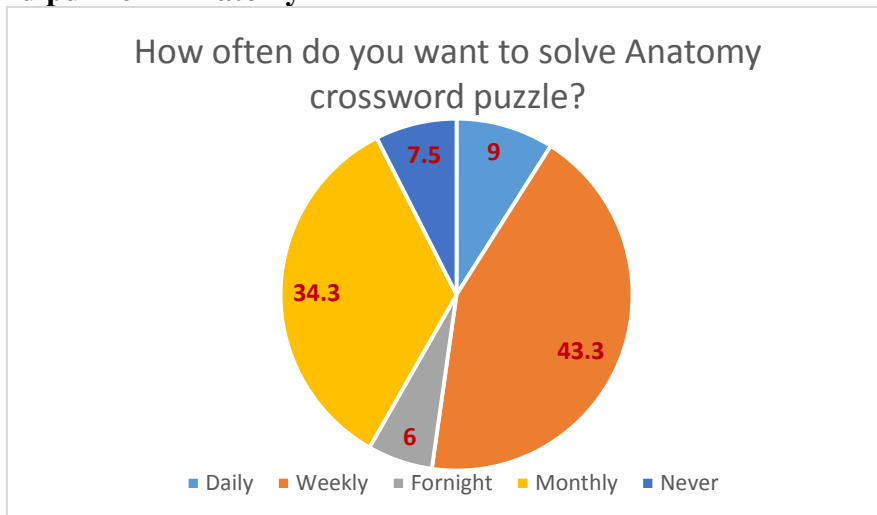
**Figure 2: Piechart Showing the percentage of students willing to solve cross word puzzle in Anatomy**



**Figure 3: Piechart showing the percentage of the students on how often they used to solve the crossword puzzle**



**Figure 4: Piechart showing perceptions of students on how often they wanted to solve the crossword puzzle in Anatomy**



According to study participants, 20 (29.9%) of them found it interesting and 13 (29.4%) felt it to be extremely interesting to solve crossword puzzles in general. Among those who rated interesting or extremely interesting; male (58%) students were comparatively higher than female (28%) students who felt the same. (Table 1)

**Table 1: Rating of solving any Crossword Puzzle by students**

| Gender        | Not Applicable   | Extremely Dull 1 | Dull 2       | Neutral 3        | Interesting 4    | Extremely Interesting 5 |
|---------------|------------------|------------------|--------------|------------------|------------------|-------------------------|
| Female        | 4 (10.5)         | 1 (2.6)          | 0            | 16 (42.1)        | 9 (23.7)         | 8 (2.1)                 |
| Male          | 4 (21.1)         | 1 (5.3)          | 1 (5.3)      | 2 (10.5)         | 9 (47.4)         | 2 (10.5)                |
| Not Specified | 2 (20)           | 1 (10)           | 1 (10)       | 1 (10)           | 2 (20)           | 3 (30)                  |
| <b>Total</b>  | <b>10 (14.9)</b> | <b>3 (4.5)</b>   | <b>2 (3)</b> | <b>19 (28.4)</b> | <b>20 (29.9)</b> | <b>13 (19.4)</b>        |

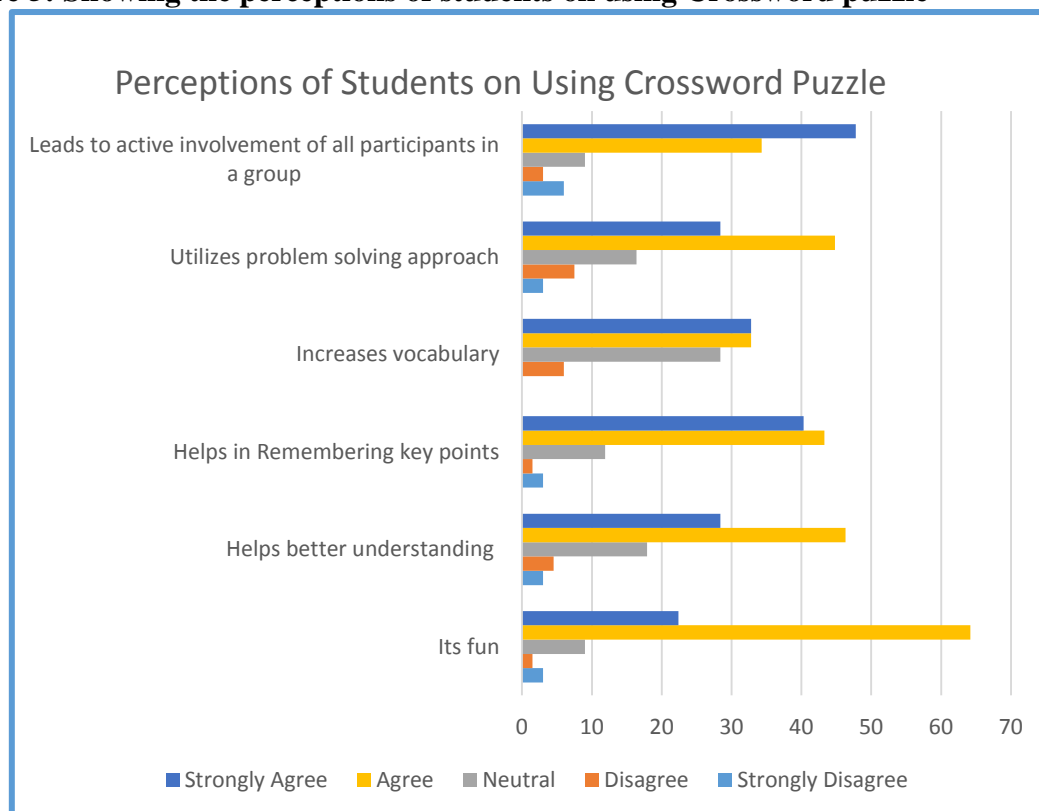
Students feedback on their perception of solving crossword puzzle was collected using 5 point Likert scale. We found that around 60 - 80% of the students agree or strongly agree to most of the statements given such as it is fun to solve puzzles, it helped in remembering key points, utilizes problem solving skills and helped in active involvement of all the participants. More than 1/3<sup>rd</sup> of the students either answered as neutral or disagreed to the statement that 'solving puzzles increases vocabulary' especially boys disagreed to this statement than girls. About 1/4<sup>th</sup> of students were neutral or disagreed that solving puzzles utilizes problem solving approach. 17 students were not sure or disagreed that solving crossword would help in understanding the topics better. (Table 2 & Figure 5) Mean score on the perceptions of students showed that it was above 3.5 implying that all the statements were agreed or strongly agreed by the study participants. (Figure 6)

**Table 2: Students Perceptions on using crossword puzzle as a teaching learning tool in Anatomy**

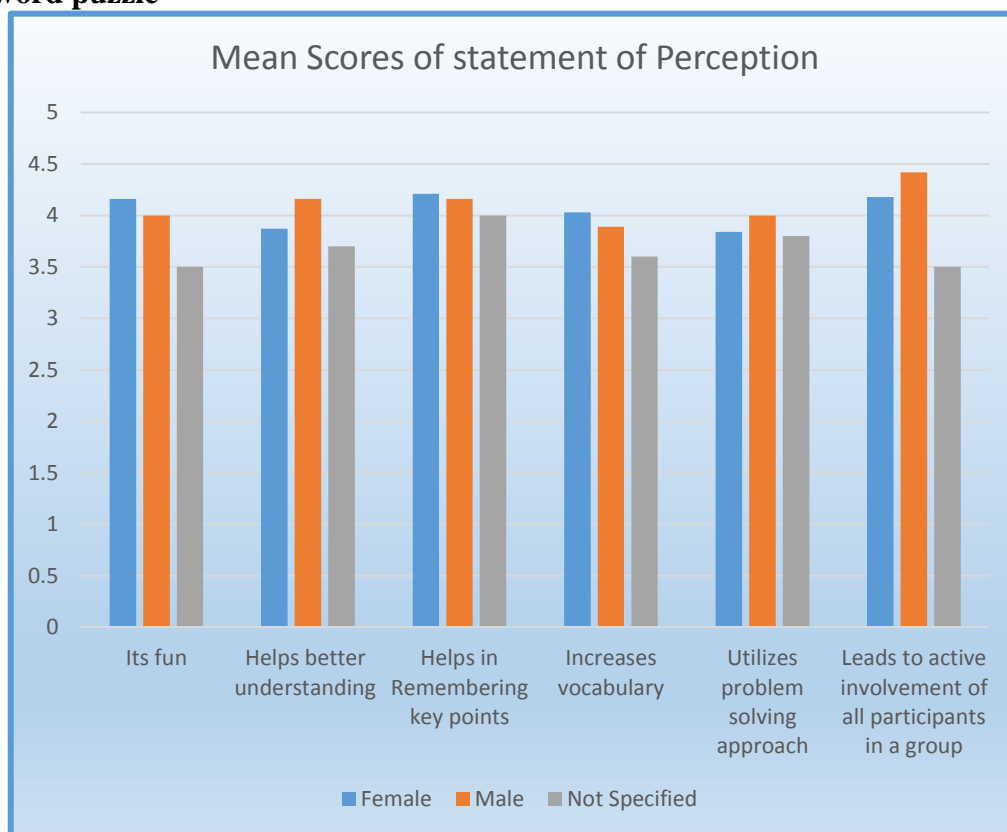
| Statements  | Sex           | Strongly Disagree | Disagree       | Neutral          | Agree            | Strongly Agree   |
|---|---------------|-------------------|----------------|------------------|------------------|------------------|
| Solving crossword puzzle is fun                                       | Female        | 0                 | 0              | 3 (7.9)          | 26 (68.4)        | 9 (23.7)         |
|   | Male          | 1 (5.3)           | 1 (5.3)        | 0                | 12(63.2)         | 5 (26.3)         |
|   | Not Specified | 1 (10)            | 0              | 3 (30)           | 5 (50)           | 1 (10)           |
|   | <b>Total</b>  | <b>2 (3)</b>      | <b>1 (1.5)</b> | <b>6 (9)</b>     | <b>43 (64.2)</b> | <b>15 (22.4)</b> |
| Solving crossword puzzle helps better understanding of the topic      | Female        | 1 (2.6)           | 1 (2.6)        | 6 (15.8)         | 24 (63.2)        | 6 (15.8)         |
|   | Male          | 1 (5.3)           | 0              | 5 (26.3)         | 2 (10.5)         | 11 (57.9)        |
|   | Not Specified | 0                 | 2 (20)         | 1 (10)           | 5 (50)           | 2 (20)           |
|   | <b>Total</b>  | <b>2 (3)</b>      | <b>3 (4.5)</b> | <b>12 (17.9)</b> | <b>31 (46.3)</b> | <b>19 (28.4)</b> |
| Solving crossword puzzle helps in Remembering (memorizing) key points | Female        | 1 (2.6)           | 1 (2.6)        | 3 (7.9)          | 17 (44.7)        | 16 (42.1)        |
|   | Male          | 1 (5.3)           | 0              | 1 (5.3)          | 10 (52.6)        | 7 (36.8)         |
|   | Not Specified | 0                 | 0              | 4 (40)           | 2 (20)           | 4 (40)           |

|   |               |              |                |                  |                  |                  |
|---|---------------|--------------|----------------|------------------|------------------|------------------|
|   | <b>Total</b>  | <b>2 (3)</b> | <b>1 (1.5)</b> | <b>8 (11.9)</b>  | <b>29 (43.3)</b> | <b>27 (40.3)</b> |
| Solving crossword puzzle increases vocabulary                                       | Female        | 0            | 0              | 10 (26.3)        | 17 (44.7)        | 11 (28.9)        |
|   | Male          | 0            | 3 (15.8)       | 5 (26.3)         | 2 (10.5)         | 9 (47.4)         |
|   | Not Specified | 0            | 1 (10)         | 4 (40)           | 3 (30)           | 2 (20)           |
|   | <b>Total</b>  | <b>0</b>     | <b>4 (6)</b>   | <b>19 (28.4)</b> | <b>22 (32.8)</b> | <b>22 (32.8)</b> |
| Solving crossword puzzle utilizes problem solving approach                          | Female        | 1 (2.6)      | 2 (5.3)        | 6 (15.8)         | 22 (57.9)        | 7 (18.4)         |
|   | Male          | 1 (5.3)      | 1 (5.3)        | 3 (15.8)         | 6 (31.6)         | 8 (42.1)         |
|   | Not Specified | 0            | 2 (20)         | 2 (20)           | 2 (20)           | 4 (40)           |
|   | <b>Total</b>  | <b>2 (3)</b> | <b>5 (7.5)</b> | <b>11 (16.4)</b> | <b>30 (44.8)</b> | <b>19 (28.4)</b> |
| Solving crossword puzzle leads to active involvement of all participants in a group | Female        | 1 (2.6)      | 2 (5.3)        | 3 (7.9)          | 15 (39.5)        | 17 (44.7)        |
|   | Male          | 1 (5.3)      | 0              | 1 (5.3)          | 5 (26.3)         | 12 (63.2)        |
|   | Not Specified | 2 (20)       | 0              | 2 (20)           | 3 (30)           | 3 (30)           |
|   | <b>Total</b>  | <b>4 (6)</b> | <b>2 (3)</b>   | <b>6 (9)</b>     | <b>23 (34.3)</b> | <b>32 (47.8)</b> |

Figure 5: Showing the perceptions of students on using Crossword puzzle



**Figure 6: Showing the mean scores of statement on perceptions of students on using Crossword puzzle**



**Students also gave their suggestions which has been listed out as below:**

Increased team work and spirit

Increased memory

Could link concepts

Led to Better understanding of the topic

Cultivated interests

Could use as Knowledge analyser

Was helpful for Revision of the topics

Improved concentration

The students also opined that it is not applicable for theory exams

**Discussion**

The study was carried out to determine the use of crossword puzzle was an active tool of learning anatomy. Anatomy involves acquiring lot of knowledge in less period of time and this increases stress which in turn hinders learning process of the students consciously or unconsciously. Incorporation of active learning methods will overcome these problems, improve understanding and make the learning experience of students more productive. <sup>[1]</sup> The concept of active learning is gaining much momentum, especially in the field of medicine. <sup>[3]</sup> Introduction of games in the classroom transforms learning into a less threatening and more enjoyable process for both the students and the instructors. <sup>[4]</sup> The idea of crossword puzzle is said to be originated in Egypt and was published in Brazil in the year 1925 for the first time. <sup>[5]</sup> There is little consensus about the date of introduction of crossword puzzles into the classroom, but the educational value of these puzzles seems to be widely recognized. <sup>[6]</sup> Many skills are involved to solve crossword puzzle which includes spelling, reasoning, making

inferences, evaluating choices and drawing conclusions.<sup>[7]</sup> The significance of crossword puzzle in our study is that it is suitable for all types of learners. Visual learners enjoy using their strong puzzle solving skills. Auditory learners enjoy mastering the puzzle using stepwise reasoning. Kinesthetic learners enjoy the multi-task strategies required to solve a crossword.<sup>[7]</sup> Junior MM de lima suggested that crossword puzzle should be used as supplementary teaching methods and helps mastering a difficult art in a better entertaining way of learning among students.<sup>[8]</sup> There are studies in support of this view which showed efficacy of incorporation of the crossword technique to master the intricacies of interpretation of electrocardiograms (EKG).<sup>[9]</sup> In the present study it was found that crossword puzzle facilitated active learning as it was fun to solve and helped in better understanding of the topic. The learning also improved as crossword puzzle helped in increasing vocabulary and remembering key points. These findings are consistent with the results of study done by Saran<sup>[1]</sup> and Orawiwatnakul.<sup>[10]</sup> Students also found crossword puzzle to use problem solving approach which involved recall of the subject. Majority of the students agreed crossword puzzle leads to active involvement of all participants in a group. Saran has reported similar results that Crossword puzzles can provide a more relaxed and friendly classroom atmosphere which will facilitate active and more productive learning for students.<sup>1</sup> Sivagnanam has described that crossword puzzle generates much interest and it is a novel tool for group learning. They also stated that it increases interaction with in the group and also between educators and learners.<sup>[3]</sup> Ramsden suggested that effective teaching helps to achieve classroom excellence and recognised the power of feedback for motivating the student learning.<sup>[11]</sup> Our study includes the perception of the students regarding crossword puzzle an active tool of learning and their feedback with the suggestions which has been shown in results section. Bloom's taxonomy begins from lowest levels of critical thinking, and advances to the higher levels of synthesis and evaluation.<sup>[12]</sup> The importance of critical thinking is especially important for problem-solving assignments that simulate real-world scenarios.<sup>[13]</sup> Goh and Hooper concluded that the crossword puzzle game provides motivation and challenge to the students as it require both lateral and longitudinal thinking to solve it.<sup>[14]</sup> Using a specially designed crossword puzzle helps students to review concepts in preparation of the test.<sup>[15]</sup> Although solving crossword puzzles makes learning to be more enjoyable and have been advocated by researchers to be used as a supplement to traditional methods and not as a replacement.<sup>[2]</sup> There are reports suggesting that crossword puzzles have been used as a study aid and those students who solved this scored higher than those students who did not.<sup>[7]</sup> Our future study includes assessment of the students who solved crossword puzzle in comparison with those who did not solve and to evaluate the effectiveness of solving crossword puzzle as an learning outcome. The limitation of our studies is that few 10 (16%) students had not specified the gender in the questionnaire.

### **Conclusion**

Crossword puzzle helps students improve vocabulary knowledge and helps to remember better and also involves active participation of the students in learning.

### **Acknowledgements**

I year MBBS Students. The manuscript was presented at National conference of medical education held at JSS Medical College, Mysore in February 2016 and was awarded best poster presentation

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