Efficiency of Peer Tutoring Program at the Alabama College of Osteopathic Medicine (ACOM)

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Abstract

Introduction: The benefits of peer tutoring programs in improving peer tutees' overall academic performance are well-documented in the context of various academic settings, including allopathic medical schools. However, there exists very few published studies that have evaluated the impact of such peer tutoring programs in an osteopathic medical school setting. The goal of this retrospective study is to evaluate the impact of peer tutoring program, namely the Academic Assistance Program (AAP) in academic performance of peer tutees at the Alabama College of Osteopathic Medicine (ACOM).

Methods: Twenty-eight peer tutees in their first-year and fifteen peer tutors in their second-year at ACOM participated in the AAP. To evaluate the academic performance of peer tutees, we compared their final exam test scores (individual courses and cumulative) with their corresponding test scores before enrolling in AAP, which consisted of scores from their first exam in the beginning of calendar year (Exam 1), undergraduate study, and MCAT.

Results: The peer tutees' final test scores (for both category: individual courses and cumulative) were significantly higher than their Exam 1 scores as assessed by two-tailed, unpaired t-test (both cases, p < 0.005). We also found that the peer tutees' final cumulative scores (without lab scores) do not correlate with neither their MCAT scores (r = -0.13) nor with their undergraduate science GPA (r = 0.15). While their Exam 1 scores showed a weak correlation with their undergraduate science GPA (r = 0.38), no such correlation was found when compared to their MCAT scores (r = -0.02).

Discussion and Conclusion: Our data suggest that peer tutoring programs such as the AAP can contribute to improving students’ overall academic performance. Additional comparative study should be conducted to assess long-term impact of such programs on not only peer tutees but also peer tutors.

Keywords: Peer-tutoring; academic assistance; medical students; academic performance; medical education; osteopathic medical school; medical school
Introduction

Peer tutoring programs are designed to provide support to academically struggling students who seek help outside the classroom environment (peer tutees) by utilizing peer tutors who are not professional teachers (Topping, 1996; Burgess, McGregor and Mellis, 2014). Such programs have repeatedly proven effective in improving peer tutees’ overall academic performance, building their self-confidence and self-esteem, and reducing test anxiety (Resnick and MacDougall, 1976; Burgess, McGregor and Mellis, 2014; Swindle and Wimsatt, 2015; AlShareef et al., 2019).

These programs have been adapted in various academic settings going from high school to universities to medical schools because of their well-documented benefits at several levels (Topping, 1996; Topping, 1998; Burgess, McGregor and Mellis, 2014). At the institution level, peer tutoring programs can improve the institution’s pass rate, address specific gaps in the student curriculum, and reduce faculty teaching burden (Ten Cate and Durning, 2007a; Burgess, McGregor and Mellis, 2014). Interestingly, there is a growing body of evidence suggesting benefits to peer tutors by reinforcing their own understanding, boosting their sense of responsibility, as well as improving their communication, leadership, and academic skills (Bardach, Vedanthan and Haber, 2003; Burgess, McGregor and Mellis, 2014).

While the benefits of peer tutoring programs are well documented in various academic settings, they have not been rigorously explored in an osteopathic medical school setting (Resnick and MacDougall, 1976; Burgess, McGregor and Mellis, 2014; Swindle and Wimsatt, 2015; AlShareef et al., 2019). In the context of medical school, the transition from undergraduate or any other non-traditional environment to the first year of medical school may itself be daunting. Attending to the rigorous coursework while adjusting to the new school environment can lead to transitional stress (Ten Cate and Durning, 2007b; Bugaj et al., 2019). With the goal of helping students smoothly transition into ACOM’s curriculum as well as helping them achieve greater success in general, we established a peer tutoring committee. This committee consisted of a total of seven members including ACOM’s Director of Academic Support Services (DASS). As a committee, we designed a peer tutoring program called the Academic Assistance Program (AAP) in the Spring of 2018 which was brought into effect in Fall 2018. We identified first-year medical students as peer tutees based on their first-year of medical school and paired them with high achieving students as tutors from second-year. After a semester of enrolling in AAP, we performed a retrospective analysis on the peer tutees’ performance before and after participating in AAP. Our results reveal the effectiveness of AAP in improving academic performance of first-year medical students at ACOM.

Methods

Peer tutee and tutor recruitment

Based on prior data on student performances, the Director of Academic Support Services (DASS) at ACOM identified Anatomy and Molecular Medicine as the two key courses where AAP could help. The recruitment of the first-year students as peer tutees was also led by the DASS. The students that failed either one or both the Anatomy and Molecular Medicine courses in their first exam of the calendar year (Exam 1) were recommended to enroll by the DASS. Based on this, twenty-eight peer tutees enrolled into the AAP, fourteen in each course.

While recruitment of the peer tutees was led by the DASS, the recruitment of the qualified second-year peer tutors was led by our AAP planning committee. Following approval from the administrative body at ACOM, we initiated recruitment of qualified tutors where we meticulously outlined the program objectives and tutor expectations. We selected a total of fifteen tutors based on key criteria outlined by the DASS at ACOM. The key criteria included a good academic standing (average As and Bs, and Anatomy and Molecular Medicine test scores above 75%) high motivation, leadership skills, and willingness to help others. Although the peer tutors were not compensated...
monetarily, they were encouraged to report their volunteer hours to ACOM. Their contributions would be reflected in their Medical Student Performance Evaluation (MSPE) which could boost their candidacy for future opportunities. To ensure the privacy of peer tutees, the tutors were trained on protecting student privacy under the guidelines outlined by the Family Educational Rights and Privacy Act (FERPA).

**Study design and statistics:**

All the test scores were retrieved from SouthEast Alabama Medical Education Division (SEAMed). Data from twenty-eight peer tutees (fourteen for each individual course) were analyzed. A two-tailed, unpaired t-test was performed to compare the final cumulative (defined by combined Anatomy and Molecular Medicine) test scores to Exam 1 test scores. For course specific analyses, test scores specific to ‘Anatomy’ and ‘Molecular Medicine’ were retrieved for both final exam and Exam 1. The final exam test scores particular to these courses were compared to their respective Exam 1 test scores using the two-tailed, unpaired t-test.

Unlike the final Anatomy exam, the Anatomy Exam 1 scores did not assess peer tutees’ performance in the associated laboratory course. Furthermore, the peer tutees were not tutored on the laboratory course. Thus, to gain a better insight, we compared the Anatomy final test scores both with and without lab to Anatomy Exam 1 scores. In contrast, the Molecular Medicine course, by design, does not have any associated laboratory course, thus the final test scores were compared directly with the Exam 1 scores.

In addition to comparison with Exam 1, we also evaluated if the final overall cumulative scores correlate with either the MCAT scores or undergraduate science GPA using Pearson correlation analyses. Additionally, we also performed Pearson correlation analyses to interrogate whether the Exam 1 scores showed any correlation with the MCAT scores or undergraduate science GPA.

All the statistical analyses were performed using a GraphPad Prism 7.0 (San Diego, CA).

**Results/Analysis**

To evaluate the efficiency of AAP, we first retrieved the MCAT scores as well as the final undergraduate Science GPA of the peer tutees enrolled in the program as reported in **Table 1**. In order to gain a better insight on the academic performance levels of the peer tutees before starting medical school, graphs showing the distribution of the number of students obtaining a range of MCAT scores (**Figure 1A**) or undergraduate science GPA (**Figure 1B**) were plotted. The curve in the graph represents a Gaussian distribution of the data fitted using Gaussian equation (GraphPad Prism 7.0). The mean MCAT score and undergraduate science GPA were found to be 502.1 ± 4.5 (Mean ± Standard Deviation) and 3.09 ± 0.3 respectively; the corresponding minimum scores were determined to be 489.0 and 2.13; and the corresponding maximum scores to be 510.0 and 3.64, respectively.

**Table 1:** Peer tutees’ academic performance before starting medical school

| n = 28 | Peer tutee scores | MCAT scores | Undergraduate Science GPA |
|--------|-------------------|-------------|---------------------------|
|        |                   | 528.0       | 4.0                       |
| **Total score** |                  | 502.1 ± 4.5 | 3.09 ± 0.3                |
| **Mean ± SD**   |                  | 489.0       | 2.13                      |
| **Minimum**     |                  | 510.0       | 3.64                      |
| **Maximum**     |                  |             |                           |
As mentioned before, one of the criteria for selecting peer tutors was based on their final Anatomy and Molecular Medicine test scores of above 75%. The peer tutors’ test scores are reported in Table 2, where the mean scores for Anatomy and Molecular Medicine courses were determined to be 85.8 ± 5.5 and 87.7 ± 4.5 respectively; the corresponding minimum scores were determined to be 76.9 and 78.3; and the corresponding maximum scores to be 93.6 and 94.6, respectively.

Table 2: Peer tutor’s final test scores on Anatomy and Molecular Medicine

| n = 15 | Peer tutor exam scores |
|--------|------------------------|
|        | Anatomy    | Molecular Medicine |
| Mean ± SD | 85.8 ± 5.5 | 87.7 ± 4.5 |
| Minimum | 76.9       | 78.3             |
| Maximum | 93.6       | 94.6             |

The peer tutees performance before and after AAP were compared in three different ways:-

1. The mean final cumulative (defined by combined Anatomy and Molecular Medicine) test scores (72.2 ± 5.4) of the peer tutees were significantly higher (****, p < 0.0001) than the mean Exam 1 cumulative test scores (64.4 ± 8.0) as evaluated by two-tailed, unpaired t-test (GraphPad Prism 7.0) and shown in Figure 2 and Table 3. The final exam scores presented here include the Anatomy laboratory scores. The error bars in Figure 2 represent the Standard error of means (SEM).

Table 3: Peer tutees’ academic performance before and after AAP

| n = 28 | Peer tutee cumulative (Anatomy + Molecular Medicine) exam scores |
|--------|---------------------------------------------------------------|
|        | Exam 1              | Final exam                        |
| Mean ± SD | 64.4 ± 8.0        | 72.2 ± 5.4                      |
| Minimum | 49.0               | 63.0                             |
2. The mean final Anatomy exam score with lab included (69.9 ± 4.5, Figure 3A) as well as the mean final Molecular Medicine test score (74.4 ± 5.3, Figure 3B) of the peer tutees were both significantly higher (both cases: ‘***’, p < 0.0005, two-tailed, unpaired t-test, GraphPad Prism 7.0) than their corresponding Exam 1 mean test scores of 63.4 ± 5.5 (Figure 3A) and 65.3 ± 10.0 (Figure 3B), respectively.

In the case of the Anatomy course, the final test score included data from the laboratory course while the Exam 1 did not. Thus, we also performed another analysis where we excluded the laboratory course scores from the final anatomy exam scores and compared with the Exam 1 scores. This comparison also revealed a statistically higher (‘***’ p < 0.0005, two-tailed, unpaired t-test, GraphPad Prism 7.0) mean final test score (71.4 ± 5.0) compared to Exam 1 score (63.4 ± 10.0) as shown in Figure 3A. The error bars in Figure 3 represent the SEM.

All the corresponding mean, minimum and maximum test scores are also reported in Table 4.

Figure 3: Peer tutors’ individual exam scores significantly higher after participating in AAP
Table 4: Peer tutees’ course-wise breakdown of exam scores before and after AAP

|                | Peer tutee exam scores |                |                |
|----------------|------------------------|----------------|----------------|
|                | Anatomy, n = 14        | Molecular Medicine, n = 14 |
| Exam 1         | Final exam             | Final exam (Lab excluded) | Exam 1         | Final |
| Mean ± SD      | 63.4 ± 5.5             | 69.9 ± 4.5**     | 71.4 ± 5.0***  | 65.3 ± 10.0   | 74.4 ± 5.3** |
| Minimum        | 52.0                   | 63.0            | 64.0           | 49.0          | 67.0        |
| Maximum        | 72.0                   | 76.0            | 78.0           | 89.0          | 88.0        |

3. Interestingly, the final cumulative test scores (lab excluded) did not seem to correlate with neither the peer tutees’ corresponding MCAT scores (Pearson correlation coefficient (r) = -0.13, Figure 4A) nor with their undergraduate science GPA (r = 0.15, Figure 4B) as shown by Pearson correlation calculations (GraphPad Prism 7.0).

Figure 4: Correlation analyses evaluating peer tutees’ academic performance before starting medical school vs. after participating in AAP
On a side note, we also performed correlation analyses using Pearson's method (GraphPad Prism 7.0) to investigate whether the Exam 1 scores showed any correlation with the peer tutees' undergraduate GPA or MCAT scores. The Exam 1 scores showed a weak correlation with their undergraduate GPA ($r = 0.38$) as shown by Pearson correlation analysis in Figure 5B. However, no such correlation was found when compared to their MCAT scores ($r = -0.02$) as shown in Figure 5A.

**Figure 5**: Correlation analyses evaluating peer tutees' academic performance before starting medical school vs. Exam 1

**Discussion**

The peer tutoring program AAP at ACOM was developed with the goal of assisting academically struggling first-year students achieve better academic performance. Through our retrospective study comparing exam scores before and after enrolling in AAP, we conclude that the AAP indeed contributed to improving peer tutees' academic
performance. Our results are consistent with a plethora of studies done at various academic settings where peer tutoring has been regarded as powerful tools to providing academic support to students outside of class (Topping, 1996; Topping, 1998; Burgess, McGregor and Mellis, 2014).

So why is it that such programs are so successful? As an AAP committee, we conducted an informal meeting with peer tutees to assess which methods employed by the tutors were most helpful to them. It appears that the peer tutors’ recommendations on effective study strategy and time management, both of which are often overlooked in a traditional classroom teaching, were the most helpful in addition to help with the coursework itself. For instance, the peer tutees employed study strategies such as mnemonics, imagery, flash cards etc. that better suited tutees’ learning styles. Another reason behind the success of such peer tutoring programs can be attributed to the theory of ‘cognitive congruence’. Based on this, because the peer tutors and tutees share a similar knowledge base and learning experience, the peer tutors are more likely to implement a customized tutoring strategy suitable to each tutee (Ten Cate and Durning, 2007a; Yu et al., 2011). Similarly, peer tutees are more comfortable to talk to the peer tutors about their trouble areas and confide in them, which further fosters learning. In the context of first-year medical students who are trying to adjust into a rigorous study environment, peer tutors can serve as a role model, can offer personal guidance, provide relevant resources and study materials, and acceptance within the school climate (Ten Cate and Durning, 2007a).

Interestingly, our correlation analyses also showed that the students’ performances in medical school do not correlate with neither their MCAT scores nor their undergraduate science GPA. Our analyses are in direct contrast with the recent study where the authors analyzed more than 950 cases from 16 medical schools. In this study, they found a medium to large correlation between both MCAT scores and undergraduate GPA with the students’ performance in their first year of medical school (Busche et al., 2020). However, the correlation between MCAT and medical school performance have been contradictory across various studies. While some studies reveal significant correlations between MCAT score, undergraduate GPA and students’ performance in the preclinical years of medical school (Vancouver et al., 1990; Dixon, 2012; Dunleavy et al., 2013), other studies find weak to no correlations (Donnon, Paolucci and Violato, 2007; Lynch et al., 2009; Saguil et al., 2015). Our study also showed a weak correlation between MCAT or undergraduate Science GPA with peer tutees’ Exam 1 performance. This suggests that all students, regardless of their MCAT scores or undergraduate Science GPA, should be encouraged to participate in peer tutoring programs. Furthermore, unlike the approach we took for our AAP, peer tutoring should be made available to the first-year students as soon as their classes begin without waiting on their Exam 1 results. This would allow the students to take full advantage of peer tutoring throughout their first-year.

There are several limitations to our study. First, we analyzed a total of only 28 cases, and followed the scores for only two out of the five courses offered in the first year. Because our decision to do the analyses on the effectiveness of AAP was made on a retrospective basis, the number of cases and courses we followed could not be changed. Second, we did not follow the peer tutees’ academic performance long-term. This is because in the peer tutees’ second-year, the peer tutors would be off-site pursuing their clinical rotations. However, the conclusions made from this study encouraged the administrative body at ACOM to permanently employ the AAP program into ACOM. For future studies, more data can be collected on a yearly basis and a follow up study can be done with more ends. Third, given that there are several studies that show the benefits of peer tutoring programs for peer tutors, we did not follow the academic performance or professional growth of peer tutors (Bardach, Vedanthan and Haber, 2003; Burgess, McGregor and Mellis, 2014). Future studies should also include tracking the success of peer tutors. Fourth, through our study, we cannot ignore the possibility where the students may themselves be motivated to pass their finals compared to Exam 1. While informal interviews from peer tutees suggested that the AAP really helped them succeed, future studies should include control groups where struggling students who did not seek peer tutoring can be followed alongside for comparison. For our study, most of the identified struggling students enrolled into the AAP and thus we were not able to perform this analysis.
Overall, our data shows a significant increase in peer tutees’ test scores after participating in the AAP. This means that providing peer tutoring outside of classroom may represent an undervalued but key aspect of an effective medical school curriculum.

Conclusion

This study shows that peer tutoring programs such as the AAP can significantly improve the overall academic performance of medical students. This further indicates that peer tutoring programs such as AAP can serve as a valuable tool for helping academically struggling students succeed and that such programs should be highly encouraged and implemented in medical schools.

Take Home Messages

1. Peer tutoring programs can improve the academic performance of peer tutees in an osteopathic medical school setting.
2. Peer tutoring programs can alleviate peer tutees’ stress with transition from undergraduate or other non-traditional environment to a more stressful medical school environment.
3. Success of peer tutoring can be attributed to the fact that peer tutors and tutees share similar knowledge base.
4. Besides academic coaching, some key areas of success represents effective study strategies and time management.
5. Students’ performance in standardized tests may not reflect their performance in medical school. Peer tutoring programs can bridge this gap.

Notes On Contributors

Kailash KC is a medical student (class of 2021) at the Alabama College of Osteopathic Medicine. He graduated with a Bachelor’s of Science in Biology with a minor in Chemistry from the Sam Houston State University, Texas. Alozie Mbanaso is a medical student (class of 2021) at the Alabama College of Osteopathic Medicine and has a Bachelors of Science degree in Psychology from the University of Maryland. Kim Chosie is the director of Academic Support at the Alabama College of Osteopathic Medicine and is a Licensed Professional Counselor. Emmanuel Segui is an Institutional Data Analyst and Instructor of Statistics at the Alabama College of Osteopathic Medicine.

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Figures 1-5. Source: The Authors
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Appendices

None.

Declarations

The author has declared that there are no conflicts of interest.

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Ethics Statement

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