

Millenium, 2(16), 11-22.



APRENDIZAGEM ASSISTIDA POR PARES: PERCEPÇÃO E SATISFAÇÃO DOS ESTUDANTES DE LICENCIATURA EM MEDICINA  
PEER-ASSISTED LEARNING: UNDERGRADUATE MEDICAL STUDENTS' PERCEPTION AND SATISFACTION  
APRENDIZAJE ASISTIDO POR PARES: PERCEPCIÓN Y SATISFACCIÓN DE LOS ESTUDIANTES DE LICENCIATURA EN MEDICINA

*Mona G. Amer*<sup>1</sup>

*Raad M. M. Althaqafi*<sup>2</sup>

*Sara A. Assiri*<sup>2</sup>

*Atheer Alsufyani*<sup>2</sup>

*Faisal S. Alrubai*<sup>2</sup>

*Nader M. Mohamed*<sup>3, 4</sup>

<sup>1</sup> Taif University, College of Medicine, Anatomy & Histology Department, Medical Education Department, Taif, Saudi Arabia

<sup>2</sup> Taif University, College of Medicine, Taif, Saudi Arabia

<sup>3</sup> Taif University, College of Medicine, Pediatrics Department, Taif, Saudi Arabia.

<sup>4</sup> General Organization of Teaching Hospitals and Institutes, Pediatrics & Neonatology, Zagazig, Egypt

Mona G. Amer - mona\_amer@rocketmail.com | Raad M. M. Althaqafi - raadmatar96@yahoo.com | Sara A. Assiri - saraassiriii@gmail.com |  
Atheer Alsufyani - theerz\_1996@hotmail.com | Faisal S. Alrubai - faisalAlrubai@gmail.com | Nader M. Mohamed - nadermmm333@yahoo.com



**Corresponding Author**

*Mona Gomah Amer*

Department of Anatomy & Histology, College of Medicine,  
Taif University, P.O. Box 11099  
21944 Taif - Saudi Arabia  
mona\_amer@rocketmail.com

RECEIVED: 19<sup>th</sup> March, 2021

ACCEPTED: 26<sup>th</sup> June, 2021

## RESUMO

**Introdução:** A Aprendizagem Assistida por Pares (AAP) é um método de ensino que desenvolve novos conhecimentos e competências através do apoio ativo à aprendizagem por pares.

**Objetivos:** Avaliar o impacto do AAP na educação médica, recolhendo dados quantitativos que exploram a sua eficácia. Avaliar a percepção e a satisfação dos estudantes com AAP.

**Métodos:** Foi desenvolvido um inquérito à escala Likert de 5 pontos para estudantes participantes no programa AAP, quer como tutores, quer como alunos. Os dados foram comparados e analisados estatisticamente de acordo com o género, GPA, e ano de estudo. Além disso, o acompanhamento dos tutores e dos alunos foi feito através da comparação das suas notas com as que não foram partilhadas no AAP e com o seu GPA do ano anterior.

**Resultados:** A análise estatística dos dados do questionário revelou que os estudantes de medicina consideraram o ensino voluntário por pares semelhante ao ensino docente e têm uma percepção geralmente positiva do AAP. A maioria dos inquiridos relatou ter beneficiado tanto profissionalmente como pessoalmente das atividades de AAP. Recomendaram a expansão do papel do AAP e a incorporação oficial das sessões AAP no currículo. A realização dos estudantes foi significativamente aumentada para aqueles que atuaram como alunos e tutores de pares.

**Conclusões:** A utilização do AAP em conjunto com outros métodos de ensino e aprendizagem proporciona um valor adicional ao promover a cooperação e interação social entre estudantes de medicina e prepara-os ainda mais para o seu futuro papel como educadores de ciências médicas. É necessária investigação adicional sobre o impacto do AAP nos resultados académicos, tanto a curto como a longo prazo, em programas médicos.

**Palavras-chave:** aprendizagem assistida por pares, educação médica, desenvolvimento profissional, ensino de estudantes.

## ABSTRACT

**Introduction:** Peer-assisted learning (PAL) is a teaching method that develops new knowledge and skills through active learning support from peers.

**Objectives:** To assess the impact of PAL in medical education, by collecting quantitative data that explore its effectiveness. To evaluate students' perception of and satisfaction with PAL.

**Methods:** A 5-point Likert scale survey was developed for students participating in the PAL program either as tutors or learners. Data were compared and statistically analyzed according to gender, GPA, and year of study. Moreover, follow up of peer tutors and peer learner's achievement was done through comparing their grades with those that not shared in PAL and with their GPA of previous year.

**Results:** Statistical analysis of questionnaire data revealed that medical students regarded voluntary peer-teaching similarly to faculty teaching and have a generally positive perception of PAL. Most of the respondents reported that they benefited both professionally and personally from PAL activities. They recommended expanding the role of PAL and officially incorporating PAL sessions into the curriculum. Students' achievement was significantly increased for those who acted as peer learners and peer tutors.

**Conclusions:** Using PAL in conjunction with other teaching and learning methods provides additional value by fostering cooperation and social interaction among medical students and further prepares them for their future role as medical science educators. Additional research into the impact of PAL on academic achievement, both short- and long-term learning outcomes, in medical programs is warranted.

**Keywords:** peer-assisted learning, medical education, professional development, student teaching

## RESUMEN

**Introducción:** El aprendizaje asistido por pares (AAP) es un método de enseñanza que desarrolla nuevos conocimientos y habilidades a través del apoyo activo del aprendizaje por parte de los compañeros.

**Objetivos:** Evaluar el impacto del AAP en la educación médica, mediante la recopilación de datos cuantitativos que exploran su eficacia. Evaluar la percepción y la satisfacción de los estudiantes con el AAP.

**Métodos:** Se elaboró una encuesta con una escala de Likert de 5 puntos para los estudiantes que participaban en el programa AAP como tutores o como alumnos. Los datos se compararon y analizaron estadísticamente en función del género, el promedio académico y el año de estudio. Además, se realizó un seguimiento del rendimiento de los compañeros tutores y de los compañeros alumnos mediante la comparación de sus notas con las de los que no compartían el AAP y con su GPA del año anterior.

**Resultados:** El análisis estadístico de los datos del cuestionario reveló que los estudiantes de medicina consideraban la enseñanza voluntaria entre pares de forma similar a la enseñanza en la facultad y tienen una percepción generalmente positiva de la AAP. La mayoría de los encuestados afirmaron haberse beneficiado tanto profesional como personalmente de las actividades de AAP.

Recomendaron ampliar el papel de la AAP e incorporar oficialmente las sesiones de AAP en el plan de estudios. El rendimiento de los estudiantes aumentó significativamente en el caso de los que actuaron como alumnos y tutores de sus compañeros.

**Conclusiones:** El uso de AAP junto con otros métodos de enseñanza y aprendizaje proporciona un valor adicional al fomentar la cooperación y la interacción social entre los estudiantes de medicina y los prepara aún más para su futuro papel como educadores de ciencias médicas. Se justifica la realización de más investigaciones sobre el impacto de la AAP en el rendimiento académico, tanto a corto como a largo plazo, en los programas de medicina.

**Palabras clave:** aprendizaje asistido por pares, educación médica, desarrollo profesional, enseñanza de estudiantes

## INTRODUCTION

Student teaching, also known as peer-assisted learning (PAL), is of great interest in the medical education field. PAL involves developing new knowledge and skills through active learning support from peers who are not professionally trained in teaching, who also learn themselves through teaching.<sup>1</sup>

Advocates of PAL suggest that the learning experience and knowledge base similarity between student-teachers and students is central to its success, which is known as "cognitive congruence". Student-teachers can explain concepts at an appropriate level using language and concepts that their learners understand.<sup>2</sup>

PAL is an innovative model of education aimed at cultivating creative, talented students. It helps medical students to develop skills such as problem-solving, self-directed learning, information retrieval, critical thinking, clinical reasoning, and continuing education.<sup>3</sup>

PAL is a common teaching and learning method in medical education worldwide. Peer learning is an efficient student-centric learning approach that facilitates active student participation and, as such, encourages creative, independent thinking. PAL provides an opportunity for students to take the responsibility for their learning in a safe environment.<sup>1</sup>

Most medical schools implement peer teaching programs by using students as teachers.<sup>4</sup> In pre-clinical medicine, PAL is well established for anatomy,<sup>5,6</sup> physiology,<sup>7</sup> and problem-based learning coursework.<sup>8</sup> In clinical medicine, this method is applied primarily to developing clinically relevant skills, such as communication,<sup>9</sup> physical examination,<sup>10</sup> and technical procedures.<sup>11</sup> Furthermore, PAL is used to teach clinical procedures in specialized programs for students who are currently involved in clerkships or internships.<sup>12</sup> PAL even seems to prevent stress at medical school. Pedagogical advantages of PAL include an interactive participation in learning process and immediate feedback, along with lower levels of anxiety in the tutees.<sup>13</sup>

The medical school aims to cultivate outstanding students with life-long independent learning by promoting active student participation and thus, to endorse creative thinking. As such, our College of Medicine utilizes a variety of unconventional teaching methods such as self-studying, tutorials, small group discussions, and seminars, all of which encourage learner independence and incorporate elements that prepare the students to bring everything to a clinical encounter without formal guidance. Among these, PAL was introduced in 2017-2018 as a new initiative named "Taif Medical Students As Teachers" (TMSAT) in the form of higher- or same-level students tutoring their colleagues in active, small-group learning sessions. This initiative requires regular evaluation, including the perception and satisfaction level of its participants, to identify pertinent areas of improvement and determine its future course. Feedback must be collected from both peer tutors and peer learners to determine the usefulness of PAL in their learning process. Hence, an assessment of the impact of PAL in medical education is needed.

Therefore, the purpose of the current study is to provide quantitative data exploring the effectiveness of the TMSAT initiative for undergraduate medical students to determine if PAL enhances academic achievement of undergraduate medical students. Moreover, this study aims to evaluate the perception and satisfaction of students participating in PAL by examining their motivation to become student tutors, their teaching experiences, and the impact of PAL on their academic development.

## 1. METHODS

### • Study design

This descriptive, cross-sectional study examined the perception and satisfaction of undergraduate medical students concerning the PAL program at our College of Medicine.

### • Ethical considerations

This study was approved by the Internal Review Board of the University. Confidentiality was maintained throughout the data collection, analysis, and publication processes.

- **Peer-assisted learning (PAL) initiative:**

Medical students at our University are involved in a peer instruction program named "Taif Medical Students As Teachers; TMSAT) that started in the 2017-2018 academic year and continued through 2019-2020 as a form of educational volunteer work. Students in their fourth, fifth, and sixth years participated as tutors for students from all levels (learners). The sessions were held in small groups and the topics were chosen by the students after surveying the groups' needs. The peer tutor presented the topic to their subgroup and then directed further discussion. Students were given the topic, learning objectives, and presentation material prior to the session. Otherwise, there were no strict guidelines for the format of the session's presentation and discussion sections. On average, the sessions lasted 1–2 hours, scheduled according to the group's availability. A faculty member was present as an observer with no active involvement during the presentation or discussion and provided informal feedback to the tutors after the session. Volunteer peer tutors were trained within the PAL activities on presentation skills and running educational sessions. Moreover, students learn about effective presentation skills and evidence-based medicine by presenting seminars in their other curricular modules. They are given faculty members' contact information in case they need to seek help or support throughout the semester.

Data on the number of sessions and students' involvement either as peer tutors or learners were collected. The academic performance (GPA) of peer tutors was analyzed to determine whether the experience affects their progression. These data were all statistically analyzed.

- **Survey design**

A survey was developed using a 5-point Likert scale (strongly disagree to strongly agree) based on previous reports.<sup>14, 15, 16</sup> It was designed for students participating in the PAL initiative either as tutors or learners and for others not participating. The survey contained X items grouped into six sections: (1) biographic data; (2) 12 statements directed toward peer tutors on their experience, benefits, and support; (3) 11 statements directed toward peer learners on their knowledge, skills, and attitude; (4) X statements directed toward all participants on the club's performance in general; (5) the causes of lower participation levels among female students than their male counterparts; and (6) free-form responses including general comments and future recommendations.

- **Effect of TMSAT on students' academic achievement**

Students from 1st year that participated in the sessions as peer learners were followed for evaluation of their academic achievement. Thirty-five sessions on basic sciences topics were implemented by PAL during the year 2018-2019. All tutored sessions were structured to re-enforce the learning outcomes of the basic science topics in cooperation with the concerned lecturer. The peer tutored sessions focused on developing the students' knowledge and cognitive skills in basic science topics. The grades of 1<sup>st</sup> year peer learners (Group 1; no 26) was compared to the students that did not attend the peer tutoring sessions (Group 2; no 45). Moreover, comparison the GPA of the peer tutors' students from 6<sup>th</sup> year that shared in more than ten sessions of PAL were compared with the GPA of the same students in the previous year.

- **Statistical analysis**

SPSS Statistics for Windows, version 23.0 (IBM Corp, Armonk, NY, USA) was used for all data analyses. Descriptive analyses involved means and standard deviations (SD) for numerical variables or frequencies for categorical variables.

Answers were given a score ("Strongly Disagree" = 1, "Disagree" = 2, "Neutral" = 3, "Agree" = 4, "Strongly Agree" = 5). Overall satisfaction among peer tutors or learners with the PAL club activities was calculated from 1 to 5 on a 5-point Likert scale.

Descriptive statistics are presented in percentages. The Mann-Whitney U test was used to compare two independent groups. Cronbach's alpha was calculated to evaluate internal consistency. Spearman's correlation coefficient was used to identify correlations between questions and variables and the correlation coefficients (rho) were tested.  $P < 0.05$  was considered statistically significant.

## 2. RESULTS

The PAL club implemented its TMSAT initiative two years prior to this study. During the 2018-2019 academic year, 56 sessions were held (82% male side and 18% female side) by 31 female and 12 male tutors and attended by 235 peer learners (125 male and 110 female). During the second year of the initiative, 50 sessions (64% male and 36% female) were held by 28 tutors for 259 learners. The topics covered were basic science (60%) and laboratory skills (20%).

- **Questionnaire analysis results**

258 students responded to the questionnaire. Data on the respondents is presented in Table 1. More than 50% were fifth- and sixth-year students. 58% of respondents were male and 42% were female. Around 42% had GPAs above 3.5. 15.1% of respondents were peer tutors, 60.5% were peer learners, and 24.4% didn't participate in TMSAT activities.

**Table 1 - Geographic data on respondents to the distributed questionnaire:**

| Total no of respondents 258 |  |
|-----------------------------|--|
| <b>Gender:</b>              | Male 150 (58%)<br>Female 108 (42%)   |
| <b>study year:</b>          | 1 <sup>st</sup> year: 26 (10%)<br>2 <sup>nd</sup> year: 27 (10.3%)<br>3 <sup>rd</sup> year: 28 (11%)<br>4 <sup>th</sup> year: 38 (14.7%)<br>5 <sup>th</sup> year: 67 (26%)<br>6 <sup>th</sup> year: 72 (28%) |
| <b>Respondents' GPA:</b>    | 41.9% ≥3.5<br>58.1% < 3.5  |
| <b>Role in PAL</b>          | 15.1% share as peer tutor<br>60.5% share as peer learner<br>24.4% don't share in club activities   |
| <b>Preferred sessions</b>   | 45% preferred basic science topic<br>40% clinical skill examination<br>5% problem based learning skills<br>Others suggest small group discussion   |

The perceptions of and satisfaction with PAL from the tutors' and learners' point of view are presented in Table 2. Both questionnaires' sections relating to tutors' and learners' perception and satisfaction showed good internal consistency with Cronbach's alphas of 0.853 and 0.912, respectively.

**Table 2 - Perception and satisfaction of different respondents according to items of distributed questionnaire on PAL activity.**

| Questionnaire item   | Strongly agree   | agree | neutral | Disagree | Strongly disagree | Likert scale |           |
|--|--|-------|---------|----------|-------------------|--------------|-----------|
| <b>Perception and satisfaction of peer learner with PAL:</b>             |  |       |         |          |                   |              |           |
| Q1   | I had the opportunity to consolidate my own knowledge by peer teaching                           | 61.5% | 15.4%   | 23.1%    | 0                 | 0            | 4.3       |
| Q2   | Being tutor in clinical sessions increased my performance  | 76.9% | 7.7%    | 15.4%    | 0                 | 0            | 4.6       |
| Q3   | Being peer tutor increased my confidence in presentation skills                                  | 76.9% | 15.4%   | 7.7%     | 0                 | 0            | 4.5       |
| Q4   | I have better understanding of teamwork and communication skills                                 | 61.5% | 15.4%   | 23.1%    | 0                 | 0            | 4.3       |
| Q5   | Peer teaching helps me to get teaching skills  | 69.2% | 15.4%   | 15.4%    | 0                 | 0            | 4.5       |
| Q6   | I found myself a better role model to my peers   | 61.5% | 15.4%   | 23.1%    | 0                 | 0            | 4.3       |
| Q7   | I gain benefits from the sessions that I presented, and I want to repeat it                      | 69.2% | 23.1%   | 7.7%     | 0                 | 0            | 4.6       |
| Q8   | I was interested in the scientific content that I presented                                      | 38.5% | 23.1%   | 15.4%    | 23.1%             | 0            | 3.7       |
| Q9   | Peer teaching experience help me in personal and professional development                        | 46.2% | 38.5%   | 15.4%    | 0                 | 0            | 4.3       |
| Q10  | The available infrastructure for peer teaching is adequate                                       | 23.1% | 23.1%   | 15.4%    | 38.5%             | 0            | 3.3       |
| Q11  | I had support from faculty and other peers.  | 30.8% | 46.2%   | 23.1%    | 0                 | 0            | 4.07      |
| Q12  | I found myself adequately prepared for tutor role in peer teaching.                              | 69.2% | 7.7%    | 15.4%    | 7.7               | 0            | 4.38      |
| <b>Perception and satisfaction of peer learner with PAL:</b>             |  |       |         |          |                   |              |           |
| Q1   | I prefer being taught by peer teaching compare to standard Faculty teaching                      | 28.6% | 28.6%   | 33.3%    | 9.5%              | 0            | 3.76      |
| Q2   | I found peer teaching effective method for clinical teaching                                     | 42.9% | 28.6%   | 23.8%    | 4.8%              | 0            | 4.09      |
| Q3   | I feel more confident learning from peer that standard Faulty session.                           | 38.1% | 23.8%   | 14.3%    | 23.8%             | 0            | 4         |
| Q4   | I feel safer and more comfort during peer learning session than standard Faculty session         | 33.3% | 33.3%   | 23.8%    | 9.5%              | 0            | 3.57      |
| Q5   | I'm satisfied with skill lab peer teaching sessions that I attend.                               | 23.8% | 28.6%   | 38.1%    | 9.5%              | 0            | 3.66      |
| Q6   | I'm satisfied with theoretical peer teaching sessions that I attend. .                           | 38.1% | 23.8%   | 28.6%    | 9.5%              | 0            | 4.1       |
| Q7   | I found the trainer (peer tutor) knowledge is sufficient during session.                         | 38.1% | 33.1%   | 23.8     | 4.8%              | 0            | 3.95      |
| Q8   | I found the trainer (peer tutor) skills is sufficient during session.                            | 28.6% | 42.9%   | 14.3%    | 14.3%             | 0            | 3.86      |
| Q9   | I found the trainer (peer tutor) able to answer questions during the session.                    | 42.9% | 42.9%   | 9.5%     | 4.8%              | 0            | 4.2       |
| Q10  | I found the trainer (peer tutor) able to create positive learning environment during the session | 66.7% | 19%     | 14.3%    | 0                 | 0            | 4.5       |
| Q11  | The available infrastructure for peer teaching is adequate.                                      | 28.6% | 47.6%   | 23.8%    | 0                 | 0            | 4.04      |
| <b>All respondent's general perception regarding PAL club activities</b> |  |       |         |          |                   |              |           |
| Q1   | I'm generally satisfied with the club performance  | 36%   | 24.4%   | 30.2%    | 4.7%              | 4.7%         | 3.8±0.85  |
| Q2   | I'm satisfied with the arrangement, organization and planning of sessions                        | 33.7% | 22.1%   | 34.9%    | 5.8%              | 3.5%         | 3.77±0.98 |

- **Peer tutor's perception and evaluation of PAL**

A total of 39 peer tutors responded to survey (45% fifth and 55% sixth year; 54% male and 46% female). Peer tutors at TMSAT reported satisfaction (> 4 on 5-point Likert scale) regarding PAL's ability to consolidate their knowledge and improve their clinical performance, confidence, presentation and communication skills. The other responses had similar satisfaction levels except for their evaluation of the available infrastructure and facilities for PAL (3.3 satisfaction level). Cronbach's alpha was 0.853 for this set of questions.

Regarding the free-form question on students' recommendations for the PAL club, tutors suggested making the sessions online and on weekends. Other respondents suggested incorporating PAL into the curriculum to facilitate effective time and logistics management.

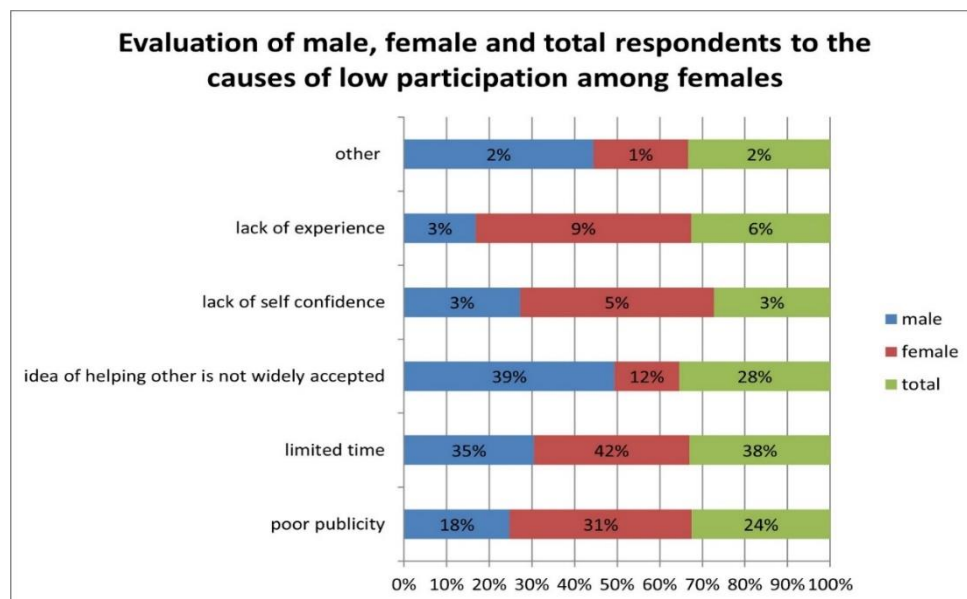
- **Peer learners' perception and evaluation of PAL**

A total of 156 peer learners participated in this study and most were in the first three years of their medical education (16.7% first year, 17.3% second year, 18% third year, 24% fourth year, 16% fifth year, 8% sixth year). About 52% of the respondents were female and 48% male. Regarding the respondents' GPAs, 62% were 3-3.5 and 38% were above 3.5. The TMSAT peer learners reported a preference (> 3.5 on 5-point Likert scale) for PAL sessions over standard faculty teaching. They felt more confident and comfortable during the PAL sessions. They were more satisfied with the theoretical sessions than the laboratory skills sessions. The learner's satisfaction with peer tutors was high ( $\geq 4$  on 5-point Likert scale) regarding their knowledge, skills, ability to answer questions and create a positive learning environment, and the available infrastructure. Cronbach's alpha was 0.912 for this set of questions.

- **General PAL club activities**

More than 55% of respondents strongly agree or agree on the club performance and organizational activities (> 3.5 on 5-point Likert scale). A significant difference in satisfaction (means  $\pm$  SD) with club performance was detected between tutors, learners, and those not participating in club activities (4.07 $\pm$ 0.92, 4.38 $\pm$ 0.78, 3.66 $\pm$ 1.15 respectively) with the highest satisfaction reported by peer tutors. Also, significant differences in the mean satisfaction regarding the arrangement, organization, and planning of sessions were detected between tutors, learners, and those not participating in club activities (3.69 $\pm$ 1.13, 4.24 $\pm$ 0.81, 3.63 $\pm$ 1.13 respectively) with the highest satisfaction among peer learners.

More TMSAT sessions were held among the male students than their female counterparts (82% on the male side and 18% on the female side during the first year of the initiative; 64% male and 36% female side in the second year). The students' responses concerning the low rate of female participation in TMSAT compared with male students are shown in Fig. 1.



**Figure 1** - Histogram showing evaluation of total, male and female respondents to the possible causes of low level of participation especially at the female side.

Most of the respondents (38%) reported that time limitations were the main cause. 39% of male respondents found that the idea of helping others could also cause low participation. Poor publicity was noted by 31% of the female respondents and 24% of their male counterparts. 5% of the female respondents chose 'lack of self-confidence' and 2% of the male respondents chose 'lack of



experience'. 2% of the total respondents mentioned other causes including too few tutors, that PAL was not included in the approved study schedule, and the better academic performance of female students.

Regarding the free-form question asking for recommendations to advance the PAL club and to ensure effective communication with students at lower levels with extending the use of technology, learners suggested transferring to online sessions to save time and arrangement efforts. Moreover, they suggested officially including PAL sessions in the curriculum.

• **PAL perception according to gender**

The peer tutors' perceptions were generally positive to all questions about PAL either male or female with no significant difference. The peer learners' perspectives were generally positive for all the questionnaire statements. Significant differences were found ( $P < 0.05$ ) between male and female learners on items 2, 7, and 10 regarding their evaluation of peer tutors. Details on perception of peer tutors and learners according to gender is seen in table (3). Male students were less likely to agree with statements related to finding peer learning effective and peer tutors' knowledge. Whereas female learners were less likely to agree with statements related to the ability of tutors to create a positive environment.

**Table 3 - Showing perception of peer tutors and learners according to gender.**

| Type of respondents | Questions  | Male Mean ± SD | Female Mean ± SD | P value |
|---------------------|--|----------------|------------------|---------|
| Peer tutors         | I had the opportunity to consolidate my own knowledge by peer teaching                           | 4.43±0.9       | 4.3±0.98         | 0.67    |
|                     | Being tutor in clinical sessions increased my performance  | 4.6±0.73       | 4.5±0.95         | 0.71    |
|                     | Being peer tutor increased my confidence in presentation skills                                  | 4.6±0.72       | 4.6±0.86         | 1       |
|                     | I have better understanding of teamwork and communication skills                                 | 4.4±0.9        | 4.3±0.98         | 0.7     |
|                     | Peer teaching helps me to get teaching skills  | 4.4±0.9        | 4.5±0.93         | 0.7     |
|                     | I found myself a better role model to my peers   | 4.43±0.9       | 4.3±0.98         | 0.6     |
|                     | I gain benefits from the sessions that I presented, and I want to repeat it                      | 4.6±0.73       | 4.5±0.86         | 0.69    |
|                     | I was interested in the scientific content that I presented                                      | 3.14±1.25      | 3.68±1.2         | 0.18    |
|                     | Peer teaching experience help me in personal and professional development                        | 4±0.76         | 4.19±0.89        | 0.48    |
|                     | The available infrastructure for peer teaching is adequate                                       | 3±1.06         | 3.2±1.2          | 0.58    |
| Peer learners       | I had support from faculty and other peers.  | 3.8±0.6        | 3.99±0.9         | 0.43    |
|                     | I found myself adequately prepared for tutor role in peer teaching.                              | 4.71±0.67      | 4.3±1.2          | 0.18    |
|                     | I prefer being taught by peer teaching compare to standard Faculty teaching                      | 4.1±0.9        | 3.5±0.9          | 0.68    |
|                     | I found peer teaching effective method for clinical teaching                                     | 4±0.89         | 4.1±0.99         | 0.03*   |
|                     | I feel more confident learning from peer that standard Faculty session.                          | 3.7±1.3        | 3.7±1.1          | 1.0     |
|                     | I feel safer and more comfort during peer learning session than standard Faculty session         | 3.7±1.0        | 4.1±0.88         | 0.09    |
|                     | I'm satisfied with skill lab peer teaching sessions that I attend.                               | 3.7±0.9        | 3.7±0.99         | 1.0     |
|                     | I'm satisfied with theoretical peer teaching sessions that I attend. .                           | 3.7±1.1        | 4.11±0.9         | 0.1     |
|                     | I found the trainer (peer tutor) knowledge is sufficient during session.                         | 3.7±0.9        | 4.3±0.9          | 0.01*   |
|                     | I found the trainer (peer tutor) skills is sufficient during session.                            | 3.6±1.2        | 4.1±0.7          | 0.05*   |
| Not participating   | I found the trainer (peer tutor) able to answer questions during the session.                    | 4.1±0.8        | 4.3±0.86         | 0.3     |
|                     | I found the trainer (peer tutor) able to create positive learning environment during the session | 4.6±0.6        | 4±0.8            | 0.001*  |
|                     | The available infrastructure for peer teaching is adequate.                                      | 4.1±0.54       | 4±0.8            | 0.56    |
| Not participating   | I'm generally satisfied with the club performance  | 3.3±1.2        | 3.59±1.22        | 0.4     |
|                     | I'm satisfied with the arrangement, organization and planning of sessions                        | 3.3±1.07       | 3.59±1.15        | 0.37    |

• **PAL perception according to GPA, year of study**

Details on correlation coefficient between general satisfaction questions and type of students, year of study and GPA is seen in table (4). Spearman's rho coefficient indicated positive correlations between the responses to the two questions on general satisfaction with PAL and session organization and the respondent's year of study, meaning that satisfaction increased with the level of study with more satisfaction reported by sixth-year students.

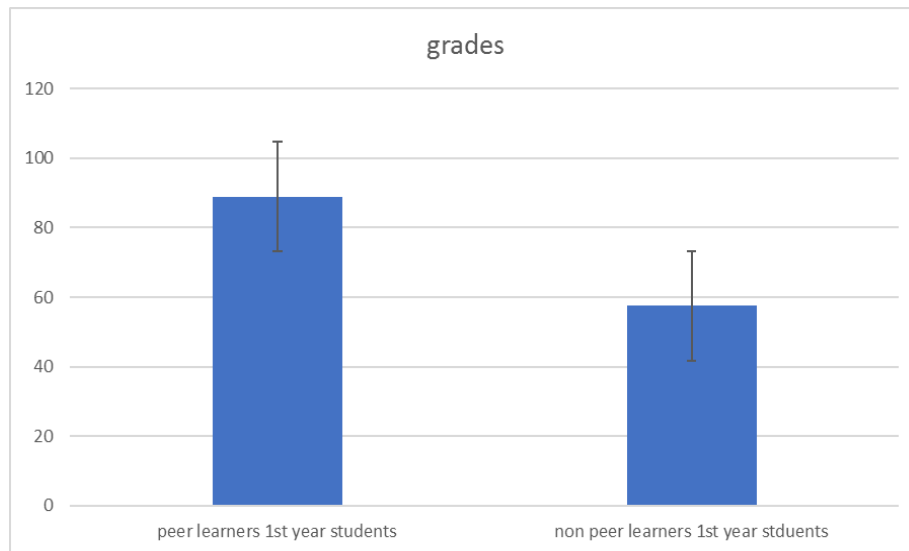
A significant negative correlation between GPA and student satisfaction was detected, meaning that satisfaction increased among low-GPA respondents.

**Table 4 - correlation coefficient between general satisfaction questions and type of students, year of study and GPA.**

|   | Year of study | Type of students peer tutors or learner | GPA     | GQ1    |
|---|---------------|---|---------|--------|
| GQ1 I'm generally satisfied with the club performance                         |               |   |         |        |
| Correlation Coefficient   | .263**        | .161                                    | -.316** |        |
| Sig. (2-tailed)   | .008          | .106                                    | .001    |        |
| GQ2 I'm satisfied with the arrangement, organization and planning of sessions |               |   |         |        |
| Correlation Coefficient   | .322**        | .232*                                   | -.212*  | .576** |
| Sig. (2-tailed)   | .001          | .019                                    | .033    | .000   |

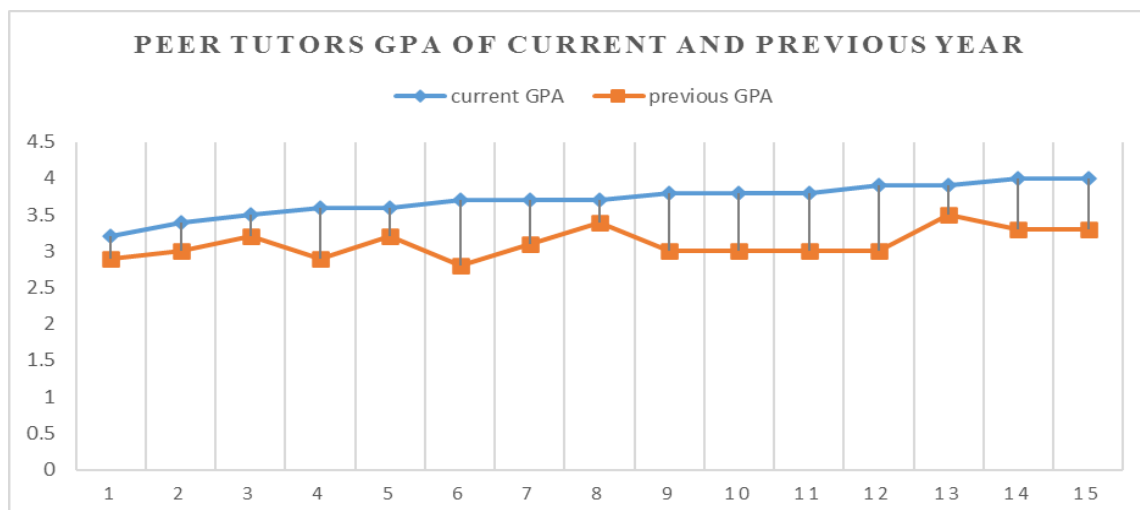
- **Effect of TMSAT on academic achievement**

Comparing mean  $\pm$  SD of grades of peer learners (group 1 students no=26) that attended all basic sciences sessions with (group 2 students no=45) of the same level that didn't attend the sessions revealed significant difference in average students grades of basic science (Group 1,  $88.95 \pm 6.63$  and group 2,  $57.45 \pm 11.20$ , P value  $< 0.01$ ) as seen in figure (2).



**Figure 2** - comparison of means of grades of peer learners of 1st year students shared in peer tutoring sessions on basic science topics with that did not attend the sessions.

Moreover, mean  $\pm$  SD of the total GPA of the peer tutors' students from 6<sup>th</sup> year that shared in more than 10 sessions of PAL (no=15) were compared with the GPA of the same students in the previous year. The results revealed significant increase in their GPA (current  $3.93 \pm 0.2$  & previous  $3.1 \pm 0.2$ ,  $p < 0.001$ ). Students tends to earn higher GPA after their engagement in PAL. All of peer tutors showed higher GPA as seen in figure (3) when compared with their GPA of previous year.



**Figure 3** - comparison of GPA of peer tutors of 6<sup>th</sup> year students that share in more than 10 sessions with their GPA of previous year.

## DISCUSSION

Although peer teaching is well established as an effective and valuable educational experience for medical students in the literature,<sup>17-19</sup> quantitative data supporting the concept is limited.

Therefore, this study aimed to determine whether PAL is effective for undergraduate medical students and to address the PAL initiative at the College of Medicine, by presenting medical student's perception and satisfaction with the "T- Medical Students As



Teachers" (TMSAT) project. This project started two years prior to the present study and involves peer tutors (students at the same level or higher) teaching theoretical or practical lessons to peer learners (younger students) voluntarily. TMSAT activities also include preparing volunteer tutors to be teachers. The topics were identified according to the student's needs. Each session was evaluated by attendees and tutors were established according to the student's evaluation. Therefore, data on PAL activities were collected and medical students were surveyed on their perception and evaluation of their PAL experience.

Peer tutors' students acknowledged that leading a PAL session improved their knowledge, clinical performance, self-confidence, teamwork, presentation skills, and professional development. This is in alignment with Durán et al.<sup>5</sup> who found that peer teaching helps the medical students develop professionally and contributes to the preparation of competent medical graduates and, as such, should be incorporated into the entire medical curriculum. Moreover, Khaw and Raw<sup>20</sup> recorded more 'strongly agree' responses from peer tutors concerning the professional development effects of PAL. This increased positive attitude was attributed to offering a medical education elective course to sixth-year medical students in which they teach first- and second-year students. Motivation, self-monitoring, organization, and knowledge retrieval during the teaching session underlie these gains.<sup>21</sup>

In the present study, peer learners had positive perceptions of PAL. Most respondents found peer teaching to be an effective way to learn and preferred it over faculty teaching. They felt more confident and comfortable learning from peer tutors. Khalid et al.<sup>22</sup> demonstrate that students have positive attitudes toward PAL especially for learning clinical skills and this positive attitude was more prominent when the tutors were more academically advanced and specifically selected and trained. Also, in a study conducted in Bahrain, students taught by PAL performed better in tutorials than those taught by faculty staff.<sup>23</sup> They attributed these findings to similarities between students and peer tutors in both demographic characteristics and experiences. In our case, peer tutors were selected based on their GPA and actual and perceived competence of the tutors by tutees in addition to learner-tutor similarities.

Lower response rates and less activity were observed for the PAL sessions in the current study among female students compared with male students. According to the students, the most common cause was time limitations, especially among female students, followed by poor publicity and the need for more orientation to the activities to reach more female students. About 28% of male respondents reported that the idea of helping others is not widely accepted and this could be a cause of low turnout. A small percentage of respondents recorded a lack of experience and self-confidence.

The questionnaire respondents in the current study largely found the peer tutors to be trustworthy both in their knowledge level and ability to manage a session; however, about 20% of the students did not consider their peers to be effective tutors.

AlShareef et al.<sup>24</sup> stated that inconsistencies in student's responses are to be expected in systems where any student can become a peer-tutor regardless of commitment or skill. Providing effective training can enhance students' tutoring skills. The students in the present study were trained in presentation skills as part of the University's study skills course during their first year of study and also on how to identify and present seminars on different topics, which were used as teaching and assessment strategies in many courses in every study year. Although the majority of the peer tutors found themselves adequately prepared to be role models for their colleagues, some additional training on the practices and expectations of a tutor would be beneficial. Several studies<sup>21, 25, 26</sup> recommend incorporating information on adult education principles, time management skills, group dynamics, and learning challenges to improve peer-tutor performance, which would likely increase student satisfaction. The feedback collected after each PAL session may also highlight additional areas of improvement.<sup>27</sup>

According to the results of this study, gender did not significantly affect the students' responses except for male students' evaluation of their tutor's efficiency. They evaluated their tutors lower than the female students who found their tutors less able to create a positive learning environment. The subjects in this study were separated for the PAL sessions according to gender and same-sex dyad grouping was applied. Also, a significant negative correlation was detected between GPA and reported satisfaction with the latter being increased among low achieving students.

Leung<sup>28</sup> identified parameters crucial for maximizing the effectiveness of peer tutoring interventions including same-age and same-sex sessions and targeting low-academic-ability students. The literature contains conflicting results regarding PLA perception among male and female students. While Akudo and Eberechukwu<sup>29</sup> found no difference between male and female students, other studies have reported more favorable perceptions both among male<sup>30</sup> and female students.<sup>31</sup> Nonetheless, student perception is likely influenced by gender-based psychosocial differences such as female medical students experiencing more anxiety and male medical students scoring higher in loneliness.<sup>32</sup>

Results of this study confirmed that peer teaching in higher education is effective in enhancement of student achievement as students who peer tutored were significantly achieved higher grades when compared with the same cohort students that were not peer tutored. These findings are in line with previous records that demonstrated improved skills and higher grades for peer learners of different educational programs<sup>33-35</sup>. Kim et al.<sup>35</sup> concluded that PAL was useful and low-cost effective strategy in enhancing exam scores and reducing student's failure rates. PAL is more effective than lecture on student's learning and retention, specifically in comprehension and application levels. PAL could be an effective mean to encourage students and improve their knowledge and performance in basic sciences<sup>36</sup>.

Also, this study highlighted enhancement of academic achievement of peer tutors, as significant increase in their GPA were observed in comparison to their previous GPA. These finding is in consistent with other research results<sup>33, 37</sup>. They demonstrated that PAL enhancing the academic achievement and learning experience of peer tutors. Roscoe and Chi,<sup>38</sup> explained the higher achievement

of peer tutors by the closely matching of the normal timetabled session with the PAL session that reinforce their competencies and skills and that the tasks for the tutors, during each session, closely matched with the requirements of their assessment. Moreover, there was demonstrable overall knowledge gain associated with acting as a tutor in a PAL program, but the greatest gain occurred in students of highest academic ability. When peer tutors conceptualize concepts and discuss them with peer learners, this aids deeper learning and understanding in the tutors.<sup>39</sup>

This finding has significant implications on the improvement of skills and competencies of medical students that assist in their employability as stated by Bennett et al.<sup>40</sup> They illustrated that PAL is an effective and feasible method for teaching clinical skills in a controlled environment, subsequently improving confidence among healthcare undergraduates. Another research work by Schauseil-Zipf et al.<sup>41</sup> concluded that PAL program of clinical skills training was rated higher by the students regarding their satisfaction with the teaching quality and their self-assessment of the acquired skills. Also, doctors seem to be more motivated for their own teaching tasks if they are assisted by student peer teachers. More research is needed to investigate the influence of peer teaching on the motivation of doctors to teach medical students and the academic performance of the student peers. Such teaching may provide the basis for feasibly mass-producing clinical skills courses for healthcare students.

## CONCLUSION

Medical students at our University regard voluntary peer-teaching as similar to faculty teaching and have generally positive perceptions about the TMSAT initiative. An overwhelming majority reported that they benefited both personally and professionally from PAL. They recommended enhancing the role of PAL and officially including sessions in the curriculum schedule. According to the students' needs assessment, a wide variety of sessions could be included to improve PAL activities such as case-based discussion and clinical skill lab in addition to theoretical topics. Since it is a fundamental duty of doctors to teach and train younger generations, medical schools must prepare their students for such roles. Therefore, a system that provides an opportunity for every student to become a trained student-teacher provides merit. Moreover, incorporating modules on specific teaching methods could be useful. Taken together, the data supports combining PAL with other methods of teaching and learning to foster cooperation and social interaction among medical students and to prepare students for their future role as medical science educators. However, additional research into the impact of PAL on academic achievement, both short- and long-term learning outcomes, in medical programs is warranted.

Lesson for practice:

1. Wide varieties of sessions could be managed by PAL such as case-based discussion and clinical skill lab.
2. Medical students benefited both personally and professionally from peer tutoring or learning.
3. PAL is a useful to prepare students for their future role as teachers of medical sciences.

## REFERENCES

- Diana, S. (2018). The effect of peer assisted learning (PAL) on anatomic competencies of prospective student's biology teachers. *Journal of Physics: Conference Series*, 1013(1), article id. 012015. <https://doi.org/10.1088/1742-6596/1013/1/012015>
- Yu, T.C., Wilson, N.C., Singh, P.P., Lemanu, D.P., Hawken, S.J., Hill, A.G. (2011). Medical students-as-teachers: a systematic review of peer assisted teaching during medical school. *Adv Med Educ Pract*, 23 (2), 157-72. doi: 10.2147/AMEP.S14383.
- Carey, M.C., Chick, A., Kent, B., Latour, J.M. (2018). An exploration of peer-assisted learning in undergraduate nursing students in paediatric clinical settings: An ethnographic study. *Nurse Educ Today*, 65, 212-217. doi: 10.1016/j.nedt.2018.03.014. Epub 2018 Mar 22.
- Bulte, C., Betts, A., Garner, K., Durning, S. (2007). Student teaching: views of student near-peer teachers and learners. *Med Teach*, 29(6), 583-90. doi: 10.1080/01421590701583824. PMID: 17922356.
- Durán, C.E.P., Bahena, E.N., MdlÁG, R., Baca, G.J., Uresti, A.S., Elizondo-Omaña, R.E., López, S.G. (2012). Near-peer teaching in an anatomy course with a low faculty-to-student ratio. *AnatAnatSci Educ*, 5(3), 171-6. doi: 10.1002/ase.1269. Epub 2012
- Rengier, F., Rauch, P.J., Partovi, S., Kirsch, J., Nawrotzki, R. (2010). A three-day anatomy revision course taught by senior peers effectively prepares junior students for their national anatomy exam. *Ann Anat-AnatAnz*, 192(6), 396-9. doi:10.12968/ippr.2015.5.1.22
- Jackson, T., Evans, D. (2012). Can medical students teach? A near-peer-led teaching program for year 1 students. *AdvPhysiol Educ*, 36(3), 192-6. <https://doi.org/10.1152/advan.00035.2012>
- Wun, Y., Tse, E.Y., Lam, T., Lam, C.L. (2007). PBL curriculum improves medical students' participation in small-group tutorials. *Med Teach*, 29(6), e198-203. <https://doi.org/10.1002/bmb.21124>

Amer, M. G., Althaqafi, R. M. M., Assir, S. A., Alsufyan, A., Faisal S. Alrubai F. S., & Mohamed, N. M. (2021). Peer-assisted learning: undergraduate medical students' perception and satisfaction. *Millenium*, 2(16), 11-22. DOI: <https://doi.org/10.29352/mill0216.23989>

- Nestel, D., Kidd, J. (2005). Peer assisted learning in patient-centred interviewing: the impact on student tutors. *Med Teach*, 27(5), 439–44. doi: 10.4103/jehp.jehp\_890\_20
- Blank WA, Blankenfeld H, Vogelmann R, Linde K, Schneider A. (2013). Can near-peer medical students effectively teach a new curriculum in physical examination? *BMC Med Educ*, 13(1), 165.
- Kühl, M., Wagner, R., Bauder, M., Fenik, Y., Riessen, R., Lammerding-Köppel, M., Gawaz, M., Fateh-Moghadam, S., Weyrich, P., Celebi, N. (2012). Student tutors for hands-on training in focused emergency echocardiography—a randomized controlled trial. *BMC Med Educ*, 29(12):101
- Meller, S.M., Chen, M., Chen, R., Haeseler, FD. (2013). Near-peer teaching in a required third-year clerkship. *Yale J Biol Med*, 86(4), 583.
- Bugaj, T.J., Mucksch, C., Schmid, C., Junne, F., Erschens, R., Herzog, W., Nikendei, C. (2016). Peer-led Stress Prevention Seminars in the First Year of Medical School—A Project Report. *GMS J Med Educ*, 33(1), Doc3. doi: 10.3205/zma001002.
- Gazula, S., McKenna, L., Cooper, S., Paliadelis, P. (2017). A systematic review of reciprocal peer tutoring within tertiary health profession educational programs. *Health Prof Educ*, 3(2), 64–78. <https://doi.org/10.1016/j.hpe.2016.12.001>
- Burgess, A., Dornan, T., Clarke, A.J., Menezes, A., Mellis, C. (2016). Peer tutoring in a medical school: perceptions of tutors and tutees. *BMC Med Educ*, 85, 8-16. doi: 10.1186/s12909-016-0589-1
- Khaw, C., Raw, L. (2016). The outcomes and acceptability of near-peer teaching among medical students in clinical skills. *Int J Med Educ*, 7, 189–195. doi:10.5116/ijme.5749.7b8b
- Omar, F., Zaheer, M., Ahmed, M.1. (2018). Effectiveness of peer teaching in medical education: medical student's perspective. *Adv Med EducPract*, 23(9), 199-201. <https://doi.org/10.2147/AMEP.S161507>
- Dandavino, M., Snell, L., Wiseman, J. (2007). Why medical students should learn how to teach. *Med Teach*, 29, 558–65. doi: 10.1080/01421590701477449
- Nestel, D., Kidd, J. (2003). Peer tutoring in patient-centered interviewing skills: experience of a project for first year students. *Med Teach*, 25(4), 398–403. doi: 10.7860/JCDR/2015/15018.6323
- Khaw, C., Raw, L. (2016). The outcomes and acceptability of near-peer teaching among medical students in clinical skills. *Int J Med Educ*, 7, 189–195. doi:10.5116/ijme.5749.7b8b
- Benè, K.L., Bergusm G. (2014);. When learners become teachers: a review of peer teaching in medical student education. *Fam Med*, 46(10), 783–787.
- Khalid, H., Shahid, S., Punjabi, N., Sahdev, N. (2018). An integrated 2-year clinical skills peer tutoring scheme in a UK-based medical school: perceptions of tutees and peer tutors. *Adv Med EducPract*, 9, 423–432. doi:10.2147/AMEP.S159502.
- Rashid, M., Sobowale, O., Gore, D. (2011). A near-peer teaching program designed, developed and delivered exclusively by recent medical graduates for final year medical students sitting the final objective structured clinical examination (OSCE). *BMC Med Educ*, 11(1), 11. doi: 10.1186/1472-6920-11-11.
- AlShareef, S.M., Aldayel, A.Y., Alghamdi, H.M., Alosaimi, M.B., Alharbi, M.M., Aldayel, A.A., Alhussain, H.A. (2019). Perceptions On Reciprocal Peer Teaching Among Medical Students As Learners And As Tutors. *Adv Med EducPract*, 10, 817-827.
- Alvarez, S., Nikendei, C., Schultz, JH. 2017. Development of a didactical training concept for peer tutors in gross anatomy. *AnatSci Educ*, 10(5), 495–502. doi:10.1002/ase.1691
- Hsiao, Y.P. (Amy), Brouns, F., Bruggen, J.V., Sloep, P.B. (2015). Effects of training peer tutors in content knowledge versus tutoring skills on giving feedback to help tutees' complex tasks. *Educ Stud*, 41(5), 499–512. doi:10.1080/03055698.2015.1062079
- Shiozawa, T., Hirt, B., Celebi, N., Werner, A., Weyrich, P., Lammerding-Koeppel, M. (2010). Does a combined technical and didactical training program improve the acceptance of student tutors in the dissection course? A prospective controlled randomized study. *Ann Anat*, 192(6), 361–365. doi:10.1016/j.aanat.2010.09.006
- Leung, Kim. Chau. (2019). An updated meta-analysis on the effect of peer tutoring on tutors' achievemen. *School Psychology International*, 40(2), 200-214. doi: 10.1177/0143034318808832
- Akudo, A.H., Eberechukwu, A.S. (2018). Gender differences on medical students' perception of peer tutoring learning strategy on clinical skills training at MacArthur clinical skills laboratory (mcsl). *Br J Educ*, 6(5), 1–8.
- Langan, M.A., Wheeler, P.C., Shaw, E.M., et al. (2005). Peer assessment of oral presentations: effects of student gender, University affiliation and participation in the development of assessment criteria. *Assess Eval High Educ*, 30(1), 21–34. doi:10.1080/0260293042003243878
- Tai, J., Canny, B., Molloy, E., Haines, T. (2017). Gender matters: students' perceptions of peer learning in clinical education. *Focus Health Prof Educ*, 18(1), 3–15. doi:10.11157/fohpe.v18i1.203

- Peterson, D.A.M., Biederman, L.A., Andersen, D., Ditonto, T.M., Roe, K., Wilson, R.K. (2019). Mitigating gender bias in student evaluations of teaching. *PLoS One*, 14(5), e0216.  
<https://doi.org/10.1371/journal.pone.0216241>
- Maynard, J., and Almarzouqi, I. (2006). "Investigating peer tutoring". *ELT Journal*, 60(1), 13-22. <https://doi.org/10.1093/elt/cci077>.
- Comfort, P. (2011). The effect of peer tutoring on academic achievement during practical assessments in applied sports science students. *Innovations in Education and Teaching International*, 48(2), 207-211.  
<https://doi.org/10.1080/14703297.2011.564015>
- Kim, S.C., Jilapali, R., Boyd, S. (2021). Impacts of peer tutoring on academic performance of first-year baccalaureate nursing students: A quasi-experimental study. *Nurse Educ Today*, 96, 104658. <http://dx.doi.org/10.1016/j.nedt.2020.104658>
- Abedini, M., Mortazavi, F., Javadinia, S. A., & Moonaghi, H. K. (2013). A new teaching approach in basic sciences: Peer assisted learning. *Procedia-Social and Behavioral Sciences*, 83, 39-43. <https://doi.org/10.1016/j.sbspro.2013.06.008>
- Ward, P., and Lee, M. (2005). "Peer-assisted learning in physical education: a review of theory and research". *Journal of Teaching in Physical Education*, 24 (3), 205-225.  
<https://doi.org/10.1123/jtpe.24.3.205>
- Roscoe, R.D., and Chi, M.T.H. (2007). "Understanding tutor learning: knowledge-building and knowledge telling in peer tutors' explanations and questions". *Review of Education Research*, 77(4), 534-578.  
<https://doi.org/10.1017/CBO9780511816796.002>
- Donohoe, C.L., Conneely, J.B., Zilbert, N., Hennessy, M., Schofield, S., Reynolds, J.V. (2015). DocemurDocemus: Peer-Assisted Learning Improves the Knowledge Gain of Tutors in the Highest Quartile of Achievement but Not Those in the Lowest Quartile. *J Surg Educ*, 72(6), 1139-44. <https://doi.org/10.1016/j.jsurg.2015.07.001>.
- Bennett, S.R., Morris, S.R., Mirza, S. (2018). Medical Students Teaching Medical Students Surgical Skills: The Benefits of Peer-Assisted Learning. *J Surg Educ*, 75(6), 1471-1474. DOI: 10.1016/j.jsurg.2018.03.011.
- Schauseil-Zipf, U., Karay, Y., Ehrlich, R., Knoop, K., Michalk, D. (2010). Peer teaching in paediatrics - medical students as learners and teachers on a paediatric course. *GMS Z Med Ausbild*, 27(5), Doc71. doi: 10.3205/zma000708.