ORIGINAL ARTICLE

Assessing correlation between students' perception of the learning environment and their academic performance

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Abstract

Objective: To assess the association between the learning environment and academic performance at medical colleges.

Methods: The cross-sectional study was conducted in four medical colleges in 2014 in Riyadh, Saudi Arabia. Online questionnaire was sent to final year medical students. It included demographic profile, the last Grade Point Average, and the Dundee Ready Education Environment Measure. Data was analysed using SPSS 17.

Results: Of the 423 students who were sent the online form, 261(61.7%) responded and among them 193 (45.6%) questionnaires had been fully filled and were included in the analysis. Mean Dundee Ready Education Environment Measure score was 117.9±27; higher for females (p=0.019). Correlation coefficient 'R' was 0.29 (p<0.001). As the perception of learning environment increased from "Poor", "Plenty of Problems", "More Positive than Negative" to "Excellent", the mean GPA increased gradually (p=0.0006). Perception of learning environment as "More Positive than Negative" and "Excellent" increased the mean GPA by 0.38 (95% confidence interval: 0.19 - 0.56) compared to "Poor", "Plenty of Problems" on multivariable analysis.

Conclusion: Low, yet positive correlation between perception about learning environment and academic performance in the form of GPA indicated that improvement in the learning environment may enhance the academic performance of medical students.

Keywords: Educational measurement, Learning environment, Perception, Medical school, Medical students. (JPMA 66: 1616; 2016)

Introduction

The learning environment and student learning style are essential determinants of students' learning.[1] They affect both academic achievements and postgraduate competence.[2] Effective education requires a supportive learning environment. Studies have shown that a positive learning environment promotes students' acquisition of knowledge.[3] But to what extent does the learning environment influence the learning outcomes? This study focuses on the interplay of the learning environment and the learning outcome in a quantitative way.

According to the Leaning, Environment, Process, Outcomes (LEPO) framework, learning environment facilitates the learning process which leads to the learning outcome, and learning outcome in turn determines the learning environment.[4] The three are interconnected in such a way that one affects the other and the circle continues. If the main trigger of LEPO, the learning environment is flawed, it can adversely affect the learning outcome.[4]

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Students' perception of their learning environment is one way to assess the learning environment in an institution. To accomplish this, many instruments have been proposed and validated to assess the learning environment. Each of these instruments measure several aspects of the learning environment within a medical school and has a different internal structure. Examples of these instruments are the Learning Environment Questionnaire (LEQ), the Medical School Learning Environment Survey (MSLES), and the Dundee Ready Education Environment Measure (DREEM).[5] The DREEM questionnaire is a validated instrument intended to assess the learning environment for medical schools. It was developed in Dundee University Medical School in 1997.[6] The DREEM questionnaire has been widely used to assess medical and nursing school's educational environment at undergraduate and postgraduate levels.[7]

Although there are many studies done to assess the students' perception of the learning environment in Saudi Arabia and worldwide, only a few of these studies have assessed its relation to the students' academic performance, which is one of the learning outcomes.[7,8] Identifying a correlation between the students' perception of the learning environment and his/her performance will further emphasise the importance of

improving the learning environment in medical schools and justify expenses aimed at improving the learning environment. The current study was planned to assess the learning environment as perceived by medical students, and to measure the correlation between students' perception of the learning environment and their academic performance, reflecting the learning outcome.

Subjects and Methods

This cross-sectional study was conducted in 2014 in medical colleges of Riyadh, Saudi Arabia. We included all the four colleges recognised by the Ministry of Higher Education and which had final year medical students. As previous researchers reported difference in some of the components of DREEM scores among males and female medical students,[9] we wanted to include both genders in the study to measure its impact on the perception of learning environment, hence we included colleges having a coeducation system. Based on these criteria, this study was conducted at the colleges of medicine of King Saud University, King Saud bin Abdul Aziz University for Health Sciences, Imam Muhammad bin Saud Islamic University and Al-Faisal University. All final year medical students of these colleges were targeted to reduce sampling variability.

An online questionnaire was sent to all students through the email database of the medical colleges. The questionnaire was sent in both English and Arabic, and consisted of two sections. One section dealt with the demographic data and academic performance and contained questions regarding the age, gender, nationality, university name, and the last Grade Point Average (GPA) of the student.

The second section was based on DREEM questionnaire as a validated instrument to measure the learning and teaching environment in an educational institute. The DREEM questionnaire contains 50 sentences describing the educational environment under five aspects: Students' perceptions of learning (SPL), Students' perceptions of teachers (SPT), Students' academic self-perception (SASP), Students' perceptions of atmosphere (SPA), and Students' social self-perception (SSSP).[6] Practical Guide for DREEM to interpret the different five sub-scales was followed.[10] The Arabic translation of DREEM was also used.[2]

The DREEM instrument has amaximum item score of 200 and a minimum of 0. The score is interpreted as follows: "Excellent" learning environment for a score of 151 to 200; "More Positive than Negative" for a score of 101 to 150; "Plenty of Problems" for a score of 51 to 100; and "Poor" Learning Environment" for a score of 0 to 50. A score of 100 reflects conflicting students' perception of the environment, and the learning environment needs improvement. Each sentence is scored 0 for Strongly Disagree (SD), 1 for Disagree (D), 2 for Uncertain (U), 3 for Agree (A), and 4 for Strongly Agree (SA). However, there are 9 out of 50 negative statements numbered 4, 8, 9, 17, 25, 35, 39, 48 and 50, and scored as 4 for SD, 3 for D, 1 for A, and 0 for SA.

Data was analysed using SPSS 17. Mean and standard deviations(SD) were calculated for continuous variables and frequency and proportion for categorical variables. The correlation between mean GPA and the DREEM score was measured by Pearson correlation coefficient R. One-wayanalysis of variance (ANOVA) was conducted to measure the difference of the mean GPAbetween the four categories of DREEM. Tukey test was performed as a post-hoc test to detect the differences of GPA between DREEM categories. Univariable linear regression was conducted to measure the association of age, gender, nationality, medical college and DREEM categories of "Poor" and "Plenty of Problems" compared to "More Positive than Negative" and "Excellent" with mean GPA. The variables having $p<0.1$ were included in the multivariable linear regression model. Multivariable linear regression modelling (having a continuous outcome and multiple exposure variables/predictors) was done to measure the association between the DREEM categories of "Poor" and "Plenty of Problems" compared to "More Positive than Negative" and "Excellent" and the mean GPA adjusting for other variables in the model. $P<0.05$ was considered significant.

The King Saud University, College of Medicine, Committee on Ethics in Research granted approval for the study. Participation in the study was voluntary and consent was given by answering a question regarding consent in the online questionnaire. Participants received an explanatory statement detailing the study and were informed that data would be de-identified.

Results

Among 423 students of the 4 colleges, 261(61.7%) responded. Of them, 193(45.6%) returned fully completed questionnaires which were included in the analysis. There were 130(67.4%) male and 63(32.6) female students with an overall mean age of 23.7±1.4 years (Table-1).

The overallmean DREEM score was 117.9±27, SPL 26.3±7.2, SPT 26±7.5, SASP 21.1±4.7, SPA 26.8±8.3 and SSSP 14.4±4.1. The means of all scores, SASP, were significantly higher in female students compared to their male counterparts ($p=0.019$). Mean DREEM score along with mean score of its components varied in the four

Table-1: Baseline Characteristics of the final year medical students.

Variable	Response
Mean Age in years	23.7±1.4
Gender (n (%))	
Male	130 (67.4)
Female	63 (32.6)
Nationality (n (%))	
Saudi	182 (94.3)
Non-Saudi	11 (5.7)
University (n (%))	
Alfaisal University	14 (7.3)
Imam Muhammad Bin Saud Islamic University	40 (20.7)
King Saud Bin Abdul Aziz University	32 (16.6)
King Saud University	107 (55.4)
Mean GPA	4.1±0.6
GPA categories (n (%))	
>4.75 – 5	15 (7.8)
>4.5 – 4.75	49 (25.4)
>4 – 4.5	73 (37.8)
>3.5 – 4	38 (19.7)
>3 – 3.5	14 (7.3)
< 3	4 (2.1)

SD: Standard deviation
GPA: Grade point average.

medical colleges (Table-2).

Students' perception of their learning environment as measured by the DREEM score and its subscales showed low positive, yet significant correlation with their GPA (Table-3).

On multivariable analysis, mean GPA of students perceiving their learning environment as "More Positive than Negative" and "Excellent" was 0.38 (95% confidence interval [CI]0.19 - 0.57) points higher than those perceiving their learning environment as "Plenty of Problems" and "Poor", adjusting for age, gender, nationality and medical college.

Table-3: Correlation of DREEM & its components with GPA and Association of DREEM being "More Positive than Negative" & "Excellent" compared to "Plenty of Problems" & "Poor" with the mean GPA by multivariable linear regression.

Correlation of DREEM & its components with GPA		
Scores	**Correlation Coefficient R**	**p-value**
Total DREEM Score	0.29	< 0.01[a]
SPL	0.24	< 0.01[a]
SPT	0.25	< 0.01[a]
SASP	0.28	< 0.01[a]
SPA	0.27	< 0.01[a]
SSSP	0.21	<0.01[a]

Factors affecting GPA				
Variable	**Univariable model**		**Multivariable model**	
	β (95% CI β)	**p-value**	**β (95% CI β)**	**p-value**
Age	-0.089 (-0.144 - -0.034)	0.002[a]	-0.08 (-0.14 - -0.03)	0.003[a]
Gender				
Female (reference)	-	0.03[a]	-	0.49
Male	-0.19(-0.365 - -0.015)		-0.06(-0.23 - 0.11)	
Nationality				
Non-Saudi (reference)	-	0.97		
Saudi	-0.005(-0.36-0.35)			
Medical college				
Al Faisal University	0.072(-0.24-0.39)	0.65		
Imam Muhammad Bin Saud Islamic University	-0.16(-0.36-0.41)	0.11		
King Saud Bin Abdul Aziz University	-0.03(-0.25-0.19)	0.79		
King Saud University	0.105(-0.06-0.27)	0.21		
DREEM				
"Plenty of Problems" & "Poor" (reference)	-	< 0.01[a]	-	< 0.01[a]
"More Positive than Negative" & "Excellent"	0.38(0.19-0.57)		0.38 (0.19 - 0.56)	

DREEM: Dundee Ready Education Environment Measure. SPL: Students' perceptions of learning. SPT: Students' perceptions of teachers. SASP: Students' academic self-perception. SPA: Students' perceptions of atmosphere. SSSP: Students' social self-perception. [a]Statistically significant.

Table-2: Mean DREEM score and mean score of its components by medical colleges in Riyadh, Saudi Arabia.

Medical college	Total DREEM score	SPL	SPT	SASP	SPA	SSSP
Al Faisal University	147.7± 22.8	34.3 ± 5.8	35.6 ± 3.9	25.1 ± 4.1	34.7 ± 7.8	17.9 ± 3.9
Imam Muhammad Bin Saud Islamic University	104.3 ± 30.6	23.5 ± 8.1	22.2 ± 7.8	19.9 ± 4.9	24.9 ± 8.7	13.6 ± 4.1
King Saud Bin Abdul Aziz University	108.9 ± 26.4	25.5 ± 5.8	25.5 ± 7.5	20.3 ± 5.1	24.9 ± 7.8	12.5 ± 4.0
King Saud University	127.7 ± 21.8	28.2 ± 5.8	28.2 ± 5.5	21.1 ± 4.2	28.5 ± 6.7	15.6 ± 3.8

DREEM: Dundee Ready Education Environment Measure
SPL: Students' perceptions of learning
SPT: Students' perceptions of teachers
SASP: Students' academic self-perception
SPA: Students' perceptions of atmosphere
SSSP: Students' social self-perception.

Discussion

There has been growing interest concerning the role and impact of the learning environment in medical schools on students' performance. The learning environment is considered an important factor in determining the success of an effective curriculum in medical schools.[9] Low positive, yet significant association between perception of learning environment and students' academic performance in the form of mean GPA in our study validates the association between learning environment and learning outcome as in the LEPO framework.[4]

Our study sought to measure the students' perception of the learning environment in four colleges of medicine in Riyadh, Saudi Arabia, using the DREEM questionnaire and to relate it to their academic performance. This is the first study to assess and show a correlation between medical students' perception of their learning environment and their GPA in undergraduate medical colleges of Saudi Arabia. A few studies have evaluated the relation between the students' perception of the learning environment as measured by DREEM and academic performance. Academic performance in these studies is defined in relation to lack of failure in university courses or as a higher score in an exam or a GPA. Maya et al. reported that the DREEM and its sub-scale scores to be higher in academic achievers (students who did not fail in a university course) compared to under-achievers.[11] Contrary to these findings, Abraham et al.reported in a study in Melaka Manipal Medical College in India that students who experienced failure in the last two years that is "academic under-achievers" had a higher DREEM score when compared to the academic achievers.[12] These conflicting findings make it difficult to relate the improvement in academic performance to the improved perception of the learning environment. It is our concern that limiting the description of academic achievement to students who did not fail in a course oversimplifies the concept, as even academic achievers sometimes experience failure. On the other hand, relating academic performance to a higher GPA allows for the inclusion of the whole learning experience in college and allows for students who have a high GPA but experienced failure to be categorised as academic achievers. Some studies have assessed the correlation between the learning environment and students' GPA with variable conclusions.[13-15] Pimparyon et al. found that only students' perception of learning subscale significantly positively correlated with nursing students' GPA.[13] They concluded that students' approach to learning is influenced by the learning environment and this affects their academic performance. Wayne et al. reported a positive correlation between perception of the learning environment (not measured by DREEM) and United States Medical Licensing Examination (USMLE) step 1 results.[14] Their findings support the results of our study. Though the correlations are low, the high significance shows that improvement in the learning environment can improve the academic performance (learning outcome) of the final year medical students.

More than half of the final year medical students in Riyadh perceived their educational environment to be "More Positive than Negative". The mean DREEM score in this study is higher compared to earlier studies in Saudi Arabia.[16-18] This may indicate that the learning environment at the medical colleges may have improved compared to previous years. Perception of the learning environment is still lower than that reported for medical colleges in the United Kingdom, Europe and Australia, indicating an opportunity for further improvement.[19-21]

Our study has several limitations. As many as 26.1% of the respondents returned incompletely answered questionnaires that had to be excluded from the study. However, the sample size was still large enough to demonstrate significant results. Moreover, the precise 95% CI in the multivariable linear regression also support the validity of our results. Another limitation is the small number of students (1.6%) in our sample who characterised the learning environment as "Poor". This limited our ability to assess the correlation of this group of DREEM score and their GPA and might explain that there was no significant difference found between the "Excellent" and "Poor" groups, and the "More Positive than Negative" and "Poor" groups.

The significant positive association between the perception of the learning environment and GPA, the learning outcome, even after accounting for the confounding factors of age, gender, nationality and the medical college is the strength of this study.

Conclusion

A positive perception of the learning environment was associated with a better academic performance, as depicted by low positive, yet significant relationship. Further interventional studies should be conducted to improve learning environment, measuring its impact on medical students' academic performance.

Disclaimer: None

Conflict of Interest: None.

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