

Perception of medical students on their education environment: A quantitative study

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Abstract

Background

Health care workforce is one of the six core components of a well-functioning and sufficient health system. The WHO highlights improving education and training of health workforce as one of the areas of focus for improving health. Medical education is a pillar of the health care workforce. Educational environment, the physical circumstances or conditions under which learning takes place is an important factor that determines the effectiveness of medical education. Its academic and clinical effects are significant determinants of medical students' attitudes, knowledge, skills, progression and behaviours. To ensure strong health systems, there is need for improvement in medical education. This has to be contextual and informed by locally relevant data. This study aimed at assessing Ugandan medical students' perception of their learning environment.

Methods

This was a quantitative cross-sectional study among medical students across five medical schools in Uganda between December 2021 and February 2022. Participants filled an online questionnaire with a demographics section and the Dundee Ready Education Environment Measure (DREEM) tool. The data was analyzed using R Studio version 2021.09.0 + 351. The average score for each of the DREEM sub-scales and total DREEM score were calculated in addition to their relationship with demographic characteristics

Results

The average total DREEM score of the 335 participants was 112.27/200 (56.12%). We found that 69% (231/335) of the students had a positive perception while 31% had a negative perception of their learning environment. The sub-scale mean scores were as follows; Perception of Atmosphere – 25.14/48(52%), Social Self-perception – 14.94/28 (53%), Perception of Teachers – 24.86/44 (56%), Perception of Learning – 28.8/48 (59%) and Academic Self-perceptions – 19.04/32 (60%). *“There is a good support system for students who get stressed”* was the item with the lowest mean score (1.41/5)

Conclusions

The perception of medical students on their learning environment is just above average. This could negatively impact the quality of the health workforce. To ensure training of a robust health workforce, there is need for improvement in learning environment especially the atmosphere and social support.

Background

Health care workforce is one of the six core components of a well-functioning, stable and sufficient health system.¹ The World health organization (WHO) highlights improving education and training of health workforce as one of the areas of focus for improving human resource for health in addition to improving recruitment, distribution, enhancing productivity, performance and improving retention.¹ Furthermore, improving education and training of health workforce is paramount given that without a constant increase in number and quality of health workers, the other measures are deemed to have suboptimal impact.² Most endeavors in this direction are to increase number of health professionals but there is also a dire need to modify and increase skill set to enhance ability of health workers to function in the dynamic health sphere of communities³.

Medical education, a pillar of the health care workforce, is the process of training doctors, subordinate to the dominant economic and social structures in societies in which it takes place.⁴ It is a continuum of lifelong learning which begins at undergraduate studies.^{5,6} Medical schools have the mandate of training health care workers to provide health care, conduct research, offer leadership in health and participate in educating the next generation.⁷

Educational environment refers to the physical circumstances, objects or conditions under which learning takes place within the school setting and is an important factor that determines the effectiveness of an undergraduate medical curriculum⁹. Shaista defines educational environment as a combination of climate, culture and ethos in which learning occurs and identifies it as the most important aspect of learning.¹⁰ The students' perception of the educational environment has been designated as the educational climate and consequently defined as the soul and the spirit of the medical school curriculum⁹. It has also been shown to influence their behaviour, progress, stress levels, academic self-conception (how student visualizes his/her academic ability), sense of wellbeing and academic performance^{11,12}. Inappropriate educational environment is associated with problems of learners' wellbeing causing boredom and burnout. Medical educators argue that the effects of the educational environment, both academic and clinical are significant determinants of medical students' attitudes, knowledge, skills, progression and behaviours¹³⁻¹⁵.

In a critical review of medical training in Uganda, it has been noted that there is a decline in the quality of clinical skills including clerkship, examination, clinical logic, choice of diagnostic tests and decision on prescribing treatment and ethical principles among fresh graduate doctors.¹⁶ Indeed such gaps in medical knowledge and competence of graduates have been highlighted as a major problem in the process of expanding the health workforce. A systematic review found that final year medical students have insufficient prescribing competences.¹⁷

There's need for medical training improvement and it should be contextual¹⁸ and informed by locally relevant data. For sustainable improvement to be made, there is need for relevant data to inform decision making and planning however there is insufficient data on medical schools. The sub-Saharan Africa medical school survey pointed this out as one of the limitations to strengthening the health workforce in

the region.¹⁹ With the COVID-19 pandemic ongoing, models of teaching in medical school have been adjusted and are set to be modified further. Guidance of these changes by student's perspectives will be of enormous value. In a bid to ensure that competence of next generation of health workers are not negatively affected by COVID-19's effect on the learning environment, it has to be understood and analyzed for remedies of any problems to be developed. This study therefore aimed at assessing the Ugandan medical students' perception of their educational environment.

Methods

Study design

This was a cross-sectional study employing quantitative methods which was conducted between December 2021 and February 2022.

Study setting

The study was carried out in Uganda, a landlocked country in Eastern Africa neighbored by Kenya in the East, South Sudan in the north, Democratic Republic of Congo in the west, Rwanda in the southwest and Tanzania in the South. As of 2022, Uganda had 55 Universities with 10 having medical schools offering a Bachelor's degree in medicine and surgery. Of these, 6 are public universities; Makerere University, Mbarara University of Science and Technology, Gulu University, Busitema University, Kabale University and Soroti University. The other 4 are private universities: Kampala International University, Habib Medical school, St. Augustine International University and Uganda Christian University.

In Uganda, undergraduate medical education is offered through the 5-year Bachelor of medicine and Bachelor of surgery degrees (MBChB). The program is taught using the semester system with two semesters per year. The first two years of the course offer students with foundational knowledge and skills to be applied in hospital during clinical study which occupies years 3 to 5. During the clinical years, the 3rd and 5th year students rotate on the 4 major wards i.e., paediatrics, internal medicine, surgery and obstetrics/gynaecology while the 4th year students rotate on the medical specialties (i.e., psychiatry, palliative care, dermatology, community education) and surgical specials (i.e., ophthalmology, anaesthesia, ENT, urology and radiology) but also offer family medicine and medical ethics. The modes of study are lectures, ward and grand rounds, call duty, simulation, community placement and tutorials. Students learn essential skills through observation, assisting and individual practice under supervision as recommended by the General Medical Council.⁸ Uganda currently has 10 medical schools with 6 being public and the rest private.

Study population

The focus of this study was undergraduate students doing Bachelor of Medicine and Bachelor of Surgery (MBChB) from first to fifth year. The study enrolled students from 5 public universities i.e. Busitema University, Gulu University, Kabale University, Makerere University, and Mbarara University of Science and

Technology. The medical school curriculum at the university runs for 5 years with students spending 2 years in pre-clinical training and 3 years in clinical training at different university teaching hospitals across the country.

Measures

Participants filled a two-part questionnaire with a demographics section and the Dundee Ready Education Environment Measure (DREEM) tool scores. The demographics part had six variables; sex, age, year of study, campus accommodation, source of tuition funding and university of study. Our primary outcome was the perception of medical students on their educational environment based on the DREEM tool score.

DREEM

The DREEM is a 50-item questionnaire developed by Roff et al. to measure the educational environment in health professional education programs.²⁰ The 50 items are divided into five subscales based on the initial psychometric analysis presented by Roff et al. The five subscales are Students' Perception of Learning (SPL), Students' Perception of Teachers (SPT), Students' Academic Self-perceptions (SASP), Students' Perception of Atmosphere (SPA), and Students' Social Self-perception (SSP).

This tool has been reported to be appropriate for use within health professional programs, not just medicine, and is not culture or context specific.^{21,22} Each item is measured using a five-point Likert scale: 0 is strongly disagree, 1 is disagree, 2 is neither agree or disagree, 3 is agree and 4 is strongly agree. Respondents are presented with a statement and asked to select a response. Items 4, 8, 9, 17, 25, 35, 39, 48 and 50 are negatively worded and these require recording prior to calculating the total and subscale scores. The DREEM tool's Cronbach alpha was 0.863.

Data Collection

The study questionnaire with demographic questions and Dundee Ready Education Measure (DREEM) tool was uploaded on google documents and a link shared with participants. Through employing convenience sampling method, the google form was sent through emails and WhatsApp messenger to eligible students' representatives from each of the universities included in the study.

Data analysis

The data was loaded in to R Studio version 2021.09.0 + 351 ". After cleaning, Internal consistency of the DREEM was calculated using Cronbach's alpha. Summary statistics of the demographic variables were calculated. Mean, standard deviation, minimum and maximum values were calculated for continuous variable while frequencies were calculated for discrete variable. The average score for each of the DREEM sub-scale and total DREEM score were calculated. The relationship between the total DREEM score and sub-scales scores with characteristics was determined with analysis of variance and theoretical hypothesis testing with critical value of 0.05. Global average DREEM score of 100 and more was

considered to represent positive perception of educational environment while that less than 100 to represent a negative perception. A summary of DREEM score interpretation can be found in Table 8 and Table 9.

Results

The study recruited 335 participants, 110 (33%) females and 225 (67%) males. The mean age of the study participants was 23.6 ± 3.4 years with a maximum age of 43 years and minimum of 19 years. Of the respondents; 231(69%) were clinical students, 180 (54%) of the students were government sponsored while 143 (43%) were privately sponsored (Table 1).

Table 1
Demographic Data of the study participants

Characteristic	Description	Number (Proportion)
Sex	Female	110(33%)
	Male	225(67%)
Age	Median	23.6 years
	IQR	19–43 years
Year of study	Year 1	56(17%)
	Year 2	48(14%)
	Year 3	80(24%)
	Year 4	92(27%)
	Year 5	59(18%)
Stage of study	Clinical	231(69%)
	Pre-clinical	104(31%)
Source of tuition	Government sponsored	180(54%)
	Privately sponsored	143(43%)
	Other	12(4%)
University	Busitema University	43(13%)
	Gulu University	60(18%)
	Kabale University	43(13%)
	Makerere University	124(37%)
	Mbarara University of Science and Technology	65(19%)

Total DREEM score

The mean total DREEM score was 112.27/200 (± 33.3) with a 95% CI (108.70, 115.85)- (54.35%, 57.93%), range of 23 to 184. We found that 231(69%) of the students had a positive perception. Of the students with positive perception,130(56.3%) were government sponsored students, 97(42.0%) were privately sponsored students and 4(1.7%) had other sources of tuition (p-value 0.02). Clinical students had a higher mean total DREEM score as compared pre-clinical students (117.98 vs. 113.23, p -value = 0.16) (Table 2). Statistically significant differences in mean total DREEM scores were only observed across the year of study, $p = 0.01$ (Fig. 1). Further analysis with the Tukey test revealed that the significant differences in DREEM mean scores were between year 5 and year 2 ($p = 0.01$) and between year 5 and year 3 ($p = 0.02$). Table 3 has a summary of the average score for each of the sub-scales and corresponding interpretation.

Table 2
Relationship between average Total DREEM score and study participant characteristics

Characteristic		Mean DREEM score (SD)	p-value (χ^2)
Sex	Female	109.2 (31.6)	0.231
	Male	113.8 (34.0)	
Uni	BUS	112.4 (34.2)	0.465
	GUL	114.0 (30.3)	
	KAB	103.4 (36.2)	
	MAK	113.4 (34.1)	
	MUST	114.4 (31.7)	
Year	I	112.4 (29.5)	0.010
	II	103.2 (36.1)	
	III	107.1 (35.2)	
	IV	113.8 (32.0)	
	V	124.1 (30.8)	
Stage	clinical	114.1 (33.3)	0.129
	preclinical	108.2 (32.9)	
Tuition	Government sponsored	112.6 (31.3)	0.062
	Other	90.2 (44.9)	
	Privately sponsored	113.7 (34.2)	

Table 3
Average score for each of the sub-scales

Sub-scale	Average score	%	SD	Interpretation
SPL	28.28/48	59	0.28	A more positive approach
SPT	24.87/44	56	0.27	Moving in the right direction
SASP	19.04/32	60	0.26	Feeling more on the positive side
SPA	25.14/48	52	0.31	A more positive atmosphere
SSP	14.94/28	53	0.49	Not too bad

Student's perception of learning (SPL)

The mean SPL score was 28.3(± 9.6). Clinical students had a higher total average SPL score as compared to pre-clinical students' average score (28.58 vs. 27.63, p-value = 0.40). ANOVA across universities yielded a p-value of 0.61, while that based on year of study had a p-value of 0.05 and that based on source of tuition had a p-value of 0.002. A Tukey test found the significant difference across source of tuition to be between students with other sources of funding and Government sponsored p-value = 0.003, and between privately sponsored and other sources of tuition, p-value = 0.001. Figure 2 shows how the average SPL score varied based on source of tuition. 'The teaching over-emphasizes factual learning' was the item with the lowest average score of 1.5/4, it was also the only item in this domain with a score less than 2. Only two items in this domain had a score above 2.5/4; 'I am encouraged to participate during teaching sessions' (2.58/4) and 'I am clear about the learning objectives of the course' (2.6/4) (Table 4)

Table 4
Relationship between average SPL score and participant characteristics

Characteristic	Description	Mean SPL score (SD)	p-value (χ^2)
Sex	Female	27.3 (9.2)	0.171
	Male	28.8 (9.8)	
University	BUS	29.7 (9.9)	0.605
	GUL	28.4 (8.9)	
	KAB	26.3 (10.1)	
	MAK	28.2 (9.6)	
	MUST	28.5 (9.8)	
Year	I	28.6 (8.4)	0.052
	II	26.5 (10.1)	
	III	27.0 (10.2)	
	IV	28.1 (9.6)	
	V	31.4 (9.1)	
Stage	clinical	28.6 (9.8)	0.401
	Pre-clinical	27.6 (9.2)	
Tuition	Government sponsored	28.2 (9.3)	0.002
	Other	18.9 (10.7)	
	Privately sponsored	29.2 (9.6)	

Student's perception of teaching (SPT)

The total mean SPT score was 24.87(\pm 7.67). Clinical students had an average SPT score of 25.10 while pre-clinical students' average score was 24.36, p-value = 0.41. There was no statistically significant difference between university SPT mean scores $F_{(4,330)} = 2.08$, p-value = 0.08. 'The teachers are authoritarian' was the only item under this domain that had a mean score less than 2 (1.94). Two items had a mean score above 2.5/4; 'The teachers are knowledgeable' (3.02) and 'The teachers have good communication skills with patients' (2.56/4) (Table 5)

Table 5
Relationship between participant characteristics, SPT and SASP

Characteristic	Description	Mean SPT score (SD)	p-value (χ^2)	Mean SASP score (SD)	p-value (χ^2)
Sex	Female	24.6 (8.0)	0.714	18.7 (6.5)	0.476
	Male	25.0 (7.5)		19.2 (7.1)	
University	Busitema	25.7 (8.4)	0.082	18.4 (6.6)	0.888
	Gulu	25.0 (7.0)		19.7 (6.7)	
	Kabale	22.4 (8.5)		18.8 (7.1)	
	Makerere	25.9 (7.5)		18.8 (7.0)	
	Mbarara university of science and technology	23.8 (7.1)		19.4 (7.0)	
Year	I	24.9 (7.4)	0.064	18.8 (6.9)	0.001
	II	23.7 (7.8)		15.9 (7.1)	
	III	23.2 (8.1)		18.8 (7.0)	
	IV	25.8 (7.4)		19.5 (6.5)	
	V	26.6 (7.3)		21.4 (6.3)	
Stage	clinical	25.1 (7.7)	0.415	19.7 (6.7)	0.005
	Pre-clinical	24.4 (7.6)		17.5 (7.1)	
Tuition	Government sponsored	24.9 (7.3)	0.345	19.2 (6.7)	0.081
	Other	21.8 (11.8)		14.7 (9.5)	
	Privately sponsored	25.1 (7.7)		19.2 (6.8)	

Students' Academic Self-perceptions - SASP

The mean SASP score was 19.04(\pm 6.89) with a range of 2 to 32, and 95% CI (18.30, 19.78). Clinical students' mean SASP score was higher than that of pre-clinical students by 2.28 and was statistically significant, p-value = 0.005. Figure 3 illustrates the difference. The difference across the years of study was also statistically significant, p-value = 0.001. Tukey multiple comparisons of the means with 95% family-wise confidence level revealed that the significant difference was between year 5 and year 2, p-value = 0.0003 Fig. 4 illustrates this difference. (Table 5)

Students' Perception of Atmosphere- SPA

The mean SPA score was 25.14(\pm 9.99) with a range of 1 to 47 and 95% CI (24.07, 26.22). Male students had a mean SPA score of 25.88 while female students had a mean score of 23.65, p-value = 0.05. The difference between universities was statistically significant $F_{(4,330)} = 2.415$, p-value = 0.049. The significant difference was between Mbarara University and Kabale University, p-value = 0.038. Figure 5 illustrates this difference. The mean SPA score was not statistically different across; Sources of tuition, year of study and whether students were clinical or pre-clinical. Two items had a mean score of less than 2: 'The atmosphere is relaxed during ward teaching' (1.87) and 'The enjoyment outweighs the stress of the course' (1.57). (Table 6)

Table 6
Relationship between participant characteristic, SPA and SSP

Characteristic	Description	Mean SPA score (SD)	p-value (χ^2)	Mean SSP score (SD)	p-value (χ^2)
Sex	Female	23.6 (9.4)	0.055	15.0 (4.9)	0.971
	Male	25.9 (10.2)		14.9 (5.1)	
Uni	Busitema	24.1 (10.5)	0.049	14.5 (4.6)	0.414
	Gulu	26.5 (9.4)		14.4 (4.7)	
	Kabale	21.7 (11.4)		14.1 (5.2)	
	Makerere	24.9 (9.9)		15.4 (5.0)	
	Mbarara university of science and technology	27.3 (9.0)		15.3 (5.4)	
Year	I	25.0 (9.1)	0.063	15.1 (4.7)	0.034
	II	23.4 (10.6)		13.7 (5.6)	
	III	24.0 (10.2)		14.1 (5.0)	
	IV	25.1 (9.6)		15.4 (4.8)	
	V	28.4 (10.1)		16.3 (4.8)	
Stage	clinical	25.5 (10.1)	0.273	15.2 (5.0)	0.242
	Pre-clinical	24.2 (9.8)		14.5 (5.2)	
Tuition	Government sponsored	25.5 (9.2)	0.186	14.9 (4.7)	0.956
	Other	20.0 (11.7)		14.9 (6.1)	
	Privately sponsored	25.2 (10.7)		15.0 (5.3)	

Students' Social Self-perception-SSP

The mean SSP score was 14.94 (± 5.02) with a range of 1 to 28, and 95% CI (14.40, 15.48). Clinical students had a mean SSP score of 15.16 while pre-clinical students had a mean score of 14.46, p-value = 0.25. The difference between mean SSP score of female and male students was insignificant p-value 0.97. This was the same for mean SSP score across the universities and source of tuition ($F_{(4,330)} = 0.99$, p-value = 0.41), ($F_{(2,332)} = 0.04$, p-value = 0.96). However, there were statistical significance differences across the years of study, ($F_{(4,330)} = 2.64$, p-value = 0.03). There was weak correlation with age, $r = -0.02$. 'I am rarely bored in this course' and 'There is a good support system for students who get stressed' were the only two items that had a mean score less than 2, 1.81 ± 1.16 and 1.41 ± 1.20 respectively. The rest of the items had a mean score between 2 and 3, none had a mean score above 3. (Table 6) (Table 7)

Table 7
DREEM item scores group by sub-scale.

DREEM Sub-scale	DREEM ITEM	mean	SD	se
Students' Social Self-perception (SSP)	My accommodation is pleasant	2.35	1.23	0.07
	My social life is good	2.61	1.1	0.06
	<i>I am rarely bored in this course</i>	<i>1.81</i>	<i>1.16</i>	<i>0.06</i>
	I am too tired to enjoy the course*	2.29	1.21	0.07
	I have good friends in this course	2.9	1.08	0.06
	I seldom feel lonely	2.15	1.22	0.07
	<i>There is a good support system for students who get stressed</i>	<i>1.41</i>	<i>1.2</i>	<i>0.07</i>
Students' Academic Self-perceptions (SASP)	Last year's work has been a good preparation for this year's work	2.16	1.15	0.06
	Learning strategies that worked for me before continue to work for me now	2.06	1.28	0.07
	Much of what I have to learn seems relevant to a career in healthcare	2.77	1.07	0.06
	My problem-solving skills are being well developed here	2.46	1.15	0.06
	I have learnt a lot about empathy in my profession	2.45	1.12	0.06
	I feel I am being well prepared for my profession	2.42	1.19	0.07
	I am confident about my passing this year	2.64	1.14	0.06
	I am able to memorize all I need	2.07	1.1	0.06
Students' Perception of Atmosphere (SPA)	The atmosphere is relaxed during class/seminars/tutorials	2.49	1.16	0.06
	<i>The atmosphere is relaxed during ward teaching</i>	<i>1.87</i>	<i>1.25</i>	<i>0.07</i>
	The atmosphere motivates me as a learner	2.13	1.28	0.07
	The atmosphere is relaxed during lectures	2.35	1.21	0.07
	<i>The enjoyment outweighs the stress of the course</i>	<i>1.57</i>	<i>1.31</i>	<i>0.07</i>
	I feel able to ask the questions I want	2.38	1.27	0.07
	I feel comfortable in class socially	2.59	1.25	0.07

DREEM Sub-scale	DREEM ITEM	mean	SD	se
	I find the experience disappointing*	2.54	1.23	0.07
	Cheating is a problem in this school*	2.61	1.28	0.07
	I am able to concentrate well	2.32	1.18	0.06
	There are opportunities for me to develop my interpersonal skills	2.45	1.21	0.07
	This school is well timed tabled	2.15	1.36	0.07
Students' Perception of Teachers (SPT)	The students irritate the teachers*	2.37	1.13	0.06
	The teachers adopt a patient-centered approach to consulting	2.44	1.09	0.06
	<i>The teachers are authoritarian*</i>	<i>1.94</i>	<i>1.15</i>	<i>0.06</i>
	The teachers are good at providing feedback to students	2.24	1.15	0.06
	The teachers are knowledgeable	<i>3.02</i>	<i>1.03</i>	<i>0.06</i>
	The teachers are well-prepared for their teaching sessions	2.49	1.07	0.06
	The teachers get angry in teaching*	2.38	1.16	0.06
	The teachers give clear examples	2.6	1.04	0.06
	The teachers have good communication skills with patients	2.56	1.03	0.06
	The teachers provide constructive criticism here	2.39	1.12	0.06
The teachers ridicule the students*.	2.2	1.12	0.06	
Students' Perception of Learning (SPL)	The teaching helps to develop my competence	2.47	1.14	0.06
	The teaching is student-centered	2.37	1.13	0.06
	The teaching encourages me to be an active learner	2.47	1.21	0.07
	The teaching helps to develop my confidence	2.4	1.19	0.06
	The teaching is often stimulating	2.25	1.15	0.06
	The teaching is well-focused	2.35	1.08	0.06
	The teaching it too teacher-centered*	2.29	1.27	0.07

DREEM Sub-scale	DREEM ITEM	mean	SD	se
	<i>The teaching over-emphasizes factual learning*</i>	1.5	1.11	0.06
	The teaching time is put to good use	2.36	1.11	0.06
	Long-term learning is emphasized over short-term learning	2.22	1.18	0.06
	I am encouraged to participate during teaching sessions	2.58	1.13	0.06
	I am clear about the learning objectives of the course	2.6	1.11	0.06

**Negative statements for which the Likert scale was reversed.*

Table 8
DREEM score interpretation.

Score	Interpretation
0–50	Very poor
51–100	Plenty of problems
101–150	More positive than negative
151–200	Excellent

Table 9
Sub-scale score interpretation

Sub-scale	Score	
Students' perception of learning- SPL	• 0–12	• Very poor
	• 3–24	• Teaching is viewed negatively
	• 25–36	• A more positive approach
	• 37–48	• Teaching highly thought of
Students' perception of teachers - SPT	• 0–11	• Abysmal
	• 12–22	• In need of some retraining
	• 23–33	• Moving in the right direction
	• 34–44	• Model teachers
Students' Academic Self-perceptions - SASP	• 0–8	• Feeling of total failure
	• 9–16	• Many negative aspects
	• 17–24	• Feeling more on the positive side
	• 25–32	• Confident
Students' Perception of Atmosphere- SPA	• 0–12	• A terrible environment
	• 13–24	• There are many issues that need changing
	• 25–36	• A more positive atmosphere
	• 37–48	• A good feeling overall
Students' Social Self-perception- SSP	• 0–7	• Miserable
	• 8–14	• Not a nice place
	• 15–21	• Not too bad
	• 22–28	• Very good socially

Sub-scale	Score	
DREEM items*	• > 3	• Positive
	• 2–3	• Could be improved
	• < 2	• Problematic area

Discussion

This study aimed at assessing the perception of Ugandan medical students towards their educational environment during the COVID-19 pandemic. This study found a mean total DREEM score of 112/200 which indicated a positive overall perception of the learning environment in the different Ugandan medical schools. Analysis of the DREEM sub-scales showed that students perceived their learning to have a more positive approach (28.28/48) and that the teaching was moving in the right direction (24.87/44). Students also felt more positive about their academics (19.04/32), their learning atmosphere (25.14/48) and their social life (14.94/28).

This study's mean total DREEM score is similar to previous studies done in Uganda and other countries.^{11, 23–26} In Uganda, two studies done at Makerere University²⁶ and Habib medical school¹¹ found that medical students generally had a positive perception of their learning environment. The similarity in results of these studies and our study is probably due to similarity in general curriculum and medical school set up across the country. However, this study's score was lower than scores from studies in South Africa, Ghana, Zambia and Nigeria.^{23,25,27,28} The difference in scores could be due to the fact that our study was done after the COVID-19 lock downs which came with numerous changes in medical school and differences in curriculum. Low DREEM scores have previously been attributed to schools' operation under a traditional curriculum model which is the case for most medical schools in Uganda.^{12,29} Olufunmilola and colleagues compared two medical schools offering different curricula and found that the student's perception of the learning environment was similar.²⁵ This means that despite the nature of curriculum having an impact on the learning environment, there are other factors to explain the low score. The other reason for the lower score could be that the study was carried out just after the COVID-19 lockdown which was accompanied by a number of changes in the learning environment such as introduction of e-learning.³⁰ Recent studies have identified burn out and stress to be high among medical students in Uganda, further explaining the difference in perceptions of the learning environment.^{31,32}

The mean total DREEM score was significantly different across years of study with pre-clinical students having lower scores compared to their clinical counterparts. These findings are similar to those of other studies.^{33,34} The heavy work load from bio-medical course units coupled with the transition processes from high school to university environment could explain the low scores in the pre-clinical years. It has also been reported that stress levels are higher during the first three years of medical school compared to the last two years.³⁵ Patil and colleagues also postulated that students in higher years studying

preclinical subjects along with clinical postings may be more enthusiastic about their future clinical knowledge and thereby leading to a more positive perception of the learning environment.³³ There may be need to further explore the nature of teaching for first- and second-year medical students in Uganda to identify ways of optimizing the learning environment besides the heavy workload. This is very important as the pre-clinical years are a formative stage and lay a foundation for the rest of medical school and their careers too. Poor perception of the learning environment in the early years of medical school can also affect academic performance and attainment of clinical skills, which is a center piece of quality healthcare delivery.

The mean DREEM score and sub-scale scores were similar across gender and universities. This is an important finding as it portrays that the learning environment in Ugandan medical school does not have discriminative structures across gender and that student's general perception of their learning environment is standardized across universities in the country. Marginalization of female students has been reported but these results provide confidence that it is not the case in Uganda.³⁶

The perception of students towards their learning atmosphere and social life were the DREEM sub-scales that had the least scores. The most problematic items in the social life were 'I am rarely bored in this course' and 'There is a good support system for students who get stressed'. This is worrying as both stress and boredom can have negative impacts on students' academic performance.^{35,37} Given the academic intensity of medical school, these findings highlight the need to improve formal support systems available for students in terms of counseling and therapy. This will contribute to improvement in the learning environment and potentially result in an improvement in academic achievement and learning outcomes for medical students.

The items that had the least scores in the student's perceptions of their learning atmosphere were 'The atmosphere is relaxed during ward teaching' and 'The enjoyment outweighs the stress of the course'. These same areas have been reported as problematic by other studies^{38,39} This is mostly likely contributed to by the fact that the students perceived teachers to be authoritarian and that teachers over-emphasize factual learning especially during ward teaching. This calls for training of teachers in medical schools to ensure that they create a relaxed learning environment during ward teaching which can improve student participation and eventually improvement learning outcomes. These results further stress the need to address stress of medical students.

Students perceived the academics (SASP) and learning (SPL) as the best areas of their education environment. The highlights in the students' academic self-perceptions were that students were confident about passing exams and deemed much of what they learned as relevant to a career in healthcare. This is because most of the work done to improve medical schools has focused on the curriculum with introduction competence based and problem-based curricula in addition to simulation training and post-graduate students as training assistants.

This study's strength is that it was carried out across the country hence the results are a good representation of the perception of medical students on their learning environment in Uganda.

Limitations: The study was done during the COVID-19 pandemic, with no data prior to the pandemic so we could not assess if the pandemic actually had an effect on the results.

Conclusions

This study revealed that medical students in Uganda perceived their learning environment to be positive. However, it was noted that the students had negative perceptions towards with learning atmosphere and social life. We recommend further investigation of items that have mean scores of < 2 (*I am rarely bored in this course, there is a good support system for students who get stressed, the atmosphere is relaxed during ward teaching, the enjoyment outweighs the stress of the course, the teachers are authoritarian, and the teaching over-emphasizes factual learning*) to identify ways of improving the educational environment. These should be areas of focus for faculty and administrators in medical schools in a bid to improve medical education in public universities across the country.

Abbreviations

BUS – Busitema University

DREEM - Dundee Ready education environment measure tool

ENT -Ear, Nose and Throat

GUL – Gulu University

KAB- Kabale University

MAK – Makerere University

MBChB-Bachelor of Medicine and Bachelor of Surgery.

MUST – Mbarara University of science and technology

SASP - Students' academic self-perceptions

SPA - Students' perception of atmosphere

SPL - Students' perception of learning

SPT - Students' perception of teachers

SSP- Students' social self-perception

Declarations

Ethics approval and consent to participate.

This study was approved by Mbarara University of Science and Technology Research Ethics committee. The study was conducted in accordance with relevant guidelines and regulations. Informed consent was obtained from all participants.

Consent for publication

Not applicable

Competing interests

The authors declare no competing of interests

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Authors' contributions

David Jolly Muganzi conceptualized and initiated the study. Timothy Kintu, Linda Atulinda, Immaculet Atim, Francis Mwaka, Racheal Nakandi, Blair Kiiza and Joseph Ngonzi executed the study. David Muganzi and Timothy Kintu analyzed the data and drafted the original version of the manuscript. Joseph Ngonzi reviewed the original version of the manuscript. All authors read and approved the final manuscript.

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Availability of data and materials.

The dataset for this study is not publicly available due privacy of participants, however it is available from the corresponding author on reasonable request.

References

1. WHO. *Key Components of a Well Functioning Health System.*; 2010.
2. *Global Strategy on Human Resources for Health: Workforce 2030.*

3. Kiguli-Malwadde E, Olapade-Olaopa EO, Kiguli S, et al. Competency-based medical education in two sub-saharan african medical schools. *Adv Med Educ Pract.* 2014;5:483–9. 10.2147/AMEP.S68480.
4. Garcia JC. Características generales de la educación médica en la América Latina [General characteristics of medical education in Latin America]. *Educ Med Salud.* Published online 1969:267–313.
5. Quintero GA. Medical education and the healthcare system - why does the curriculum need to be reformed? *BMC Med.* 2014;12(1):1–4. 10.1186/s12916-014-0213-3.
6. Prober CG, Khan S. Medical education reimagined: A call to action. *Acad Med.* 2013;88(10):1407–10. 10.1097/ACM.0b013e3182a368bd.
7. WHO. *Preparing the Health Workforce.*; 2005.
8. General medical council. *Tomorrow's Doctors Education Outcomes and Standards for Undergraduate Medical Education.*; 2009.
9. Ondieki Miruka C. Encouraging Assessment of the Educational Climate in Medical Schools under the MEPI-MESAU Consortium. *J Health Educ Res Dev.* 2015;03(03). 10.4172/2380-5439.1000e122.
10. Saiyad S. Educational environment and its application in Medical Colleges. *J Res Med Educ Ethics.* 2020;10(1):3. 10.5958/2231-6728.2020.00002.5.
11. Handan A. Uganda in. *Assessing the Learning Environment at Habib Medical School, Islamic University in Uganda.* Vol 01.
12. Roff S. The Dundee Ready Educational Environment Measure (DREEM) - A generic instrument for measuring students' perceptions of undergraduate health professions curricula. *Med Teach.* 2005;27(4):322–5. 10.1080/01421590500151054.
13. Soliman MM, Sattar K, Alnassar S, et al. Medical students perception of the learning environment at King Saud University medical college. *Adv Med Educ Pract.* 2012;8:221–7.
14. Sulea C, van Beek I, Sarbescu P, Virga D, Schaufeli WB. Engagement, boredom, and burnout among students: Basic need satisfaction matters more than personality traits. *Learn Individ Differ.* 2015;42:132–8. 10.1016/j.lindif.2015.08.018.
15. Abdulghani HM, Al-Drees AA, Khalil MS, Ahmad F, Ponnampereuma GG, Amin Z. What factors determine academic achievement in high achieving undergraduate medical students? A qualitative study. *Med Teach.* 2014;36(SUPPL1). 10.3109/0142159X.2014.886011.
16. Kigonya E, Kigonya MMed E. *Medical Education In Uganda-A Critique.* Vol 9.; 2004.
17. Do final-year. medical students have sufficient prescribing competencies A systematic literature review Enhanced Reader.
18. Gruppen LD, Mangrulkar RS, Kolars JC. The promise of competency-based education in the health professions for improving global health. *Hum Resour Health.* 2012;10(1):1–7. 10.1186/1478-4491-10-43.
19. A survey of Sub-Saharan African medical schools.

20. Roff S, McAleer S, Harden RM, et al. Development and validation of the Dundee Ready Education Environment Measure (DREEM). *Med Teach*. 1997;19(4). 10.3109/01421599709034208.
21. Soemantri D, Herrera C, Riquelme A. Measuring the educational environment in health professions studies: A systematic review. *Med Teach*. 2010;32(12). 10.3109/01421591003686229.
22. Zawawi AH, Elzubeir M. Using DREEM to compare graduating students' perceptions of learning environments at medical schools adopting contrasting educational strategies. *Med Teach*. 2012;34(sup1). 10.3109/0142159X.2012.656747.
23. Schoeman S, Raphuting R, Phate S, Khasoane L, Ntsere C. Assessment of the education environment of senior medical students at the University of the Free State, Bloemfontein, South Africa. *Afr J Health Prof Educ*. 2014;6(2):143. 10.7196/ajhpe.397.
24. Odole AC, Oyewole OO, Ogunmola OT. Nigerian Physiotherapy Clinical Students' Perception of their Learning Environment Measured by the Dundee Ready Education Environment Measure Inventory. *Int J High Educ*. 2014;3(2). 10.5430/ijhe.v3n2p83.
25. Ogun OA, Nottidge TE, Roff S. Students' perceptions of the learning environment in two Nigerian medical schools offering different curricula. *Ghana Med J*. 2018;52(3):116–21. 10.4314/gmj.v52i3.2.
26. Kagwa Nantamu M, Kiguli S, Steinberg Johannes W, Jama PM. The workplace as a learning environment: Perceptions and experiences of undergraduate medical students at a contemporary medical training university in Uganda.
27. Ade-Oshifogun TO, Cadet JA, Ade-Oshifogun JB. A Cross Sectional Study of Medical Students' Perception of Their Educational Environment in Ghana. *J Educ Dev*. 2019;3(2):15. 10.20849/JED.V3I2.585.
28. Ezeala CC, Moleki MM. Evaluation of the Educational Environments of Undergraduate Medicine and Pharmacy Programmes at the University of Zambia. *Res Dev Med Educ*. 2018;7(1):14–20. 10.15171/rdme.2018.004.
29. Alfari EA, Naeem N, Irfan F, Qureshi R, van der Vleuten C. Student centered curricular elements are associated with a healthier educational environment and lower depressive symptoms in medical students. *BMC Med Educ*. 2014;14(1):1–7. 10.1186/1472-6920-14-192/TABLES/4.
30. Olum R, Atulinda L, Kigozi E, Learning During et al. COVID-19 Pandemic: Awareness, Attitudes, Preferences, and Barriers Among Undergraduate Medicine and Nursing Students at Makerere University, Uganda. *J Med Educ Curric Dev*. 2020;7:238212052097321. doi:10.1177/2382120520973212/ASSET/IMAGES/LARGE/10.1177_2382120520973212-FIG2.JPEG
31. Olum R, Nakwagala FN, Odokonyero R. Prevalence and Factors Associated with Depression among Medical Students at Makerere University, Uganda. *Adv Med Educ Pract*. 2020;11:853–60. 10.2147/AMEPS278841.
32. Kajjimu J, Kaggwa MM, Bongomin F. Burnout and Associated Factors Among Medical Students in a Public University in Uganda: A Cross-Sectional Study. *Adv Med Educ Pract*. 2021;12:63–75. 10.2147/AMEPS287928.

33. Patil AA, Chaudhari VL. Students' perception of the educational environment in medical college: A study based on DREEM questionnaire. *Korean J Med Educ.* 2016;28(3):281–8. 10.3946/kjme.2016.32.
34. Demirören M, Palaoglu Ö, Kemahli S, Özyurda F, Ayhan IH. Perceptions of Students in Different Phases of Medical Education of Educational Environment: Ankara University Faculty of Medicine. *Med Educ Online.* 2008;13. 10.3885/MEO.2008.RES00267.
35. Abdulghani HM, AlKanhal AA, Mahmoud ES, Ponnampereuma GG, Alfaris EA. Stress and Its Effects on Medical Students: A Cross-sectional Study at a College of Medicine in Saudi Arabia. *J Health Popul Nutr.* 2011;29(5):516. 10.3329/JHPN.V29I5.8906.
36. Al-Hazimi A, Zaini R, Al-Hyiani A, et al. Educational environment in traditional and innovative medical schools: a study in four undergraduate medical schools. *Educ Health (Abingdon).* 2004;17(2):192–203. 10.1080/13576280410001711003.
37. Bramness JG, Fixdal TC, Vaglum P. Effect of medical school stress on the mental health of medical students in early and late clinical curriculum. *Acta Psychiatr Scand.* 1991;84(4):340–5. 10.1111/J.1600-0447.1991.TB03157.X.
38. Pai PG, Menezes V, Srikanth, Subramanian AM, Shenoy JP. Medical students' perception of their educational environment. *J Clin Diagn Res.* 2014;8(1):103–7. 10.7860/JCDR/2014/5559.3944.
39. Ojuka D, Aseta F, Githambo B, Wambua B. The Medical Education Environment at the University of Nairobi, Kenya: An Assessment with the DREEM Tool. *Annals of African Surgery.* 2021;18(2):96–102. 10.4314/AAS.V18I2.7.

Figures

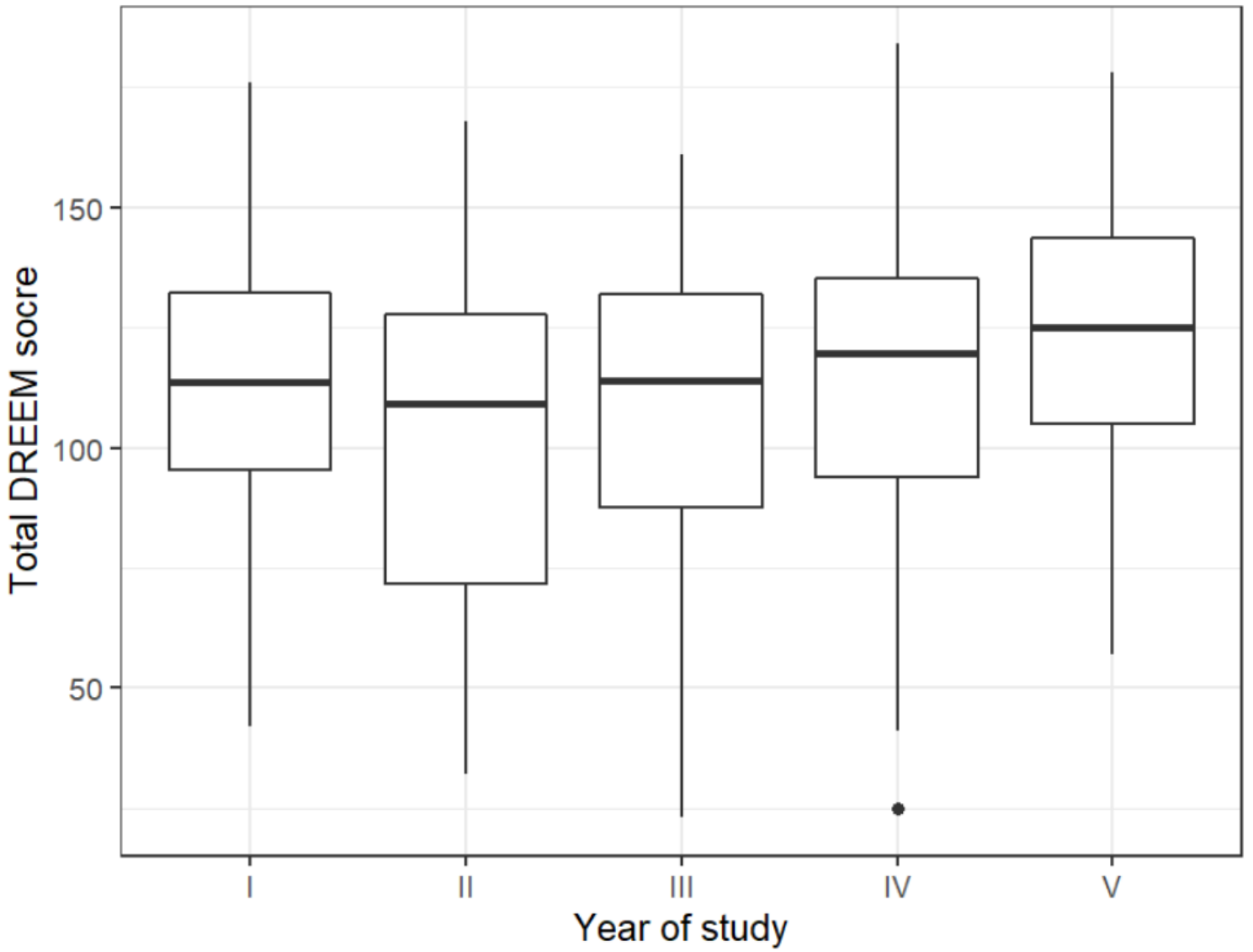


Figure 1

Relationship between Total DREEM score and year of study

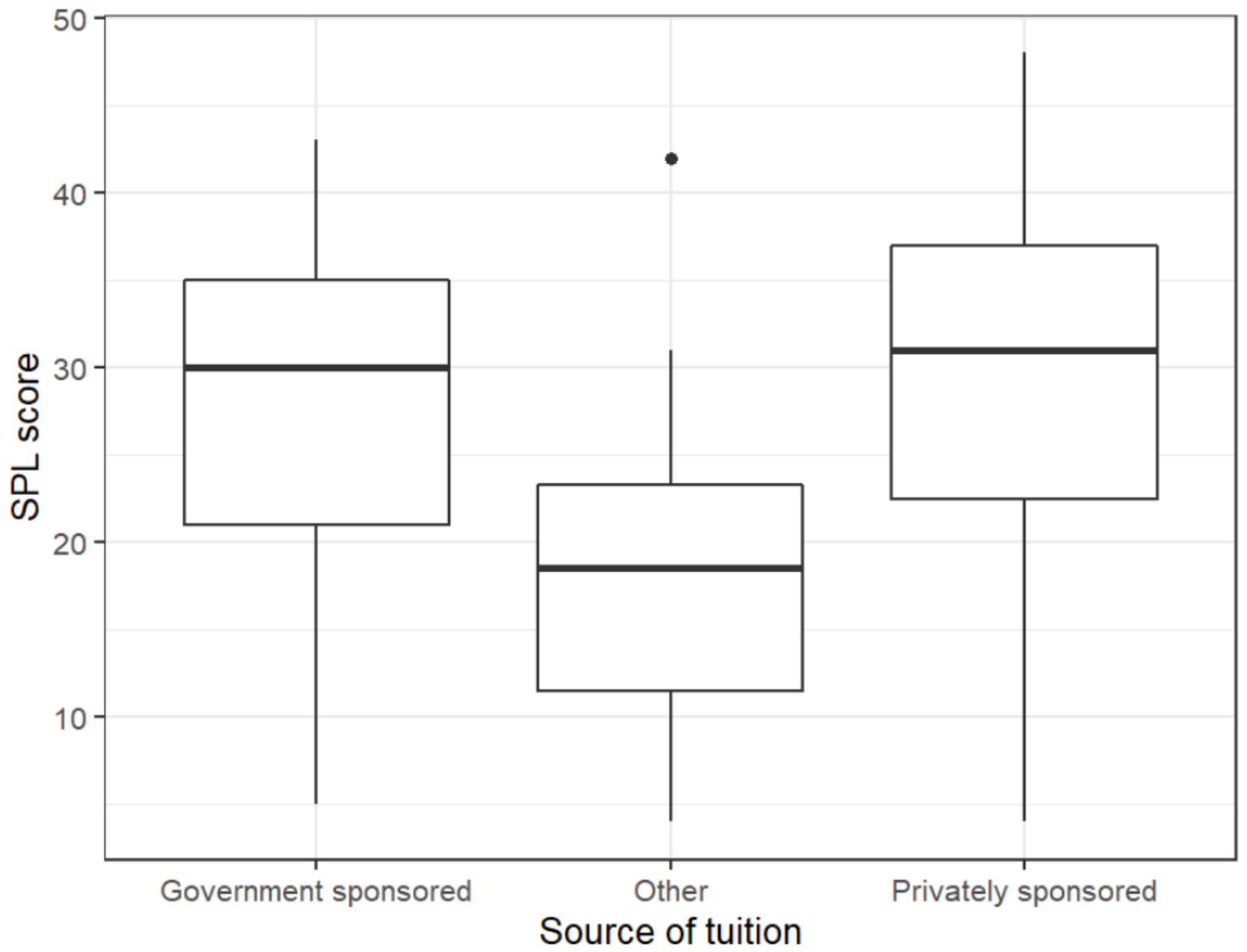


Figure 2

Relationship between mean SPL score and source of tuition

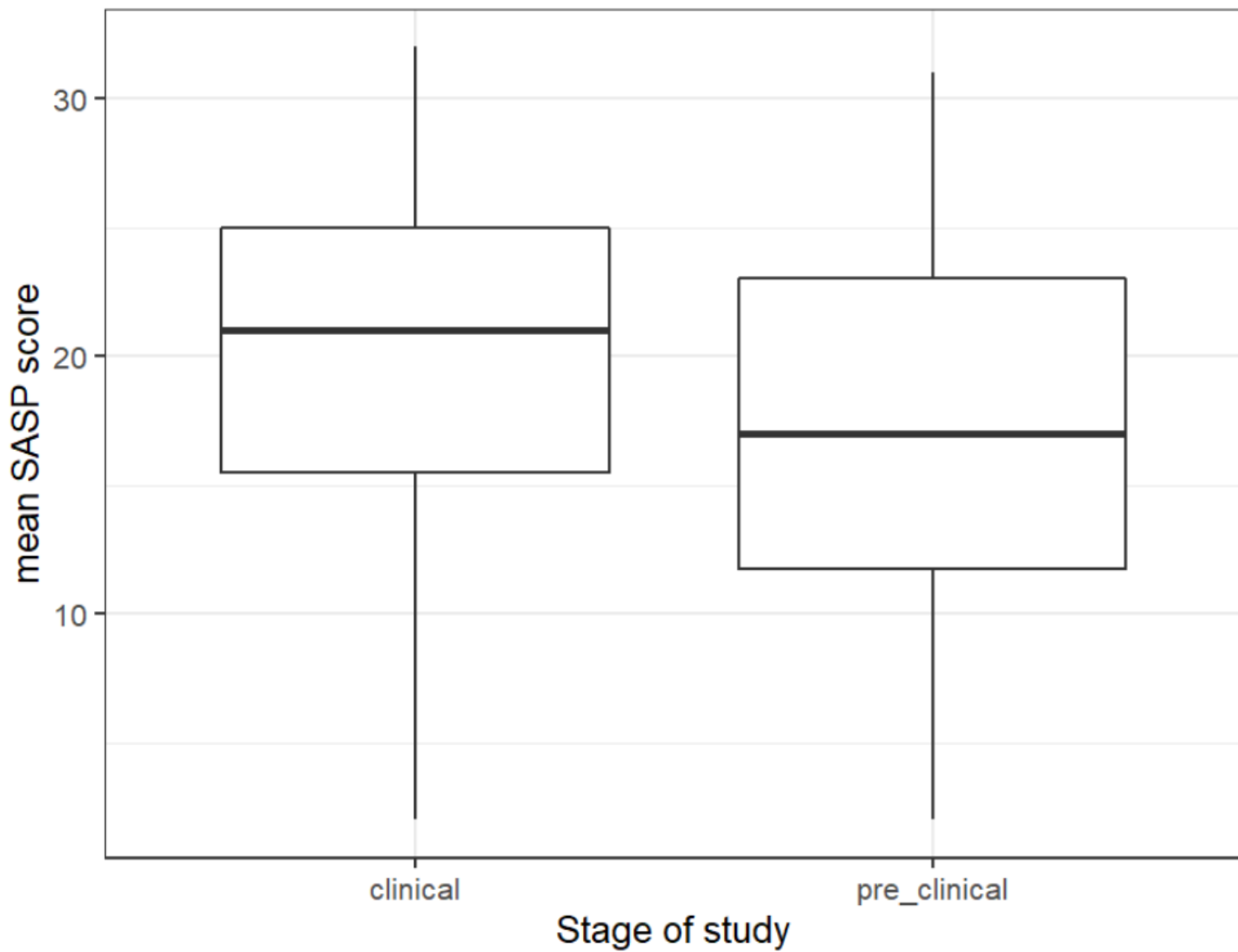


Figure 3

Relationship between mean SASP score and stage of study

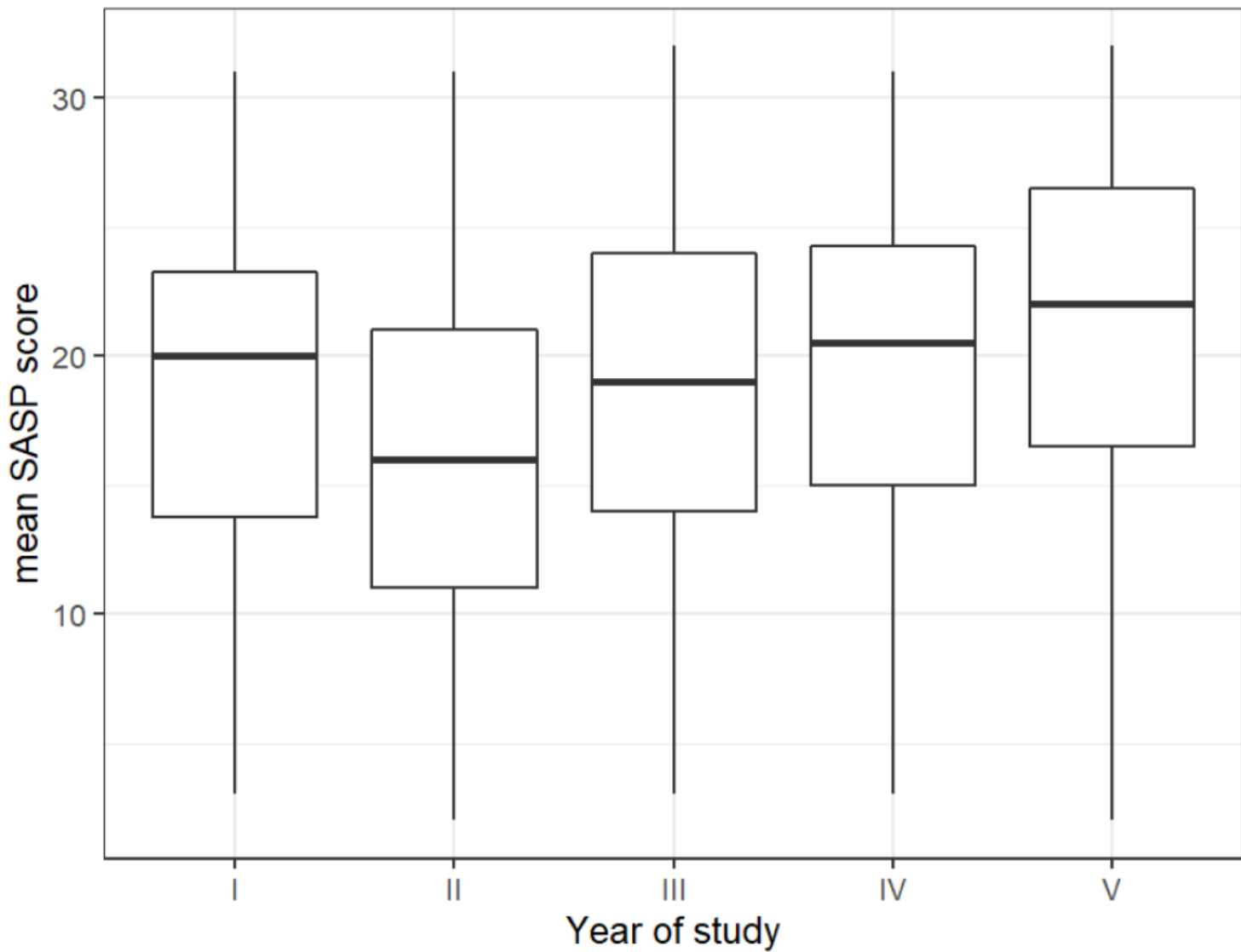


Figure 4

Relationship between Mean SASP score and year of study

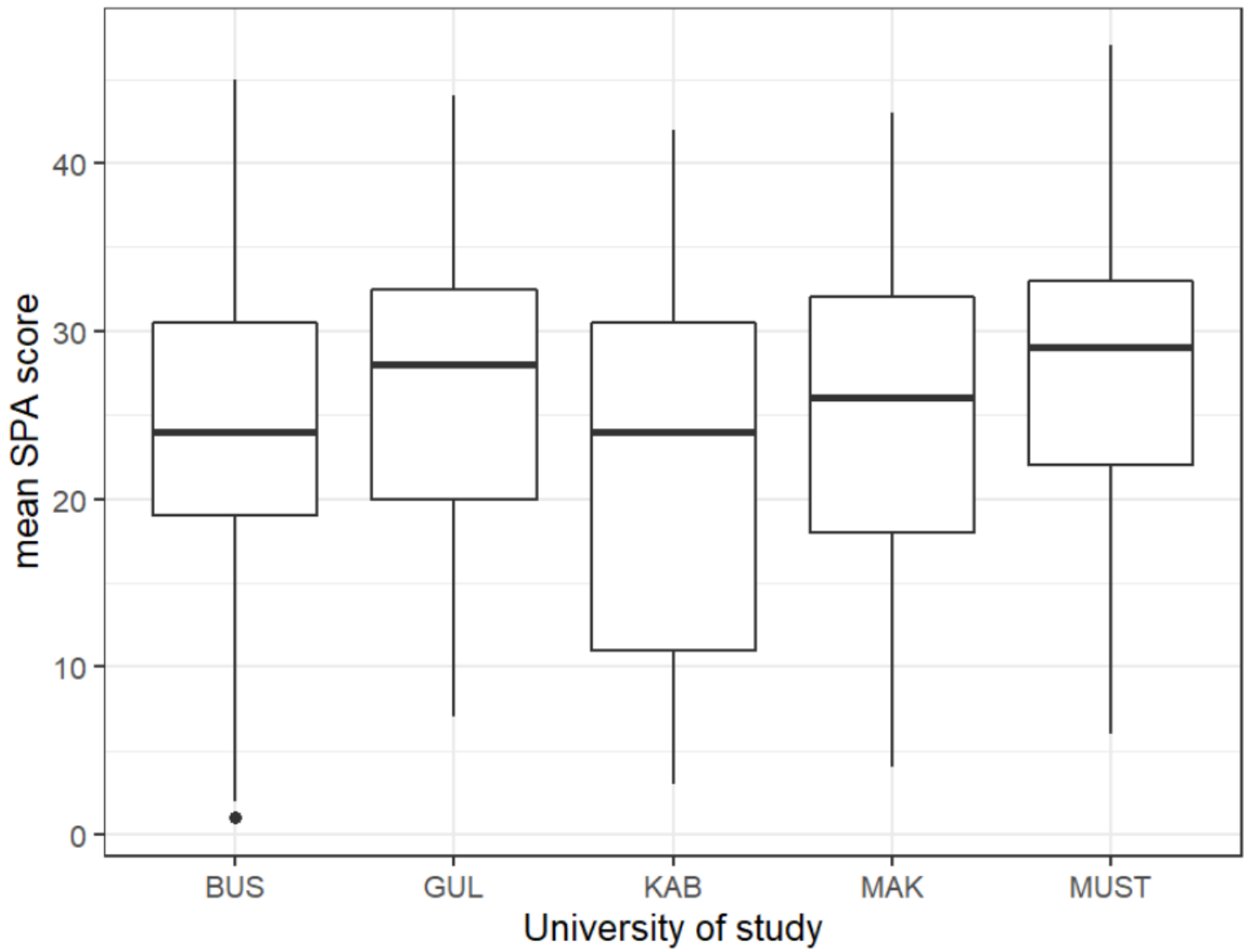


Figure 5

Relationship between the mean SPA score and university of study